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Caring for the Peak of the Load

Every time that a new electric lighting or railway power plant is designed one of the foremost and most difficult of the problems to be solved is "How shall we cope with the peak of the load." Many methods to solve this question have been proposed, and a number of them are in use, the most usual being an installation of storage batteries. There is no doubt that in many ways this is the most satisfactory means of accomplishing the desired result, with the exception that a considerable investment is required and the rate of deterioration is excessive. Where the interest on the investment, depreciation in value, and cost of maintenance is considered, it becomes a question whether or not a storage battery installation is more economical than using one or more extra engines and batteries of boilers, keeping the fires banked and the engines idle during the slack hours, especially as these engines being in use for only a few hours a day may be of simple design and need not have all the economies imperative when all-day running is necessary.

In connection with the latter plan it may be added that a great increase in the boiler capacity is not needed if the plant is equipped with economizers, rapid steaming water boilers and forced draft. The possibilities of this combination has not been as fully appreciated as they deserve by many designing engineers and officials. Apart from considering the combination merely as a means of meeting the heavy demand of rush hours, each equipment has its advantages in regard to the economical generation of steam, which alone often warrants its use, besides offering a solution of the problem in question, that of providing a large reserve steam generating capacity, which can be utilized in a comparatively short space of time. The function of the economizer in this combination is that of providing a large mass of water which, when forced draft is used, can be heated up far above the boiling point by the flue gases, which are much above their temperature created with natural draft. By forced draft, also, the boilers, if properly constructed, can be forced to almost any degree desired in a very short time.

Financially considered, it may be said that the investment in such a plant is as great as that in a storage battery, but when operating expenses are taken into account it at once appears that while in the case of the storage battery the energy must be first stored in the battery and then discharged, the efficiency of the system must be considerably below unity. In the second system, however, there is no double conversion, and under certain conditions it may show a gain over the battery method.

Turnstiles in Boston

At a hearing held last week before the Massachusetts Railroad Commissioners, in Boston, a number of remonstrants against the use of turnstiles at the exits of elevated and subway stations presented their objections. The arguments advanced were on the ground that the turnstiles formed an obstruction in a public highway, and were dangerous to patrons of the road. Several persons testified that they had received injuries in passing through the gates, and claimed that the company ought to supplant the devices by men stationed at the exit points.

On the Boston Elevated Railway 87,000,000 people have passed from the trains since the elevated structure was opened for business, and thus far only seven complaints of injuries received at turnstiles have been received at the company's offices. Under the present system of train operation it has been found necessary to collect fares before allowing passengers to enter on the platforms, as cars would have to be run very slowly between stations if conductors were required to collect fares after the passengers had boarded the cars. This makes it necessary to prevent people from approaching train platforms by the exit stairways, and if a man were placed there, instead of a turnstile, people might climb to the platform only to be told to go down and come up another way. It is also necessary to insure the safety of people present on the train platforms in the subway by shuttting out loafers and others who do not intend to ride. Some dissatisfaction was found with the stiles first used, so they have been modified. The present turnstile is so planned that every passenger has to push it until a ratchet slides up a short incline in the rotary mechanism. The arm may swing back if someone leaves the stile with the ratchet half-way up the incline, but injuries received in this way are almost unknown. If the company should follow the suggestion of placing a man at each point where there is now a turnstile, the exit man could not be made a fare taker without destroying

the system of separating people coming in and those going out. There are thirty-three places where a man would be required to replace an exit turnstile, and this would require sixty-six additional men each year, or an expense of over $42,000, not including entrance turnstiles.

In regard to the so-called public highway obstruction we cannot see why any railway company which leases property for business purposes and pays a rental, should not be allowed to charge for admission to that property. It would be poor policy to throw open the stations to the general public without payment of fare, not only on account of the increased liability to accident from the third rail and swiftly moving trains, but because a fare must be paid somewhere, and it is better to have the fare paid at the entrance than either on the cars or at an exit. Passengers are in a hurry at an entrance only when they see their particular train or car coming, but they are always in a hurry at the exits. Then, again, the platforms are so small that it would be dangerous to allow peddlars and idlers there.

The claim advanced by the objectors to turnstiles, that any person has a right to cancel the contract to ride at any time before actually stepping on the cars is little short of infantile. We cannot see how any person of sanity and intelligence, who deliberately buys a ticket of the railway company and enters its station, with the privilege of riding, after the ticket has been macerated in the ticket chopper, deserves to get his money back, in case a sudden fancy that, after all, he does not wish to ride, enters his head. In regard to the actual turnstile accidents we can only say that practically no form of modern machinery or mechanism, from a needle to a railway train, is free from the possibilities of accident under some conditions, and the price of our highly engineered civilization is of necessity paid in part by the assumption of this risk. When one considers, however, the millions of passengers carried without injury by our elevated roads and reflects upon the marvellous safety of rapid transit in cities in consideration of the traffic handled, and follows month by month the ever-increasing use of safety appliances by progressive managers, the arguments of the fault-finders, as exhibited in the Boston instance, appear little short of inane.

Steam Road and Trolley

A report comes from Maine of proposed legislation to permit steam roads to buy, build and operate trolley systems. This is already permitted in some States but forbidden in others, so that there is nothing of novelty in the proposition from 'way down East. It emphasizes, however, a strong tendency of somewhat uncertain purpose and effect. Whatever steam railroads may do or fail to do we believe first, last and always in the future of electric railways, the lines that stop at "every man's corner" instead of every 5 miles or 10 miles. The urban dweller, much as he depends on the trolley, can hardly realize what an interurban road means to the region it traverses. The world wagged comfortably along for many a century without the telephone, but now that we have it we can hardly do business without it. Just so with the trolley; it has made itself indispensable in every place that it has touched. The best proof of this is the rapidity with which fervid denunciation has been transformed into enthusiastic endorsement when the projected road has become a reality. Even exclusive summer colonists who have damned most earnestly when a trolley line has threatened to invade the sanctity of their domain have been converted by the light of experience. Now, in so far as the Maine proposition or its equivalent will tend to the building of more and better electric roads, it is excellent and worthy of support; in so far as it will hinder such developments it is bad and reprehensible. That steam railroads have built and operated electric roads of the most useful and efficient sort admits of no dispute. The Nantasket line, the New Britain line and the fine line between Manchester and Concord, N. H., which we have recently described, are cases in points.

On the other hand there are plenty of cases in which steam roads have throttled franchises or have acquired them for purely obstructive purposes. Competition is never grateful to any line of business, and the deadly effect of a well administered trolley line needs no sort of demonstration. There is little doubt that an interurban line is a dangerous competitor even when it is short and without through connections, while with them it takes on a still more serious phase of development. There is at present a strong tendency to build long lines, and we have many times pointed out the advantages of at least a working form of consolidation in the case of connecting electric roads. This is a form of combination which results in nothing but good to the community. The immediate result in almost every case is better service and the reduction of fares, while the roads themselves can gain by important economies. In particular we have often pointed out the advantage of through cars, welding connecting roads into a coherent system. The steam roads themselves have long since passed through the stage of independent or conflicting operation and have emerged into a state of aggregation that gives the public long through routes all over the country. Now, what is going to be the effect of ownership by steam roads on the relations between contiguous electric roads? When a railroad acquires one link in a chain what relation will that link afterwards bear to the others? Will it be possible to unite it so as to form part of a through route? These are most vital questions bearing on the matter in hand. In other words, will the proposed measure advance or obstruct the general cause of electric traction in its larger and more important developments? That roads built and operated in the light of extensive railway experience will be in themselves well built and well operated is altogether probable, but will they, upon the whole, tend to enlarge or to restrict the sphere of electric railroads?

On the answers to such questions as these depend the propriety of a general provision such as has been proposed. The answers may often be predicted in particular cases, but in general they are indeterminate. A statute cannot readily be made to fit every case or to provide for future changes of railway policy. It is hard to foresee all the possible contingencies or to find a touchstone to discriminate between permissive and obstructive purposes. But what would be the result of a provision to the effect that any line built or purchased under such an act as that which is here in question should grant connection and right of way over its tracks to present or future contiguous lines on terms to be fixed by the courts? Would the steam railroads want rights thus guaranteed against obstructive use? If they would, by all means let them be granted, for every well-run road is a public benefit by whomsoever built and owned. In the case of most ordinary lines there is little need of such a provision, for the advantages of united action are too apparent to need legislative enforcement. There are sometimes temporary misunderstandings between connecting lines, but they are generally overcome by obvious common

interests. Where compensation with steam roads is concerned these common interests are replaced by a mutual distrust and rivalry that is not easy to dissipate. It looks to us very much as if some such rider should be attached to any act which should give railroads the right to occupy in their own behalf ground which otherwise might be used for greater public good. The strength of electric traction lies in the benefits it confers on its patrons. They are sometimes prone to grumble, to find fault with the accommodations, and to demand all sorts of unreasonable concessions, but we have yet to see the case in which the worst electric line ever built, operated in the most shiftless way on record, would be willingly dispensed with by the community it inefficiently serves. Electric traction is going ahead, it is giving and will give to this country the best system of transportation that the world has ever seen, and its way must not be blocked. Its growth may legitimately be regulated and guided, but in the interests of the whole people it must not be checked.

The Passenger Traffic Problem of Greater New York

The articles by Mr. Wheatly on this subject, commencing with the issue of Jan. 10, are concluded in this issue. The first article was an attempt to show the present traffic conditions in Manhattan and to indicate what the problem for solution was conceived to be. The article in the issue of Jan. 17 gave an outline of the additional traffic facilities authorized or proposed and pointed out, wherein these facilities appeared to fall short of providing an adequate and comprehensive rapid transit system for Manhattan. This article also indicated the relation of the additional facilities to one another and to the present lines of traffic. The concluding article in this series, which is published in this issue, deals with the present traffic conditions in Brooklyn and Queens, and the probable effect of the completion of the new bridges and tunnels upon the entire transportation situation of Greater New York, and especially of Brooklyn and the Long Island suburbs.

One of the points brought out early in the discussion was that the existing lines of traffic in Manhattan are already being worked almost to the utmost limit of their capacity. The addition of a third track on the elevated structure here and there, the amplification of its terminals at City Hall, the Battery and other congested points, the removal, in so far as is possible, of the existing limitations to train movement at Ninth Avenue and Fifty-Third Street and other similar junction points, the completion of the electrical equipment of all of its lines, making possible an increased number of cars per train, and the lengthening of its station platforms is about all that can be done to increase the passenger-carrying capacity of the Manhattan Elevated road. When all of these things have been done the increase in hourly traffic capacity will amount to only a small percentage of the maximum traffic now being carried in one direction. It has recently happened repeatedly that over 100,000 people have been carried in one hour, of which, perhaps, 90 per cent were in one direction. It may be possible, however, by making a more evenly balanced traffic to increase considerably the number carried in one hour in both directions. Mr. Vreeland is authority for the statement that the adoption and enforcement of a proper code of rules of the road and the consequent removal of the vehicle interference, will enable the surface lines to increase their carrying capacity 25 per cent in one direction. Here, too, there is an opportunity, by creating a more evenly balanced traffic, to carry more people in one hour in both directions. With the co-operation of the city authorities all of these improvements on the elevated and surface lines are made possible, but without their active assistance little can be accomplished.

The significant fact is strongly brought out by Mr. Wheatly that the north and south traffic leaving the business district in New York now averages about 142,000 passengers in the maximum hour, and that this number is 56 per cent of the total. The existing conditions of overcrowding on the north and south lines are well known, and the proportion of passengers who do not obtain seats may be estimated by any one who rides in the rush hours. It has been variously estimated that 50 per cent to 60 per cent obtain seats while 40 per cent to 50 per cent stand. How near this estimate is to the truth can be shown only by actual figures. But the fact remains that the present volume of north and south traffic most urgently demands radical action looking towards permanent and adequate relief. Unless this is done the future growth of the northern part of the city and its suburbs is bound to be retarded. The additional facilities outlined at present do not furnish adequate and permanent relief to the north and south traffic.

Mr. Wheatly calls attention to the fact that the greater part of the additional facilities will not be completed until 1907 or 1908, and not until then may it be expected that there will be an adequate outlet for the growth of population. Furthermore, the additional facilities, as at present outlined, point toward Brooklyn, Queens and suburban Long Island as the territory to which the overflow of population will be forced to go. Heretofore the growth has been principally toward the north, because only in that direction was there direct land communication with the suburban districts, with the single exception of the Brooklyn Bridge, which afforded a most inadequate means of communication with Long Island as a whole and with Brooklyn in particular. The difficulty in the way of the population spreading west is shown by the fact that with the present ferryboat service across the Hudson River the first mile is made at the average rate of only 4 miles per hour. The completion of the subway, with its ability to handle only about 28,000 seated passengers per hour in one direction, will give only temporary relief to the north and south traffic. Within a short time after its completion this rapid transit highway is apparently destined to be overcrowded quite as badly as the existing lines. Before additional subways can be authorized and completed the traffic will have greatly increased, and the congestion is expected to be as great, if not greater, than at present.

But most remarkable of all is the statement that the additional bridges and tunnels leading toward Long Island will have a maximum carrying capacity per hour in excess of the entire number of people who now come from Long Island to Manhattan in one full day. This maximum traffic capacity of the bridges and tunnels will not, however, be reached until there is a great increase in the population across the river, and not until the railroads serving Brooklyn, Queens and suburban Long Island have made adequate increase in their facilities for handling the vastly increased passenger traffic. The railway officials are fully alive to the fact that to attract increased population the traveling facilities must be kept considerably in advance of the demand for transportation. There seems to be little reason to doubt that the wisdom of the municipal authorities in providing upon such a broad and comprehensive basis for the future growth of the territory across the East River, will result in drawing to that territory the overflow of population which is now waiting to leave Manhattan upon the line of least resistance, as well as the increase of population for many years to come.

ELECTRIC ROAD FROM FAYET TO CHAMONIX

Chamonix, the French village which lies nearest to the foot of Mont Blanc, is the most popular tourist resort and center for excursions in the entire Mont Blanc region. Up to within a year, however, there was no means of reaching the town except by a diligence ride for several hours after leaving the nearest steam railroad station to Fayet-St.-Gervais, or by the even longer passage, by diligence or on foot, across the Téte Noire pass from the Swiss village of Martigny. The new electric road which now connects Fayet and Chamonix has been built by the Paris-Lyons-Mediterranean Railroad Company, one of the large trunk railroads of France, and connects at Fayet with a steam line of the Paris-Lyons-Mediterranean Railroad Company. There are no special features worthy of notice on the steam-operated part of the line as far as Fayet-St.-Gervais, but from this point the new electric railway offers a great number of interesting points which will be noticed hereafter.

GENERAL VIEW OF ELECTRIC TRAIN, STATION AT CHAMONIX AND MOUNT BLANC

The road is being extended from Chamonix on to Switzerland, and this work is now under construction by the Paris-Lyons-Mediterranean Company, but the present article will deal in detail with only that portion now open for traffic.

The traffic on the line is, of course, very irregular, consisting principally of tourists, and no traffic was expected during the winter months. The company was, in fact, authorized by its concession to suspend the service during the winter, that is, six months every year, and to charge the fares double those obtaining on the main trunk lines of the Paris-Lyons-Mediterranean system. It appears, however, that the results of the first year's working, that is, during 1902, have been so encouraging that the company expects to maintain the service throughout the year, except when heavy falls of snow actually prevent.

The length of line from Fayet to Chamonix is about 19 km or 12 miles, in which distance there are twelve stopping points. The maximum grade is one of 9 per cent for a distance of 2.155 km (about 1½ miles), the other of 8 per cent for a length of 1.386 km (about 0.85 miles). The remainder of the road presents no grades exceeding 2 per cent.

Experiments were first made with a mountain locomotive, which could be run with or without using the cogwheel, but this was replaced by a special system of train control, which is very similar to some of the American multiple unit systems. It was devised by Mr. Auvert, one of the engineers of the Paris-Lyons-Mediterranean Railroad, and has proved very satisfactory. The question could have been solved, of course, by the use of single motor cars instead of trains, but this was not considered practicable in this case for reason that the company wished to keep the rolling stock the same as that employed on the steam divisions of its system.

TRACK AND THIRD-RAIL SYSTEM

The track is laid with 35 kg (70 lbs.) T-rails in 39.36 ft. (12 m) lengths, and with a 1 m gage. A central rail is fixed between these rails on the steep inclines above referred to. The track rails are mounted on ties spaced as shown in Fig. 1, and are held to the ties by tie-plates with lag screws, except at certain portions of the heavy grades, where they are solidly anchored at intervals to prevent creeping. Fig. 2 shows clearly the systems of track construction as well as the central rail, above referred to, which has been installed on the heavy grades for emergency braking purposes. The rail is gripped by the brake fixed on the cars. It is of the ordinary track-rail section, and is fixed at a height of some 60 mm (2½ ins.) above the outer track rails, as shown. The ordinary angle-plates are used with this rail, and the anchoring chairs are fixed to heavy wooden supports, the latter being placed alternately, one each side of the track.

The third rail is also of the same section and type as the track rails. It is placed outside the track and is supported by paraffined wood insulators, which are mounted on the ties, as will be seen in Fig. 3. In the stations the third rail is carried between tracks for the convenience and safety of passengers. Moreover, wooden guards are used, very similar to those employed on the Paris-Orleans Railway, as described in a recent number. The top of the third rail is some 23 mm (15-16 in.)

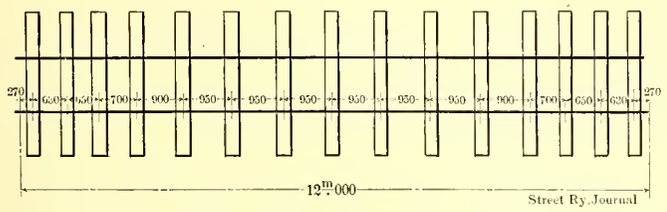


FIG. 1.—PLAN OF TRACK, SHOWING SPACING OF TIES

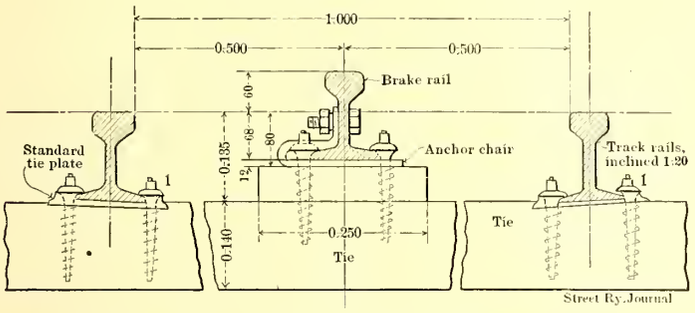


FIG. 2.—SECTION OF TRACK SHOWING BRAKE RAIL

higher than the track level, and is 108 cm (3 ft. 6 ins.) from the center of the track. For bonding the company has adopted the Brown plastic bond, which has given very satisfactory results. The resistance of the third rail has been found to be about 0.000049 ohms per meter length. The Paris-Lyons-Mediterranean Railway Company, however, now favors the use of special composition rails, already adopted by the Paris Metropolitan Railway Company for its recent work and which will be used on future work.

At crossings and elsewhere where the third rail is interrupted the ends are connected in the manner represented in Fig. 4. The bare copper wires joining the ends of the third rail at these places are simply laid in wooden troughs, which are filled with asphalt. The same wooden trenches are used for the connecting feeders of the third rail.

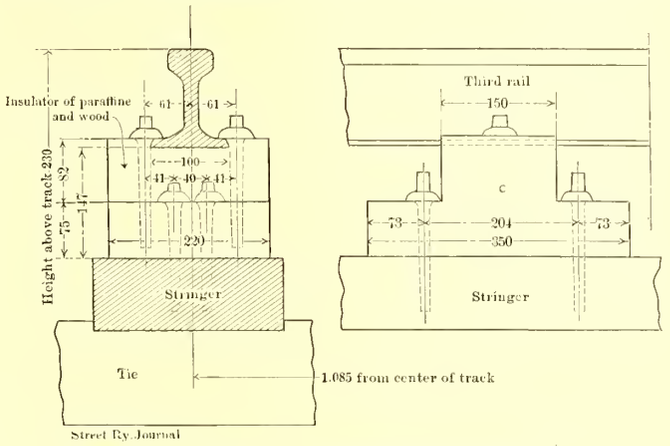


FIG. 3.—METHOD OF INSULATING THIRD RAIL

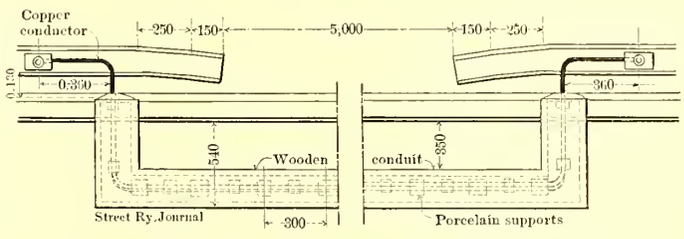
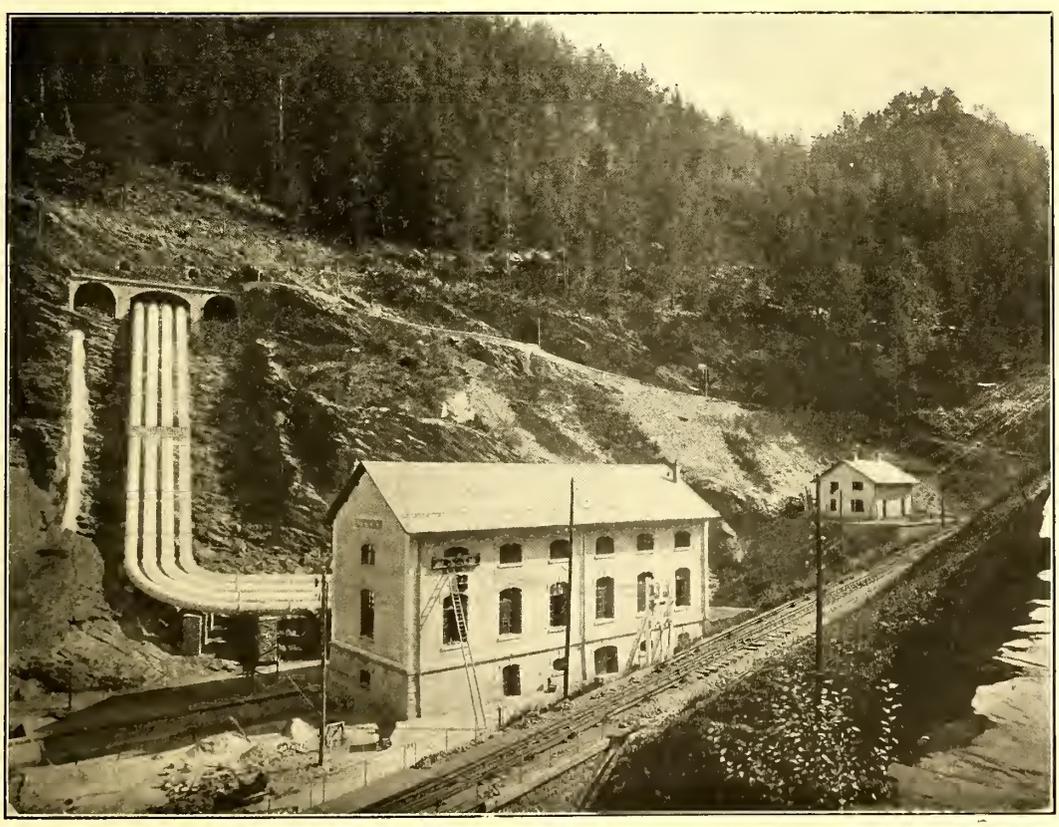


FIG. 4.—METHOD OF ELECTRICALLY CONNECTING THIRD RAIL AT CROSSINGS

GENERATING STATIONS

There are two generating stations, situated respectively at Servoz and Chavants, as shown on the map, Fig. 5. Distribution is by direct current, but high-tension distribution with sub-stations will probably be used for feeding the extension of the line now under construction.



VIEW OF POWER STATION AND GRADE AT SERVOZ

Both stations are hydraulic and derive their power from the River Arve, the valley of which is followed by the line for some considerable distance. The water of the Arve River is turbid and muddy, and special care had to be taken on this account to pass the water through a special depositing chamber before admitting it to the turbines. These chambers are cleaned out from time to time.

The fall of water utilized by the Servoz station is afterwards employed by the electrochemical works at Chedde, for which purpose the fall was at first constructed by the Société des Forces Motrices de l'Arve. The total height of the fall is 178 m (584 ft.). The first 39 m (126 ft.) is used by the Servoz station of the Paris-Lyons-Mediterranean Company, while the remaining 139 m (458 ft.) is employed by the Chedde electrochemical works, as above stated. The normal

flow is 12 cu. m (423 cu. ft.) per second, while the minimum flow is 6 cu. m (212 cu. ft.) per second. The normal horsepower available for the Servoz station is 4560 on turbine blades, and the minimum power available on the turbine blades of the Servoz station is 2280 hp.

The low water season exactly coincides with the stoppage of the operation of the railway, so that there is no shortage of power, although now that the service is proposed for the whole year there may be trouble from this cause. The Chavants station, however, is well supplied with water and can make up the deficiency at Servoz.

PASSENGER STATION AT CHAMONIX

The waterfall supplying the Chavants station has been installed in its entirety by the Paris-Lyons-Mediterranean Company. The figures corresponding to those given for the Servoz station above are as follows: Height of fall, 94 m (288 ft.); maximum flow of water, 11½ cu. m (406 cu. ft.) in summer; minimum flow, 5 cu. m to 6 cu. m in winter.

The same system of hydraulic construction has been followed in both stations, and one description will serve for both. The dams were at first built with wooden beams, but they were carried away, and solid masonry dams have been substituted.

The depositing chambers rendered necessary by the muddy character of the water are 230 m (754 ft.) in length for the Servoz station, and are subterranean. They allow an output of 8 cu. m (282.4 cu. ft.) per second, and the speed of the water is reduced between the intake and the outlet to 0.47 m (1.54 ft.) per second. The sand and other matter in suspension are thus deposited. There are also by-passes, allowing the water to be diverted directly into the Arve when necessary to clean the depositing chambers.

The main turbines have no regulators and the voltage is kept constant by electric means only. The methods vary somewhat in the Servoz and Chavants stations. The reason of this is that the Servoz station feeds directly into the line, whereas the Chavants station supplies its current to the line through a feeder of considerable length, so that over-compounding is necessary. This fact makes the question of close regulation less important than in the case of direct feeding. In both stations the turbine constructors had the following limitations imposed upon them: The full-load speed was to be 450 r. p. m.; the no-load speed was specified not to exceed 600 r. p. m., a variation which will seem very low if one remembers that the ordinary turbines built for a normal speed of 450 r. p. m. have a no-load speed of 1000 r. p. m. to 1100 r. p. m. This variation of speed has been obtained by special construction of the blades in the revolving part of the turbine.

THE SERVOZ STATION

This station contains four main generating groups and two excitation groups. All are horizontally placed and the generators and turbines are direct coupled by means of a Raffard strap coupling. The ratings of the main generators are as follows: Normal output (continuous) 370 amps.; overload for one-half hour, 450 amps, with rise of temperature not exceeding 45 degs. C.; momentary overload without dangerous sparking 600 amps.

This latter figure is interesting, inasmuch as the machines have to take care of heavy overloads, no accumulator batteries being provided.

The four main generators are separately excited and are of 200 kw rating each with six poles and are connected to reaction centripetal turbines. The two auxiliary dynamos are of 40 kw, four poles each, and are connected to centrifugal turbines. They serve as exciters to the large machines and also fulfil the lighting service of the stations. The auxiliary turbines for the exciters are regulated by a special and very exact regulator, designed by the Société de Construction de Vevey. As this regulator is of a well-known type attention will be given to the main generator regulation, which, as above stated, is made by compounding, the turbines running at no-load speed of 615 r. p. m. and a full-load speed of 450 r. p. m.

STE. MARIE VIADUCT ON CHAMONIX ELECTRIC RAILWAY

The variations in speed and power are given in the following table:

Mechanical hp on turbine shaft	Speed in r. p. m.	Voltage at generator terminals	Load in amperes	Effective load in kw
0	615	550	0	0
62	595	577	72	42
107	575	578	124	72
162	550	578	188	109
214	522	568	252	143
260	500	558	312	175
308	470	542	380	206
342	478	522	440	230

The regulation, as will be seen from the tables, is very good and is obtained as follows:

The main generators have two field windings, one of which receives constant excitation from the auxiliary dynamos, and the second field winding is connected in series with the station, and is therefore excited by the current on the machines. Any increase in load naturally decreases the speed of the turbines, as per the first two columns in the table above. The increased load, however, increases the series excitation of the generator, and therefore compensates for the decrease in speed by raising the ampere turns of excitation. The variation in voltage is not considerable, as will be seen from the third column in the table.

The switchboard is of the panel type, the panels being distributed from left to right-hand side as follows: Generating panels, 1 and 2; line panel; generator panels, 3 and 4; exciter panels, 1 and 2. The measuring instruments are of Chauvin and Arnoux type, and Thomson-Houston circuit breakers are used, being set at 1750 amps.

CHAVANTS STATION

By reference to the profile map this will be seen to be situated near kilometer 9. This station feeds the line by means of a feeder running as far as kilometer 12, and over-compounding is therefore used. This over-compounding is made on the same principle as that at the Servoz station. A special device has been provided in order not to run the Chavants machines as motors when the load on the line is light. One possible danger which might result from over-compound is that the series field might be reversed at Servoz station and the constant excitation might be such as to result in a serious loss in current and even accident. An automatic apparatus has, therefore, been provided for braking the Chavants station under light load by resistance in series. This resistance is short circuited as soon as the load in the Chavants station exceeds 50 amps. The general arrangement of this device is shown in Fig. 7. It consists essentially of a motor M, the fields of which are in series with the line, and the armature of which is connected to a constant voltage through the lighting bus-bars. When the load passing through the fields of the motor is small it does not create a sufficient torque for running the motor. When it is high enough to overcome the resistance of the spring R the motor draws down the plunger A, which short circuits the resistance B by means of the bridge C. The resistance is made of a type PR Thomson-Houston resistance, carrying 70 amps., and having a resistance of 0.8 ohms.

The bus-bar voltage at the Chavants station is, therefore, in-

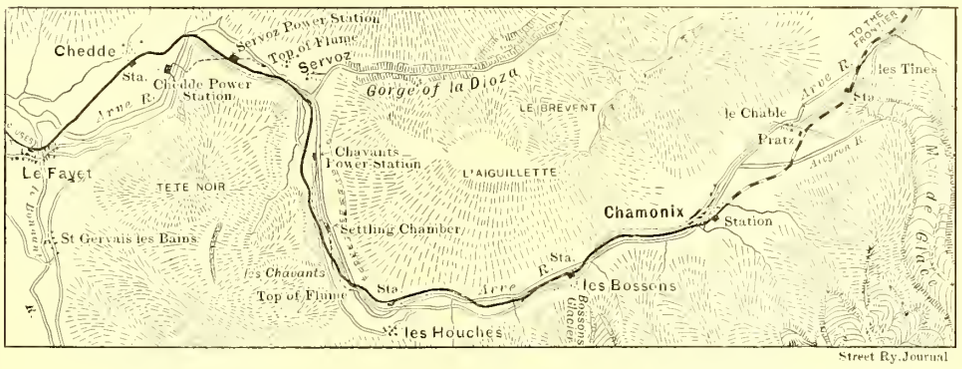


FIG. 5.—MAP SHOWING ROUTE OF CHAMONIX ELECTRIC RAILWAY

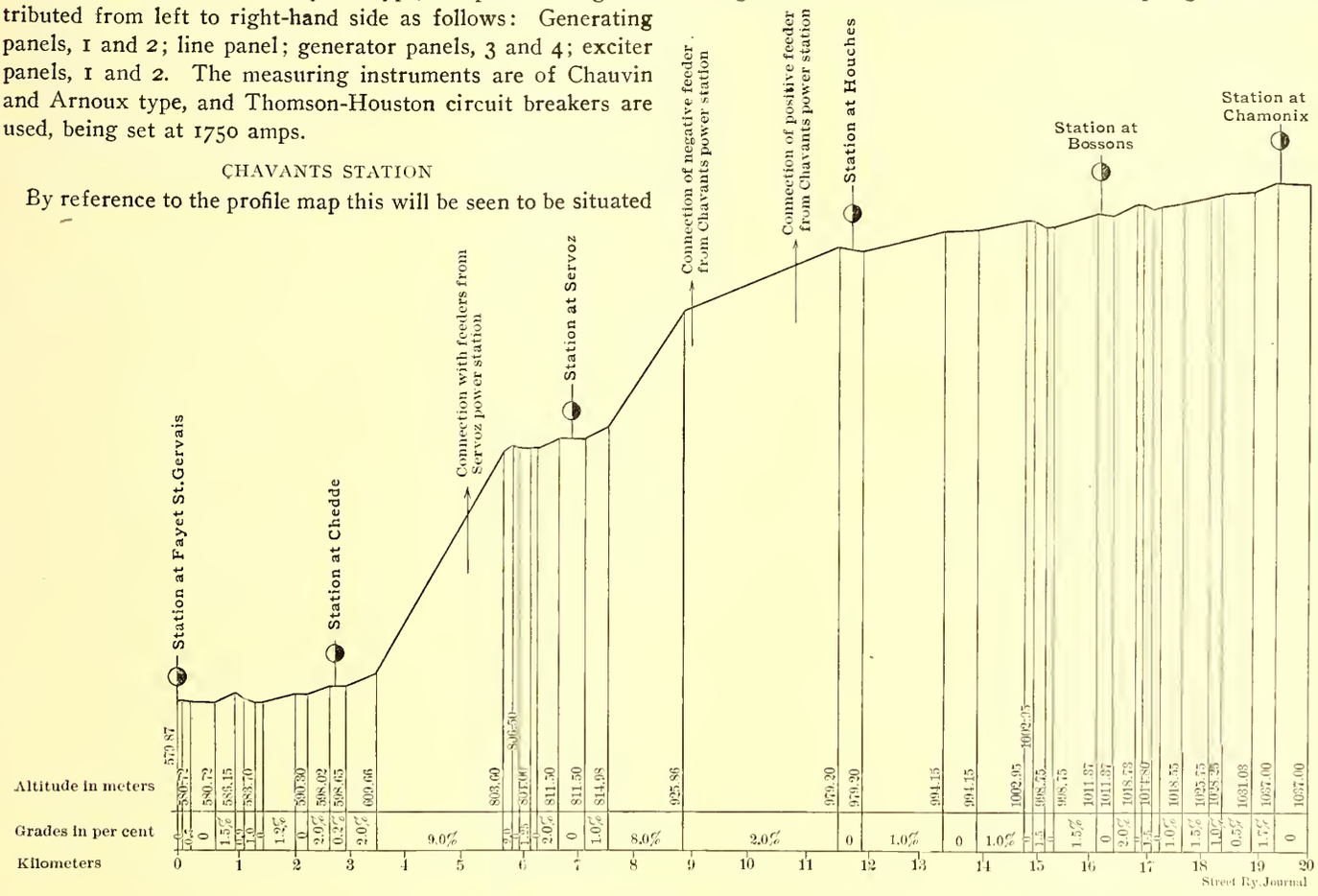


FIG. 6.—PROFILE OF CHAMONIX ELECTRIC RAILWAY

creased as follows: At no-load speed of 600 r. p. m. the no-load tension at the terminals of the generator is 550 volts. At the speed of 450 r. p. m., corresponding to full load of 290 amps., the terminal voltage is 680 volts. This increase in voltage is about exactly absorbed by the loss in the feeders on the positive and negative side.

HYDRAULIC POWER STATION AT SERVOZ

ROLLING STOCK

As was stated in the earlier part of the article the rack system was tried and discarded, and the locomotive used therewith was replaced by a multiple unit system of train control, designed by M. Auvert, engineer of the Paris-Lyons-Mediterranean Railway Company, and which has been in successful service for the past six months. It is not the purpose here to discuss the many interesting points involved in the pneumatic system of train control in operation on the line, which will form the subject of another article at a future date. A brief description will be given, however, of the trains, motors and rolling stock which present special features of interest.

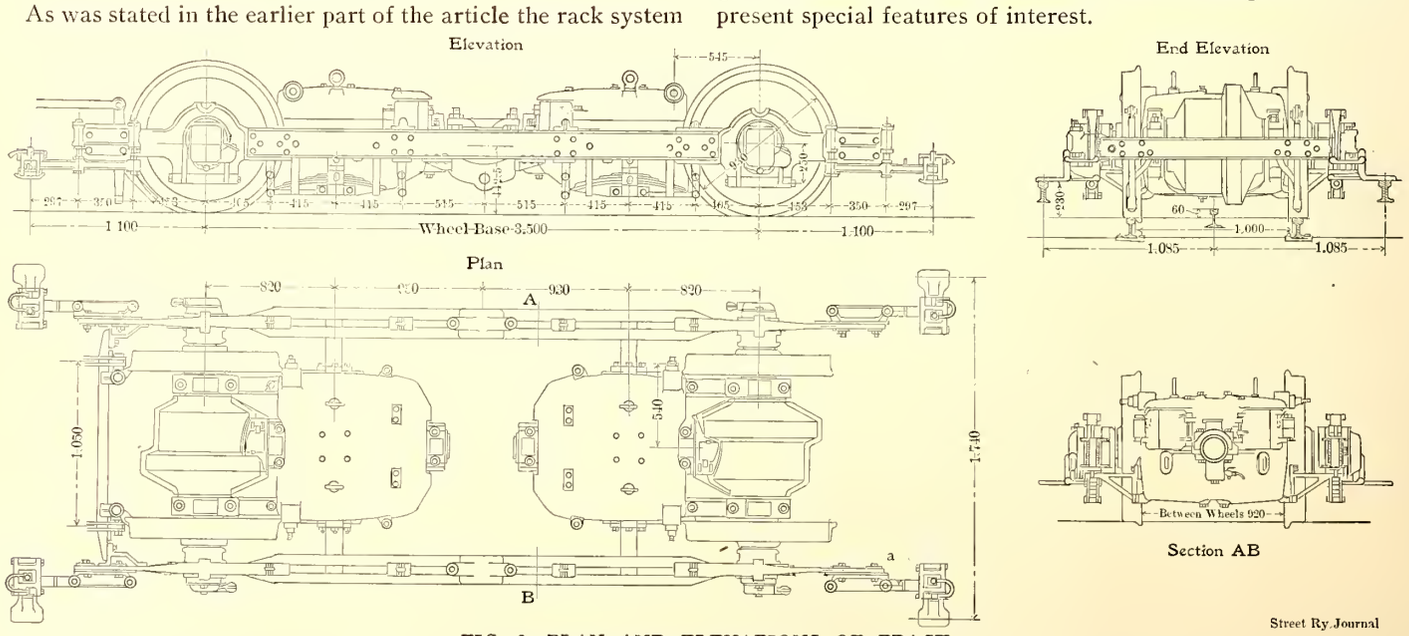


FIG. 8.—PLAN AND ELEVATIONS OF TRACK

The following table gives the schedule of regular trains in service, to which are added extra trains whenever needed.

From this table we see that at least two kinds of cars have been used, one for passenger traffic and the other for freight:

TIME TABLE OF TRAINS AND REGULAR SERVICE

April 1 to June 1.....	3	passenger trains,	1	freight train	each way.
June 1 to July 1.....	5	" "	2	" trains	"
July 1 to July 15.....	8	" "	2	" "	"
Sept. 15 to Nov. 1....	5	" "	2	" "	"
Nov. 1 to Dec. 15....	3	" "	1	goods "	"

The passenger cars are of two classes as on the Paris-Lyons-Mediterranean main line divisions, and the freight cars are of several types. Both passenger and freight cars are used as

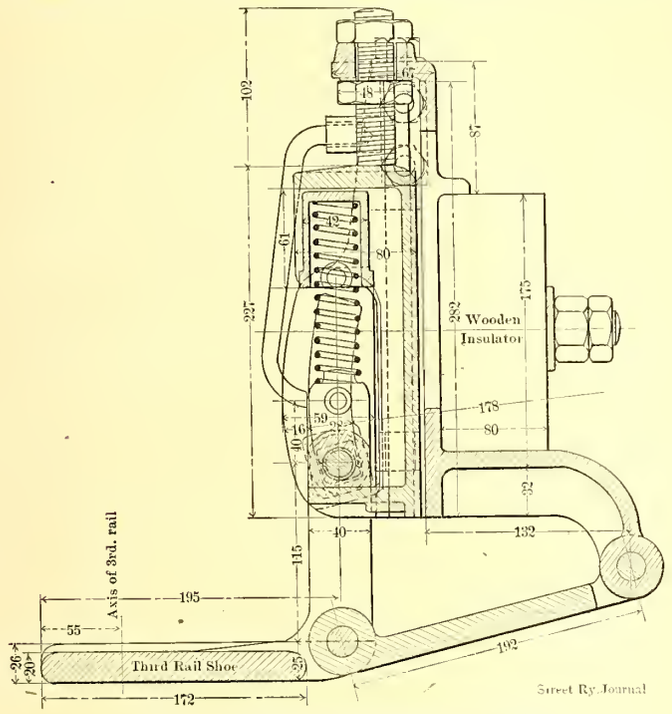


FIG. 11.—SECTION OF THIRD-RAIL SHOE

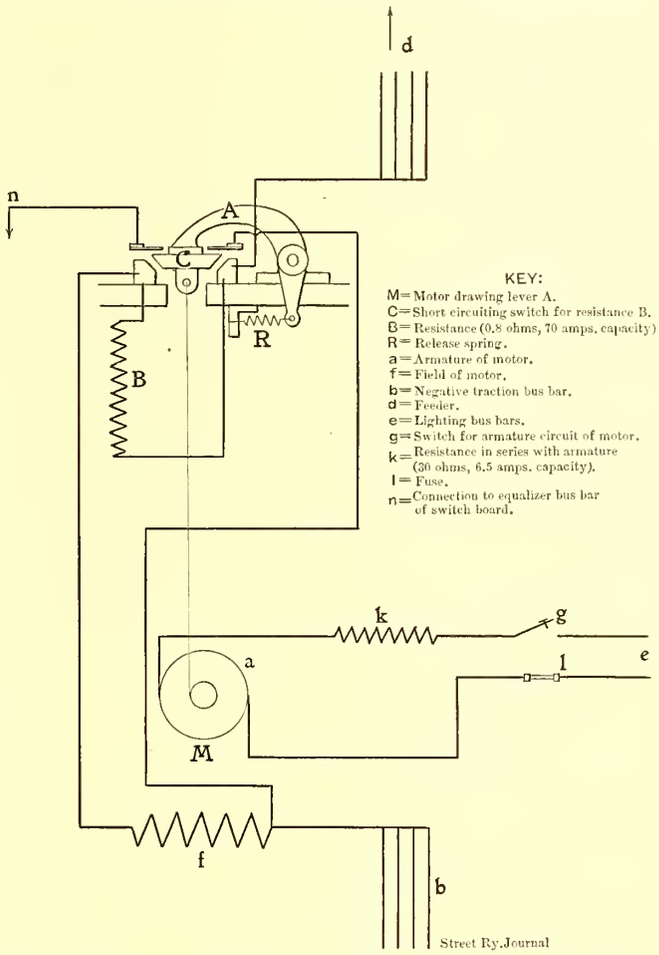


FIG. 7.—DIAGRAM OF REGULATING DEVICE AT POWER STATION

motor cars; a train always includes a large proportion of motor cars, in view of the high grades to be surmounted. For instance, a seven-car train is composed of five motor cars and two trail cars. Lighter trains are made of five motor cars and one trailer, four motor cars and one trailer, or three motor cars and one trailer. The motor cars weigh about 20 tons each.

frames rest on the axle boxes without the interposition of springs. This disposition was adopted to avoid the difficulties which would have been experienced from the use of springs in this case. Their play would have changed the relative positions of the central brake and the rail on which it acts, as will be described, and which is a special feature of these cars.

The motors are mounted with their shafts parallel to the

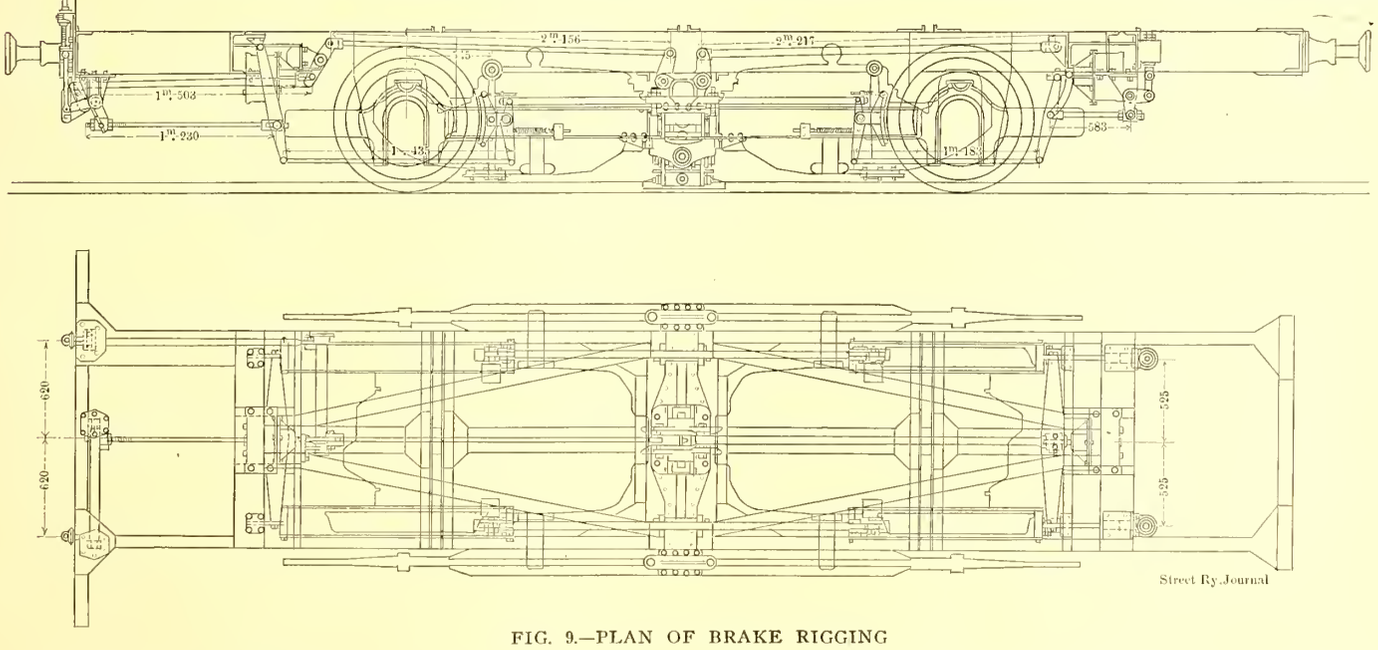


FIG. 9.—PLAN OF BRAKE RIGGING

All of the cars are mounted on two axles, and are equipped with two-series motors of 65 hp each. The assembly of the truck parts is not made according to the principles of ordinary track, and the end of the shaft opposite to the commutator carries a bevel pinion, which meshes with a bevel gear. The motor is suspended from each side by means of long, flat elliptical

springs, each system of springs supporting the motor on its own center of gravity.

A double system of brakes is used, as shown in Figs. 9 and 10. One system acts on the wheels, and is suspended from the motor frame. The other acts on the center rail and is suspended from a cross bar of the truck. The suspension of wheel brakes from the motor frames is intended to avoid the inconvenience to passengers of shocks by braking, as these shocks are thus reduced to a minimum.

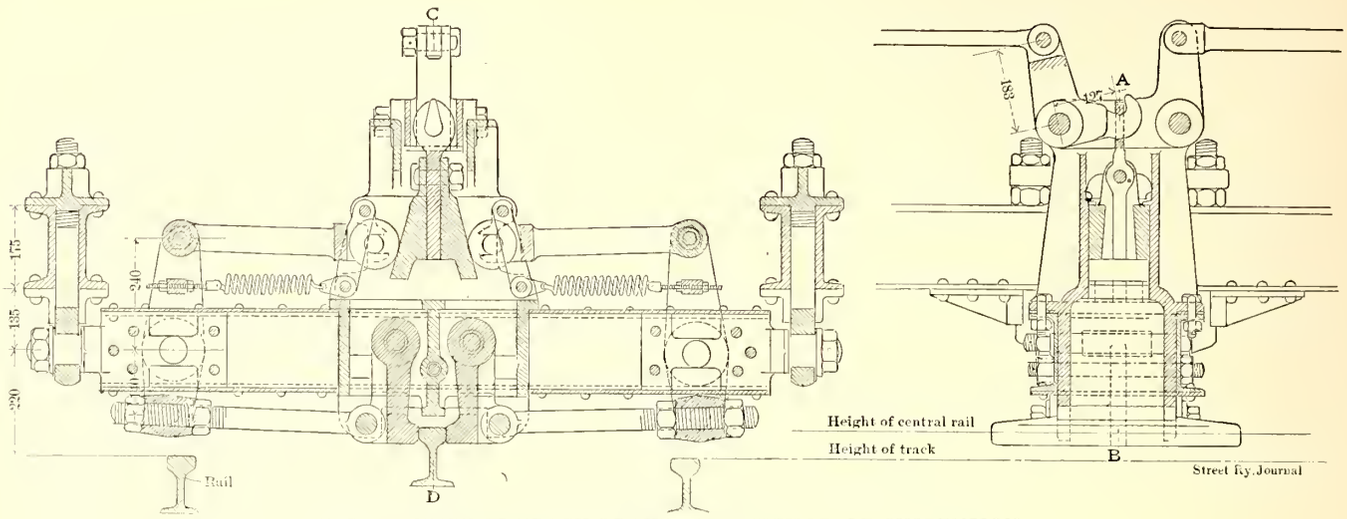
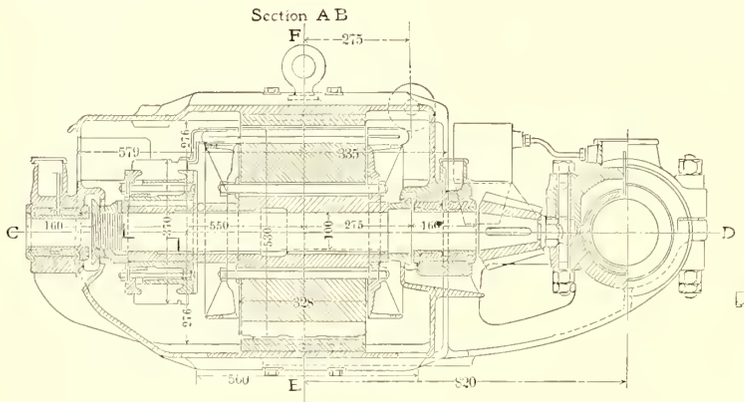
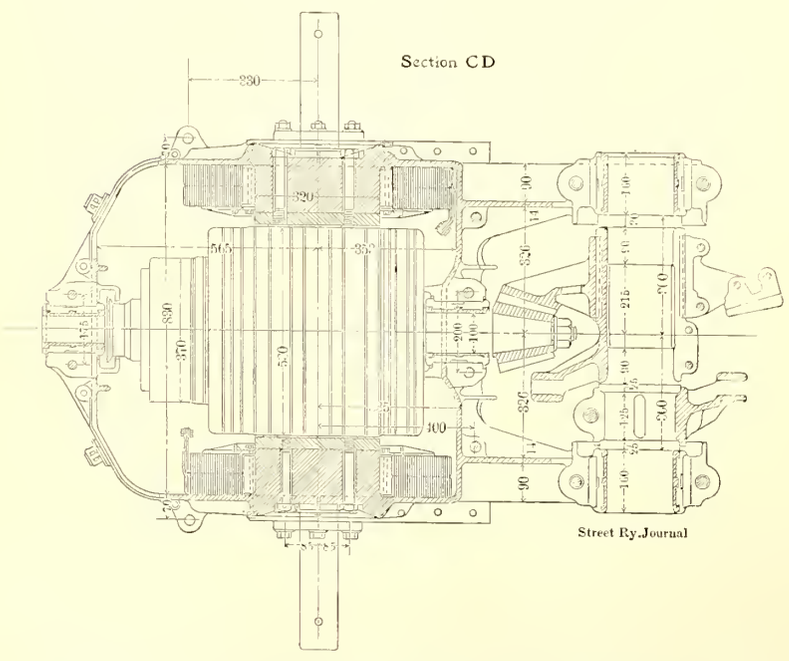


FIG. 10.—CENTRAL-TRACK BRAKE AND METHOD OF SUSPENSION





It must not be forgotten that the brake generally employed is the wheel brake, the central track brake being only used for emergencies.

The third-rail shoe is supported by means of a rather solid iron bar at the ends of the side-bars, as shown in Fig. 8. Its construction differs somewhat from the American third-rail shoe, as will be seen in further detail in Fig. 11. The frame of the shoe support is now carried by a wooden bar of a section of 80 mm x 175 mm (3 ins. x 7 ins.). This wooden beam is also used for electrically insulating the third-rail shoe, in addition to a "stabilite plate," which was formerly used alone. Stabilite is a material somewhat similar to vulcanized fibre but harder.

According to American practice the motors should have their

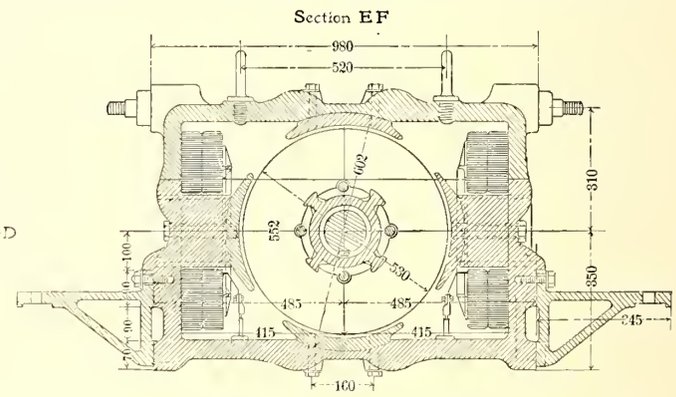


FIG. 12—SECTIONS OF MOTOR

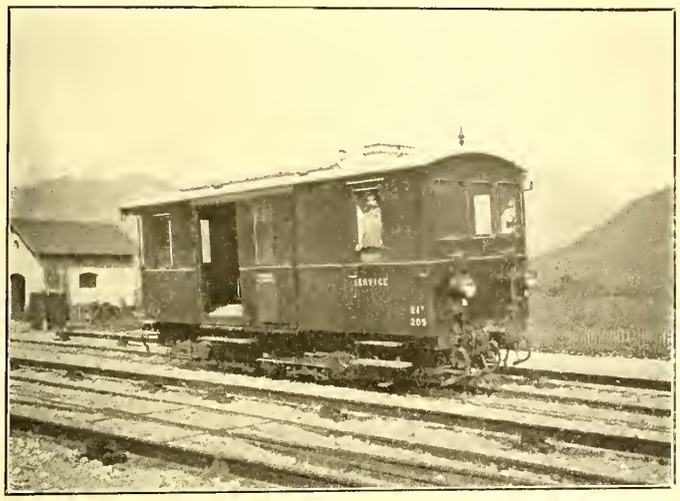
shafts parallel to the axles of the truck, but some difficulties would have been experienced a few years ago in the construction of heavy motors of this kind for a gage of 1 m, especially with the elastic coupling, which is very much in favor in France; and as such a coupling takes a certain space on the available length of axle it increases the space necessary for motor suspension. The motor had, therefore, to be placed longitudinally.

This arrangement is very clearly shown in Figs. 8 and 12, especially the latter. Referring to this figure we see that the end pinion on the motor armatures meshes with a large bevel gear, which transmits the rotation from the motor to the elastic coupling, the bevel gear, as shown, being keyed not to the shaft but onto the sleeve of the elastic coupling, represented in detail in Fig. 13. From inspection of these figures it will be seen that the power is transmitted from one sleeve to the other through springs which rest on the ends of pieces on the two sleeves. The pinion, gear and coupling are enveloped in a gear case filled with special lubricating material. Incidentally it may be stated that the grease usually employed in these cases has been discarded, as the centrifugal force threw it out of the gears along the sides of the gear case, so that good lubrication

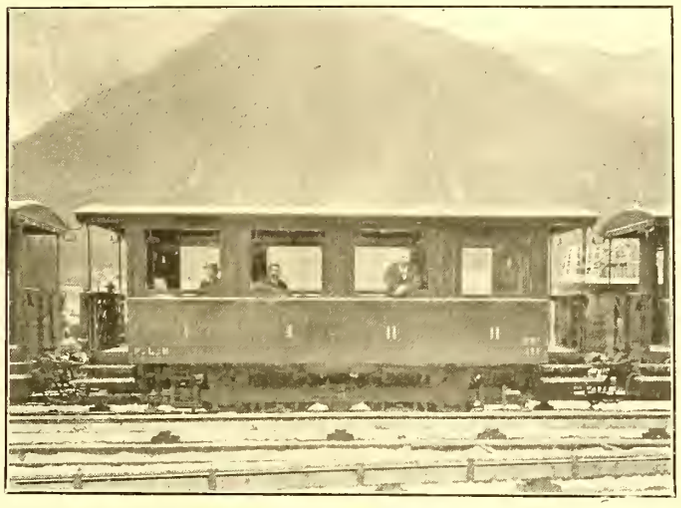
was an impossibility. The material now used is called "mineral tallow." The gears used were cut in the shops of the Paris-Lyons-Mediterranean Railroad for the La Fayet Chamonix road, and are of cast-steel of a very hard constitution, the pinions being made of mild forged steel.

The oiling of journal boxes of the truck is accomplished by means of felt oilers and the motor axle bearings by means of a wick. The bearings themselves are of Babbitt bronze.

Each of the two motors of the motor cars is rated 65 hp at 550 volts, with a temperature rise of 60 degs. C. over the air temperature. The overload rating is 200 amps. per motor during ten minutes without undue sparking. A speed of 275 r. p. m. is obtained with a gear ratio of 4:1. The motors are direct-current series motors, as per ordinary practice. They have four poles, and the non-laminated pole pieces are placed horizontally and vertically, the latter having no windings, the horizontal pole pieces having each two field coils. The outside appearance of the motors is similar to American construction, the electrical parts being protected by two shells, completely enclosing them, the joint being horizontal and secured by bolts. The lower shell of the motor carries the armature bearing and the lower part of the axle bearings. The commutator has 113 segments. The motors were supplied by the Alioth Company.



BAGGAGE MOTOR CAR



PASSENGER MOTOR CAR

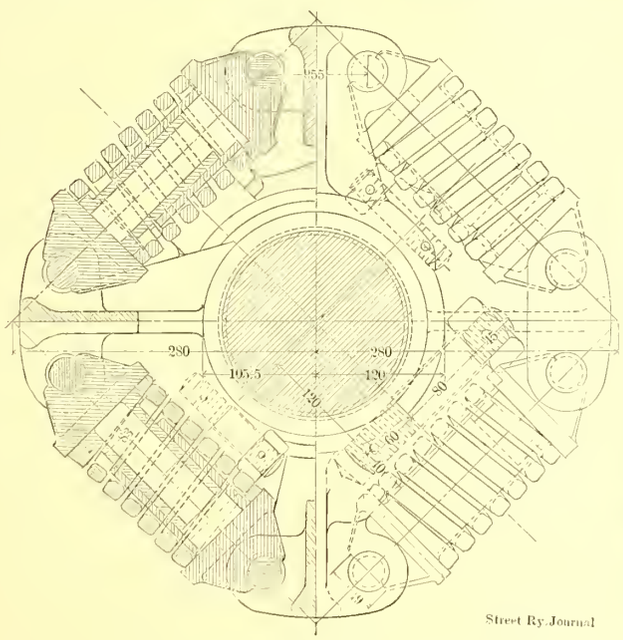


FIG. 13.—FLEXIBLE COUPLING USED BETWEEN MOTOR SLEEVE AND AXLE

Both motors of the same motor car are permanently in multiple, and this has been done for avoiding the possibility experienced with series coupling of motors of slipping. Five positions are employed on the controllers, which are operated, as before stated, by pneumatic means. Three positions use rheostatic control of the armature only, and in the last step the field coils are shunted. This plan was adopted by the Paris-Lyons-Mediterranean Railroad Company so as not to be limited to one running speed only. It has been found, however, that the use of the accelerated-service speed point is the one with no resistance in the armature circuit, and with shunted field is inadvisable in practice, and it is very seldom employed. The reversal of motors is obtained by simply reversing the armature in the ordinary way. The resistances used for control were first made with wire coils, but were replaced later by packed-card resistances, similar to the American types. These resistances are not used for braking, as in some mountain installations in Switzerland.

The Paris-Lyons-Mediterranean Railroad system of pneumatic control itself would offer a very interesting study, but it deserves to be treated in more detail than is possible in this article. Briefly, it consists of moving the several controllers by pneumatic impulses from a train pipe operated from the motorman's cab.

As in most installations of this character the brakes may be operated by compressed air or by hand. Each is independent. Compressed air is normally employed with the wheel brakes, and exceptionally with the central rail brake. The regulations provide that this brake is to be used only on down grades exceeding 8 per cent.

TRUCK OF MOTOR CAR

The cars are heated electrically by means of de Guise electric

heaters, which are somewhat similar to the American Gold heaters. The electric lamps are supplied with current at 330 volts. This tension is held fairly constant by resistances, which are regulated by means of a small motor arranged in a similar manner to the current checking device in the Chavants station, described above. Ten incandescent lamps of 16 c. p. each are used on each car. Each head motor car carries an electrically-driven compressor, which furnishes air for the train, for the brakes and also for the pneumatic control. It is of the Christensen type.

The accelerating current during maxium load amounts to about 180 amps. per car. The speeds secured are about 40 km (25 miles) per hour on the level and 12 km (7½ miles) on the grades.

Electrical appliances have been extensively used in the depots, shops, etc., including several 6-ton cranes, one 20-ton crane and several winches, all running under 550-volt circuit. There are also elevators running on the 110-volt lighting circuit, and a special electric crane of 20 tons spanning the tracks, both the normal and 1-m gage at the terminal station of La Fayet. This crane is used for transferring freight from the standard to the narrow-gage cars.

The station's lighting is arranged from the third-rail circuit of 550 volts.

The line has developed a traffic of about 120,000 passengers during the first year. The operation expenses, including repairs, amounted during the same time to about frs. 1.80 per car km (57 cents per car mile).

PROPOSED EXTENSIONS

The following plans of extension have been made and are now being carried out by the Paris-Lyons-Mediterranean Railroad Company, to whom this paper is indebted for the preceding and following information:

All arrangements have been made for extending the line as far as the Swiss frontier, a distance of some 20 km (13 miles). The first portion of this extension has already been commenced, i. e., as far as Argentiere, but the date of starting on the second portion will depend upon the rapidity with which the Swiss end of the line, which will terminate at Martigny, is built.

The same rolling stock will be utilized. The line will be third rail, 500 volts and of similar construction to that now in operation.

The Chavants station, which is of sufficient capacity to supply 12,000 hp, eventually will supply the total power required for the extension. Alternating current will be used at from 10,000 volts to 12,000 volts and 25 cycles. The generators will be of 1200 hp each.

Each transformer sub-station, of which there will be two, will be provided with two converter sets, each of which will suffice for the service, the other being installed as reserve. There will be a battery of 306 accumulators of 1200 amp.-hours at one-hour discharge rate. There will also be one automatic booster of special construction, somewhat similar to the Pirani booster. It will have a separate shunt excitation and two opposite series excitations, one fed by the current direct from the machine, the other by the current furnished to the line.

The arrangement of the turbines will differ a deal from those now installed because they are to generate alternating current at constant frequency. They will be furnished with a regulator, the type of which is not yet determined.

As regards the Swiss extension the Swiss company is now in formation, with a capital of 10,000,000 francs.

St. Thomas, Ont., which recently took over the local street railway property, is now booming the road by having canvassers sell special tickets, offering inducements in the way of reduced fares. The plan is to educate the people to the use of the cars.

FREIGHT AND EXPRESS ON ELECTRIC RAILWAYS—I.

BY H. S. COOPER

While electric railways were actually "street" railways and all their business was purely a passenger one, it was possible for each one to be a law unto itself without special inconvenience or injury to itself or to others. Even when they strayed beyond the corporate limits of their own towns or cities and became suburbans the same course could be continued with like absence of evil results. But when they went farther afield and grew into interurbans—electric paths between cities—they found, even in their then single business of carrying passengers, cases without electric carriage precedent and conditions utterly unprovided for. In such cases the wise managers took a stealthy peep at the methods of their elder brothers, the nearest steam railroads, borrowed some of their ideas, fitted them to their own conditions and all went well.

Presently some of the suburban and interurban passengers wanted to take something or other with them on the car, something too bulky or too heavy to "carry on the lap," so it was dumped on one or the other of the platforms and an extra fare or two charged for it and rung up on the fare register. Presently also, the local storekeepers found the cars handy things by which to send out packages and bundles to their customers directly on the line of the road, and these customers found it equally as handy to send back butter and milk and eggs to the storekeepers and their friends and customers in town. By this time the platforms were getting too full of "truck" for comfort or safety, so a small portion of the car was partitioned off as an express and smoking compartment, and the smokers sat around on the egg crates and milk cans. The conductor, having no other pressing duties to perform, was made receiving and shipping clerk, freight and express agent, and was also expected to perform the duties of rate and claim agent and to act as gager and weighmaster, himself being the scales. The charges for the service still followed the extra fare principle, were 5 cents or multiples of it, and were rung up on the fare register, some roads providing a special one for this purpose.

But soon the business increased by leaps and bounds, and it was found that the little express compartment—with Pooh-Bah to run it—and the system of extra fares, were all too inadequate for the business, so special cars, devoted entirely to express and freight, were started out, and a special rate sheet of charges was promulgated, whereby the cost of sending pumpkins, eggs, apple-sass, groceries, etc., to and from town was fully itemized and explained. In getting out this rate sheet the manager studied a "standard classification" and a "local distance tariff" which he had borrowed from a friend who worked in the local steam railroad freight depot, but it was considerable of a puzzle. The abbreviations were Greek and the figures, in their little square compartments, confused him, so he figured out a rate on each one of the local products, basing it on the old extra fare principle, and let it go at that. It was true that it was arbitrary and inconsequent to a degree, and Tom, Dick and Harry came in and kicked until it was changed to suit their shipments and their ideas, but all the time the business increased, as did the profits, and the roads multiplied and extended.

But now, when these electric roads extend over States, when they begin to link cities together like beads on a string, when they meet and cross and join and interchange traffic, when they parallel and compete with steam roads in their own special territory, then it behooves them to pause and consider the subject of freight and express rates and classification, and once more turn to the steam roads and old express companies for ideas. Not that there are as yet many electric roads that are of size or have business enough to warrant the adoption of full steam railroad freight and express practice, but, as all electric railways have

learned, there are many principles in steam railroad practice that have been evolved from long and dear-bought experience, and it is a wise manager who profits from the experience of others.

Moreover, with the present extending of electric railways on their own account, and with their junction with others, it will be only a short time before nearly every interurban road will have to interchange traffic with other electric roads or with steam-railroads. In the latter case they will find that this can only be done in the manner and on the terms of the present intertraffic arrangement of the steam railroads themselves. In the former case, while it may not be necessary or wise to use the same steam road arrangement, it will be both wise and necessary to have some standard traffic agreement and rates for general use between connecting electric roads, similar in effect to that used between steam roads. While it may be possible for the electric roads for a long time to keep their own rates separate and distinct from those of the steam roads with which they interchange, it is certain that, in the end, both will be forced to unite on a common classification and tariff. "It is not wise to cross a bridge until you come to it" is a true saying, but if there is a stream to be crossed it is wise to be certain of the means of crossing it when it is reached, and in the case of traffic interchange, classification and tariffs it will be wise to look a long way ahead, and as fast as possible adjust them with an eye to the future as well as the present. Of course, for traffic originating and ending entirely within its own territory and free from the competition of common carriers, an electric road may continue for a time to be a law unto itself in the matter of rates, for in such cases local conditions will govern until a standard basis is established as is done in similar steam road territory; the only caution to be observed is to take negative example from the steam roads and not kill the goose that lays the golden egg.

Except in very rare cases it will be unwise for the electric roads to cut the steam road or express company rates between competing points, as the infinitely quicker and more frequent and regular service of the electric roads will, of itself, turn the short-haul freight business towards them. In addition to this advantage lies the farther one that, in nearly all towns and cities the electric line and its stations or depots are more accessible than those of the steam roads, which, from the nature of their freight cars and locomotives and the room they occupy, etc., are compelled to locate their freight yards and stations at points where land is cheap or their business is unobjectionable, and these locations are often inconvenient or distant from the business centers. In the country districts, also, the depots of the electric roads, or, at any rate, the loading places or spurs or sidings, can be, and generally are, much more frequent and closer together than is possible on the steam road. This is, in the beginning of the electric freight business, an important point to shippers and receivers of broken bulk or package freight, especially when such freight is perishable or semi-perishable, or when it is a rush order. Even where the electric road is compelled to use a freight or express depot of its own within a city or town its cars are so unobtrusive as compared with the locomotives and cars of the steam road that it can, without local opposition, generally maintain such a depot at a much more central and convenient point for shippers than can the steam road. This point of immediate accessibility, when coupled with prompt and quick carriage, will always give an advantage to the electric roads that will bring them the short-haul freight even at the same rates as the steam road. This is an advantage that will not only always adhere to the electric road but it is one that will grow greater in proportion as their business increases. In the first place the inflexibility of the long steam road freights, their necessarily irregular and comparatively infrequent service, is a natural handicap that they cannot remove as long as they remain steam roads.. In the next place this condition will also increase with them, as it will follow the same lines as the passenger business has, i. e., the electric roads will get the short-haul, broken bulk and package freight, and the steam roads will turn their entire attention, energies and service to the longer-haul and car-load business.

At the same time the local express and parcel business will naturally gravitate towards the electric roads for the same reasons as the short-haul freight. The local business of the old-line express companies is absolutely dependent on the often very irregular and infrequent passenger trains, and here again the regularity and frequency of the electric service cuts the ground from under their feet. Not only does it do so during normal times, but at rush periods, such as the Christmas holidays, the frequent service of the electric roads enable them to keep the goods in transit and delivery, while the regular express companies are snowed under with offices full of congested and delayed goods.

That this point is fully appreciated by the existing express companies is shown by the fact that they have, in several instances, made arrangements with electric roads by which they handle all the express and parcel business on these roads, and it is further shown by the fact that overtures have been made on the same lines to several other roads which are now operating their own express lines, and if final proofs are desired they are furnished by the fact that propositions have been made to both uncompleted and projected electric roads looking to the operating of their express business by some of the established express companies.

Whether such an arrangement, if general, would be a satisfactory or remunerative one to both parties would be hard to predict until greater and longer experience is had of the arrangement. The fewness of the roads so operating their express business, and the short time during which it has been done, prevent any generally reliable results from having been arrived at. As a whole, the roads so operating appear to be pleased with the arrangement; they state that it gives them a known fixed or certain return with a fair profit in it, that it eliminates a great many chances for risk and loss and damages, and that it greatly lessens their accounting—already becoming somewhat of a burden. On the other hand, under some of the agreements, the roads are actually losing a very large part of a profitable income and are putting themselves in a position where it will be difficult for them to recover it without intervening loss. Where the electric road is a short-cut or a connecting road between two cities or two steam roads, and where the through business is the preponderating one, it is probable that an equitable arrangement by which an independent express company operates the express business would be mutually profitable. But that it is a wise movement generally to tie up its local express business with one of the large express companies, and especially to do so for any term of years, is somewhat to be doubted, and it would be wisdom on the part of any electric road management that considers making such an arrangement to view the matter carefully, and, if it is to be tried, to do so tentatively.

This is all the more true where the electric road proposed to retain and operate the freight business. The dividing line between freight and express is sometimes dim even on steam roads, and has been, and still is somewhat, a source of dispute between the steam roads and their carrying express companies.

In the case of the electric roads this line is still more hazy, and several roads have had, in self-defense, to make an arbitrary distinction of weight, bulk or character of goods in order to preserve the difference between the two departments. With one car or set of cars handling both classes of goods, delivering each without change or rehandling, in approximately the same time between termini or destination, and with little apparent difference in cost of handling, it has seemed strange to many express customers that they should pay from two to ten times the rate that freight customers were paying for similar goods

and almost identical service, excepting, perhaps, delivery. This condition has been aggravated by the practice of many of the electric roads in counting nearly everything that was not in car-load lots as express, and putting a special rate on it. The express charge sheet of one electric road contains such items as buggies, two-horse surrey, square and grand pianos, cook stoves and ranges; that of another has cement, lime, etc., in barrels, crockery in crates, calves, pigs or lambs, boxed or crated; in fact anything in compact form, boxed, barreled, bagged, crated, baled, banded or roped seems to be acceptable as express or parcels to some electric roads, and the wonder is, where does freight come in.

Now there is little doubt that on purely local business an electric road can handle much heavier and bulkier goods than is ordinarily carried by the regular express companies, and can do such business profitably at a rate that the express companies cannot approach. But these facts are no reason for their actually doing so. Any unnecessarily low rate of service is always a boomerang, both to the parties who do it and to any and all others in the same line of business. The dear public being only a collection of individuals is as little grateful for charity as any single person, and unnecessarily low rates of service are a gratuity that will always cause ingratitude.

Express matter can be roughly divided into five classes:

1. Packages so small as to need individual attention in transit.

2. Goods so fragile as to necessitate much more careful handling in transportation than is given in freight service.

3. Matter so perishable as to need quick transportation, full protection or personal care and attention while in transit.

4. Goods so intrinsically valuable as to need special watchfulness and care until delivery.

5. Goods so greatly needed as to require the very quickest possible transportation and delivery.

For such extra care, responsibility and speed of delivery the carrier demands and the shipper expects to pay a much higher rate than is asked for the slower and less careful transportation of freight, and while many electric roads can and do transport their freight almost as rapidly and carefully as they do their so-called express matter, it is unwise, for that reason, to dump into the express list everything that comes to them.

A further matter that has hitherto differentiated express from freight has been the doorstep collection and delivery of the former by the carrier for the ostensible carriage rate, but even this distinction has lately been wiped out in some recent cases, as a few electric roads now deliver all freight within a certain distance for the same or less rates than are charged by the competing steam road for transportation only. In some other cases a small additional percentage, up to 10 per cent, is added for "wagon delivery," the shipper having to deliver the goods to the car or station of the electric road.

Taking all the foregoing facts into consideration it would seem to be a good thing for a good many of the electric roads to take a little time for considering this matter of express and freight classification and tariff before they get into such a general state of confusion that it will take drastic methods to bring them out of it and standardize them. "Make haste slowly" is a wise maxim in things that are intended to endure, and "experience is a wise teacher" is another one, and the moral thereof is, that in this part of their business the electric roads, at any rate those that either do or will compete with the steam roads or express companies, can afford to copy their practice until they are able to inaugurate a universal standard of their own.

Quite a number of electric roads have done this absolutely, and as many more have based and moulded their classification and rates approximately on those of their competing steam road and express company, and the reports from these roads, and personal observation of the results attained, all show that this is a wise way to begin. It gives an immediate and ready-made system which can be modified with ease at any time, a system that is understood by all shippers. It antagonizes the competitors the least and gives them no ground for attempted opposition and reprisals, it furnishes no bad precedent of slaughtered rates, it gives a standard for mutual comparison, it enables and facilitates interchange of traffic, and finally, from all reports received and observations made, it gets the cream of the business and pays a fair profit, if properly managed and handled.

Should the adoption of such classification and rates prove wrong in certain cases, and it will be only in a few cases among electric roads which compete with steam roads, it will be found to be, at least, as easy to change from as from an arbitrary rate sheet, and in most cases it will be easier, as in nearly every case the change will be a decrease in rates or a change in classification that will generally amount to the same thing. It is always easy either actually or apparently to lower rates or cheapen a service, but almost every one has had experience of the uneasiness of raising fares or rates, and from all appearances some electric roads are laying the foundations for such an experience by ignoring the experience of their older brothers and slaughtering rates.

Besides the natural advantages of frequent and regular service and quick transit and delivery there is, in nearly every case, another advantage with which electric roads start, and it is an advantage that entails some risk unless it is used with good judgment. This is the feeling—call it animosity, prejudice or what you will—that is generally held against the steam railroads and express companies and which manifests itself instantly on the commencement of operation of a rivaling electric road by a transference of all possible patronage to it even at equal or slightly greater cost or at less personal convenience of the shippers. It is seldom that an electric freight and express service is not welcomed, and while it is both wrong policy, bad business and poor taste for the electric road in any way to encourage or increase the feeling of antagonism against its competitor, it is both good business and good policy to retain and increase the good feeling manifested towards itself, and there is no surer way of doing this than by avoiding the conduct which created the antagonism that is so general against steam roads. To any one who has had to stand the insolence of office of the ordinary minor employees of steam roads; who has had to endure the stand-and-deliver practice of the ordinary freight and express service; who has had goods delayed, lost, injured or ruined without reparation except at the will and within the good time of the offending party; who has had to endure the exactions, discriminations and the arbitrary and one-sided rules and regulations of the generality of the steam roads and express companies—to such a one the advent of a competitor not controllable by them is most gladly welcomed, and that welcome can be made permanent if any sort of tact or management is manifested by the electric road. The advent in a community of a common carrier that will not only give better service, but will also give better treatment, is always hailed with a welcome which is an immense initial advantage to the newcomer, and one that is worth conserving at considerable trouble and even at some decrease of possible profit.

Both of these points seem to be forgotten or neglected by some of the electric roads, especially by some of the newer ones. Appeals are made to the prejudice of shippers, rates are unnecessarily cut with this end in view, and uncalled for concessions are made at the beginning that cannot be continued without loss of profit and of which the necessitated final abridgement or abrogation will lose customers and traffic and leave hard feelings. At the same time a few electric roads, and it is pleasant to state that it is only a few, have adopted with their classification and rates some steam road manners and methods, and are perhaps unconsciously placing themselves in the steam road category, to their own manifest disadvantage. Such a tendency should be repressed as soon as it becomes apparent.

THE PASSENGER TRAFFIC PROBLEM OF GREATER NEW YORK—III, BROOKLYN

BY W. W. WHEATLY

In their transportation characteristics the Boroughs of Brooklyn and Queens are quite different from Manhattan. In the admirable and comprehensive report on the engineering and operating features of the Chicago transportation problem recently submitted to the Chicago City Council, Bion J. Arnold, in the chapter devoted to a general discussion of street railway systems and the conditions governing them, said:

Nearly all the large cities of the United States are laid out and developed on one of three distinctive plans, each plan requiring a different general system of transportation routes to serve its population.

First—The peninsula plan, with water-front on both sides, such as that of New York City and San Francisco.

Second—The valley plan, with a river running through the center, population and business districts on both sides of the river, such as Pittsburg.

Third—The radiating plan, with territory on one side of the water front, such as St. Louis, Boston, Brooklyn and many other cities. To the third plan Chicago belongs.

The peninsula and valley plans usually call for comparatively small street railway track mileage, and great traffic density is found on that mileage, together with large gross earnings per capita served per mile of track and per car mile.

The radiating plan means greater street railway mileage for the population served, with much smaller gross receipts per capita. It can be easily seen how different is the problem in a peninsula and valley city from that of a radiating city. In the former there may be a few long through lines with heavy traffic with many short crosstown feeder lines. In a radiating city, on the contrary, there is a large number of through trunk lines of great length and many crosstown lines, increasing in length as they are farther removed from the point of radiation.

Population and population density have an enormous influence on street railway earnings and profits. A knowledge of these differences in city plans and their bearings on the earnings of transportation companies is absolutely essential to the proper understanding of the theory of conducting transportation. As is the case in all cities laid out on the radiating plan, Chicago has a common point where all lines of traffic concentrate and which is the objective point of its population, commonly designated as its business center.

This description of the distinctive transportation features of cities like Brooklyn, which are laid out on the radiating plan, fits so accurately the problem under discussion that it is worth giving in Mr. Arnold's own language. The transportation system of Brooklyn, as it exists to-day, is not a growth based upon a general plan carefully conceived and carried out. It has been a haphazard growth participated in by many corporations working independently of one another for a great many years, with practically all of their heavy traffic lines pointed toward the East River. In addition to belonging to cities of the radiating class Brooklyn's transportation system has another distinctive feature. It has grown into somewhat of a fan-like shape, with its long, main lines trending toward and converging at a few strategic points along its water front, where the business districts are located or where there are outlets by bridge or ferries to Manhattan. Like other cities Brooklyn has its chief problem and its subsidiary problems. Its chief transportation problem is not merely to move its population to its own business district, but to move a considerable proportion of the population through its own business district and across the East River to Manhattan. If the movement to Manhattan could be accomplished without passing through the streets in the business districts of Brooklyn, already congested with the local Brooklyn traffic, the chief difficulty, so far as it relates to Brooklyn, would be removed. The subsidiary problems relate almost entirely to the unfortunate condition which brings the long and the short-haul traffic together at congested points and retards the movement of both.

A not uncommon feature of the traffic movement of many cities of the radiating class, but which is more marked in Brooklyn than in any other large city in this country, is the remarkable concentration in the rush hours when the people are going to and returning from business, and the equally light traffic movement during the intermediate daylight hours and after 7 p. m. Brooklyn is rightly known as a large manufacturing city and the majority of its manufacturing plants are located on or near to its water front along the East River and the lower bay. Its shore front is a bee-hive of industry. Its shopping, office and financial center is also located in close proximity to the East River. All of these workers, and in addition those who go to Manhattan, seek the routes leading to the same district about the same hour every morning, and return homeward about the same hour every evening. After all of these workers have reached their places of business in the morning there is no considerable floating or visiting population, as in Manhattan or other large cities, to furnish a respectable mid-day or evening traffic. It is a circumstance worthy of mention that the mid-day traffic consists largely of Brooklyn women going shopping or visiting. A bright day and an attractive display on the bargain counters will bring them out in full force, but a disagreeable day and no attractive bargains will keep them at home. Manhattan being the objective point to which the floating or transient population is attracted, Brooklyn on account of its proximity to Manhattan is completely overshadowed, and is singularly lacking for a city of its size and importance in those elements which contribute to a steady all-day traffic.

Except in the summer season when the beaches and shore resorts along the Sound and the Atlantic Ocean attract large crowds, the traffic after 7 p. m. is exceedingly light. In addition to being known as the dormitory for Manhattan Brooklyn is also distinguished as the city of churches and the city of homes. It may also be said to be the city of cemeteries, for it has all but one or two of the pretentious burying grounds of Greater New York. These several distinguishing features are mentioned because they assist in explaining the peculiarities of its traffic. Its people are known as a home-loving people, and at the close of the day's work prefer the sanctity and quiet of their own homes to the less agreeable recreation of traveling and swelling the receipts of the transportation companies. There are traditions in certain quarters that wicked Manhattan never sleeps or rests, and, therefore, its traffic is continuous, but not so with Brooklyn.

It is not necessary to dwell upon the transportation problem of Long Island City and the Borough of Queens. The traffic has not yet reached that magnitude which makes its problem complicated or difficult. The problem here is to provide for the future rather than for the present. The traffic partakes of the same general character as in all cities of the radiating class. Figures were given in the issue of Jan. 10, 1903, showing the passengers carried on the lines in Brooklyn and Queens, and may be referred to in connection with this article.

In May, 1883, the Brooklyn Bridge was completed and opened to traffic. Since that time not another avenue of direct communication with Manhattan has been opened. All the ferry routes which now cross the East River (with the exception of one) existed twenty years ago. In Feb. 1898, after fighting many years for the privilege, the railroad companies were permitted to send the surface trolley cars across the bridge. The elevated lines commenced the free transfer of passengers to the local bridge cars in June of the same year. The simple statement of these facts when placed alongside the figures showing the growth within twenty years of Brooklyn and its suburbs is convincing testimony that the transportation facilities between Brooklyn and Manhattan have practically stood still, while the population and the passenger traffic outstripped them. Table No. XI shows the population by de-

cades of the counties of Kings, Queens and Nassau from 1860 to 1900 inclusive:

TABLE NO. XI.

Population Kings, Queens and Nassau Counties—

	1860	1870	1880	1890	1900
Kings.	279,122	419,921	599,495	838,547	1,166,582
Queens.	57,391	73,803	90,574	128,059	152,999
*Nassau. ...	.....	.....	.....	.....	55,448
Total.	336,513	493,724	690,069	966,606	1,375,029

* Nassau organized from part of Queens in 1899.

It will be noted that within twenty years the population of Kings County increased 94 per cent, and that of Queens (with Nassau added for comparison) increased 130 per cent. This tremendous growth did not seem to impress the municipal and State authorities as calling for any action on their part to increase the facility of communication with Manhattan until a few years ago. To their lack of foresight and enterprise may fairly be attributed the present congested condition of passenger travel.

The number of operating companies and the mileage of lines owned and leased in the Boroughs of Brooklyn and Queens is as follows:

Brooklyn—	Track Mileage
Brooklyn Heights R. R. Co. (surface lines)	454 miles
Brooklyn Heights R. R. Co. (elevated lines)	68 "
Coney Island & Brooklyn R. R. Co. (surface lines)	47 "
Van Brunt St. & Erie Basin R. R. Co. (surface lines)	3 "
Total.	572 miles

Queens—	Track mileage
New York & Queens Co. Ry. Co. / New York & North Shore Ry. Co.	102 miles

When the fact is understood that the chief transportation problem of Brooklyn relates to the question of carrying the population to and from Manhattan without coming into contact with the local Brooklyn traffic it is not difficult to determine the cause of the present conditions. There are two principal reasons why the transportation companies of Brooklyn have been unable of their own accord to furnish relief from the present congested conditions of travel:

First. The converging of the several long lines of heavy traffic into a few narrow lanes leading to the bridge and the ferries, and the failure of the city authorities to provide more and wider avenues of approach.

Second. The physical limitations of the present bridge and its Manhattan terminus and the steady refusal of the people to make greater use of the ferries.

It became apparent long ago to the citizens of Brooklyn, who had the time and inclination to acquaint themselves with the governing conditions, that no considerable amount of relief could be expected until there was a radical improvement in the means of communication with Manhattan. Under the wise leadership of President Greatsinger, who immediately after coming to Brooklyn discovered the root of the trouble, the transportation companies have been pressing the municipal authorities for an immediate amelioration of the situation by the adoption of well-considered plans for which the transportation companies proposed to pay. All of these plans related in one way or another to increasing the carrying capacity of the present bridge and affording immediate temporary relief. The plan known as the Martin plan for expanding the Manhattan terminals, and connecting the present bridge with the new bridges under construction, failed to receive the approval of the municipal authorities, although it had already been approved by the board of expert engineers appointed by the city and by the chief engineer of the bridge department, by the engineers of the transportation companies, and had been accepted by the management of the railroads. In his recent annual message to the Board of Aldermen the Mayor, Mr. Low, said: "Two plans have been suggested for the purpose, both of which have some merit, but neither of which is free from serious objection. A third plan is now under consideration which may solve the problem better than either of the others. The choice between these three plans must be made at an early date." It is quite clear that the delay rests with the municipal authorities and that the railroads are simply awaiting their convenience.

The construction of four additional loops for the surface lines at the Manhattan terminal will not increase the carrying capacity of the bridge, although it will assist in scattering the concentration of people in the terminal over a wider area. President Greatsinger's second plan was intended for the relief of the congestion of cars and vehicles at Sands Street and Washington Street, Brooklyn. It was a proposal that the railroad companies construct an incline and elevated structure over Sands Street, leading from Washington Street, near Concord, and passing on a level with the bridge floor to a point on the bridge roadways, where a connection could be made with the present surface tracks. Under this plan the greater number of the surface cars bound for Manhattan would avoid crossing the traffic on Sands Street returning from Manhattan. This plan, it is understood, is also awaiting the approval of the municipal authorities. A proposal, made many times within recent years by the citizens of Brooklyn for the widening of Livingston Street and its devotion to the necessities of the surface lines, appears also to be languishing, while the railroad companies are anxious to have the improvement made. President Greatsinger had other plans of equal importance for the giving of immediate relief which he would be glad to carry into effect, but has been deterred from pressing them owing to the evident lack of sympathetic co-operation on the part of the municipal authorities. The outlook seems to be that no plans for immediate relief will be authorized, and that the first relief experienced will be upon the completion of the new Williamsburg Bridge next January or soon after.

The problem for solution, as it relates to permanent future relief, may be stated under three headings:

First. To widen existing streets or open new avenues leading toward the present bridge and the new bridges now under construction; and for the city to co-operate with the railroads in making these avenues of approach toward Manhattan available for the uninterrupted use of surface and elevated rapid transit routes.

Second. Such additions of tracks, inclines and other connections as will enable the companies to furnish rapid movement not only to the present population but to the greatly increased population and passenger traffic which is certain to come. The construction of additional tracks on existing franchises should take such form as will enable fast express service to be operated for the long-distance riders, with an entire separation, if possible, of the long and short-haul traffic.

Third. To provide a means (by subway or elevated structure) of distributing and collecting in the business district of Manhattan the traffic from Brooklyn and suburban Long Island without throwing the greater part of it upon the local Manhattan lines. There should be not merely a local terminal for each bridge and tunnel in Manhattan, but a means of intercourse between these terminals, so that a circulating system of train and car service may act as an agency for distributing and collecting the traffic.

The vastly increased means of communication with Manhattan which the Boroughs of Brooklyn and Queens are to enjoy within a few years is destined to have almost a revolutionary effect upon the routing and volume of traffic. The creation of new rapid transit routes will not only create new traffic but will also break up and change the flow of traffic in existing channels. What the new alignment will be can only be conjectured. It will depend to a certain extent upon the capacity of the bridges and tunnels, but to a greater extent upon the arrangement and combination of the lines operating

over and through them, and to a still greater extent upon the convenience of these lines to the business district of Manhattan. In this connection some of the details of the new bridges will be of interest. There are presented herewith diagrams showing in cross-section the trackage and other transportation arrangements of the three new bridges over the East River, also for comparison a cross-section of the present Brooklyn Bridge.

Various statistics of travel over the present bridge have been published from time to time, but the latest record taken is shown below.

On Nov. 10 an accurate count was taken by the Brooklyn Heights Railroad Company of the number of passengers carried by surface, elevated and bridge cars over the bridge during twenty-four hours. On the same day a count was taken by bridge employees of the number of people that walked over the bridge, also the number in vehicles on the carriageways. Table No. XII gives the totals of the respective classes of traffic in each direction for the twenty-four hours:

TABLE NO. XII.

STATEMENT OF PASSENGERS PASSING OVER BROOKLYN BRIDGE NOV. 10, 1902

	To Manhattan	To Brooklyn	Total
In surface cars	74,852	72,808	147,660
In bridge cars	65,934	49,169	115,103
In elevated cars	8,716	10,125	18,841
Local pass's (bridge only)	13,780	11,913	25,693
Totals	163,282	144,015	307,297
Promenade	6,952	7,496	14,448
In vehicles (estimated)	4,100	3,800	7,900
Grand totals	174,334	155,311	329,645

Of the 133,944 elevated railway passengers carried on the bridge railway tracks only about 13 per cent were carried in through trains, and 87 per cent were compelled to transfer to or from bridge trains.

Of the total passenger traffic on the bridge 45 7-10 per cent was carried in trolley cars, 48 2-10 per cent in bridge trains, and only 6 1-10 per cent in elevated railway trains.

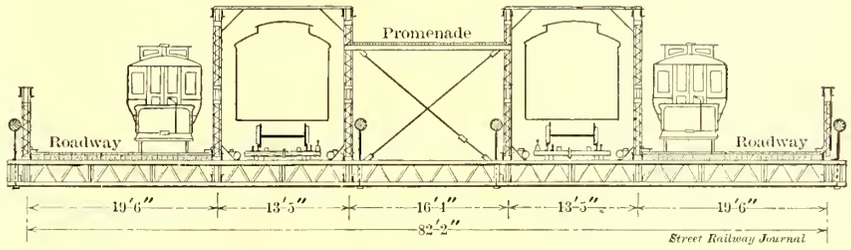
During the morning and evening rush hours the heaviest traffic for one hour was shown to be as follows:

7:30 A. M. TO 8:30 A. M.

In surface cars to Manhattan	15,251
Bridge railway to Manhattan	25,277
Promenade, to Manhattan	869
In vehicles (estimated)	480
Total for one hour	41,877

5:30 P. M. TO 6:30 P. M.

In surface cars to Brooklyn	13,700
Bridge railway to Brooklyn	26,926
Promenade, to Brooklyn	1,526
In vehicles (estimated)	550
Total for one hour	42,702



CROSS-SECTION OF PRESENT BROOKLYN BRIDGE STRUCTURE

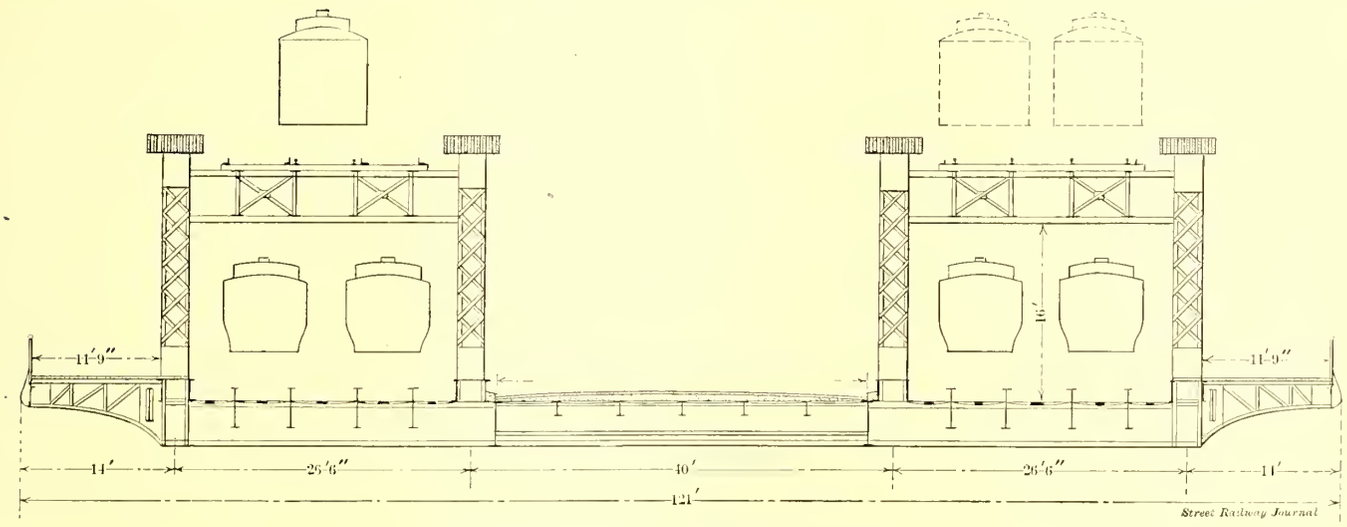
The vehicle traffic on the roadways for the month of November, 1902, was as follows:

Single horses	2,384
Single-horse vehicles	64,133
Double-horse vehicles	31,200
Total	97,717
Average for Sundays	500
Average for week days	3,190

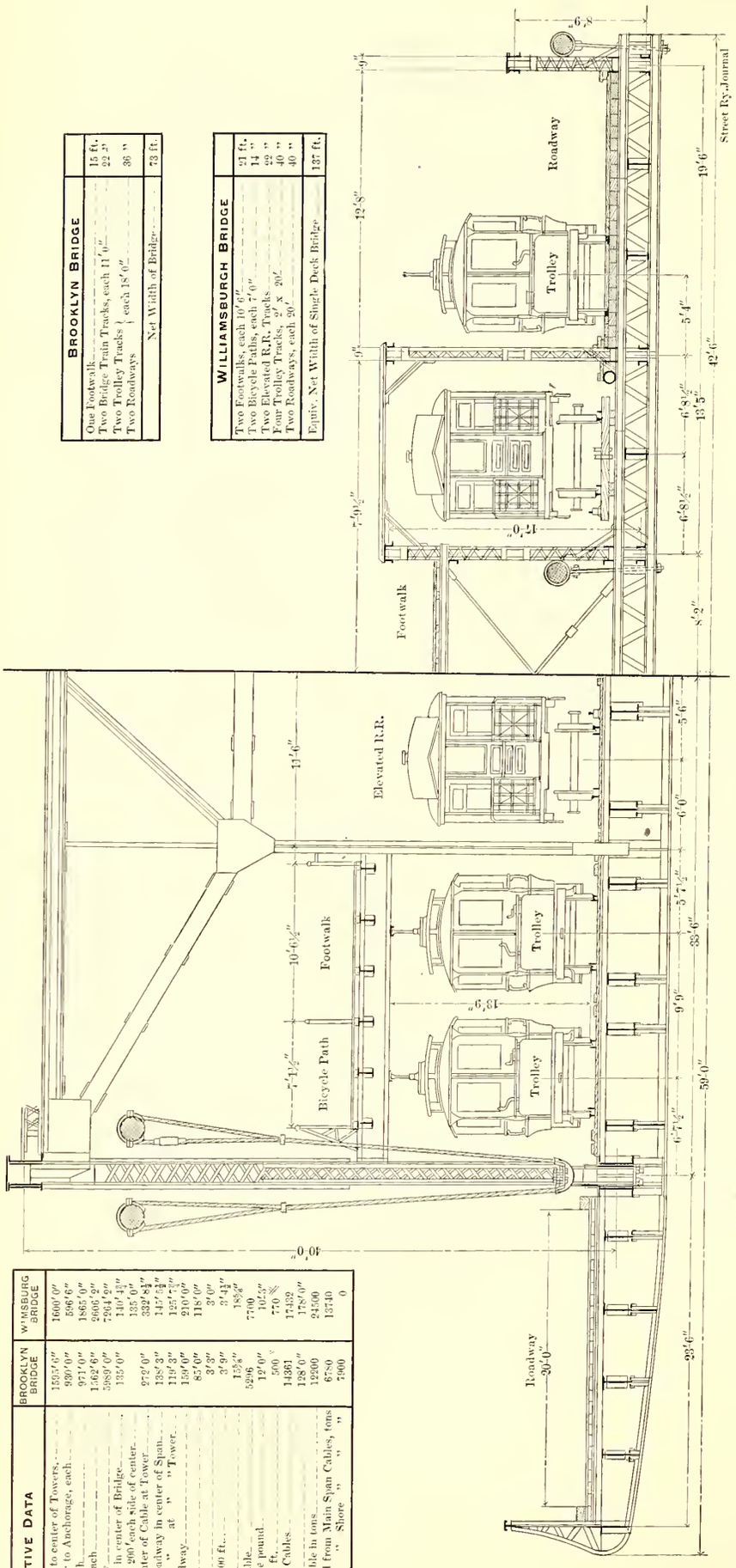
The greater proportion of the weekday vehicle traffic crosses the bridge toward Manhattan from 6 a. m. to 9 a. m., and toward Brooklyn from 4:30 p. m. to 6:30 p. m.

The completion of the Williamsburg Bridge is promised in the early part of 1904, but it is almost certain that it will be some months or a year later when the approaches and terminal arrangements in Manhattan will be completed. The municipal authorities have not yet decided upon the plans for street widening and the opening of new avenues of approach, nor upon the plans for the necessary terminal arrangements for the surface and elevated lines and the connection by elevated or subway with the other bridges and tunnels. Public policy would seem to demand that no further time be lost in agreeing upon the plans and having them promptly executed. Any delay in the completion of the necessary terminal arrangements will amount practically to a delay in the completion of the main span. The Brooklyn people, for whose benefit the bridge is intended, will not care to use it if they are to be dumped out in a local or temporary terminal on the Manhattan end, 1½ miles from the Wall Street-City Hall district, without suitable means of reaching their destination.

It will be seen from the diagram that this bridge is to have



CROSS SECTION OF MANHATTAN BRIDGE



COMPARATIVE SECTIONS OF BROOKLYN AND WILLIAMSBURG BRIDGES

Brooklyn Bridge	
One Footwalk	15 ft.
Two Bridge Train Tracks, each 11′ 0″	22 ″
Two Trolley Tracks } each 18′ 0″ Two Roadways }	36 ″
Net Width of Bridge	73 ft.

Williamsburgh Bridge	
Two Footwalks, each 10′ 6″	21 ft.
Two Bicycle Paths, each 7′ 0″	14 ″
Two Elevated R.R. Tracks	22 ″
Four Trolley Tracks, 9′ 8″ × 20′	40 ″
Two Roadways, each 20′	40 ″
Entire Net Width of Single Deck Bridge	137 ft.

Comparative Data	Brooklyn Bridge	Williamsburg Bridge
Length of Main Span, center to center of Towers	1595′ 6″	1600′ 0″
Length of Land Span, Tower to Anchorage, each	930′ 0″	596′ 8″
Length of Brooklyn Approach	971′ 0″	1865′ 0″
Length of Manhattan Approach	1,162′ 6″	9600′ 0″
Total length of Carriageway	3989′ 0″	7261′ 4″
Clear Height above M.H.W. in center of Bridge	135′ 0″	140′ 4½″
" " " 900′ each side of center		135′ 0″
Height above M.H.W. to center of Cable at Tower	272′ 0″	332′ 8½″
" " " Roadway in center of Span	138′ 3″	147′ 2½″
" " " at " Tower	119′ 3″	125′ 2½″
" of Tower above Roadway	159′ 0″	210′ 0″
Width of Bridge	85′ 0″	118′ 0″
Grade of Roadway in 100 ft.	3′ 3″	3′ 0″
Max. grade of Roadway in 100 ft.	3′ 9″	3′ 11½″
Diameter of Cables	15⅞″	18⅝″
Number of Wires in each Cable	5296	7500
Length of Wire weighing one pound	19′ 0″	10′ 5″
Weight of one Cable per lin. ft.	500 ″	770 ″
Total Miles of Wire in Four Cables	1436	1743
Versine at Mean Temp.	128′ 0″	178′ 0″
Ultimate strength of each cable in tons	12200	24500
Permanent weight suspended from Main Span Cables, tons	6780	13740
" " " Shore " "	7900	0

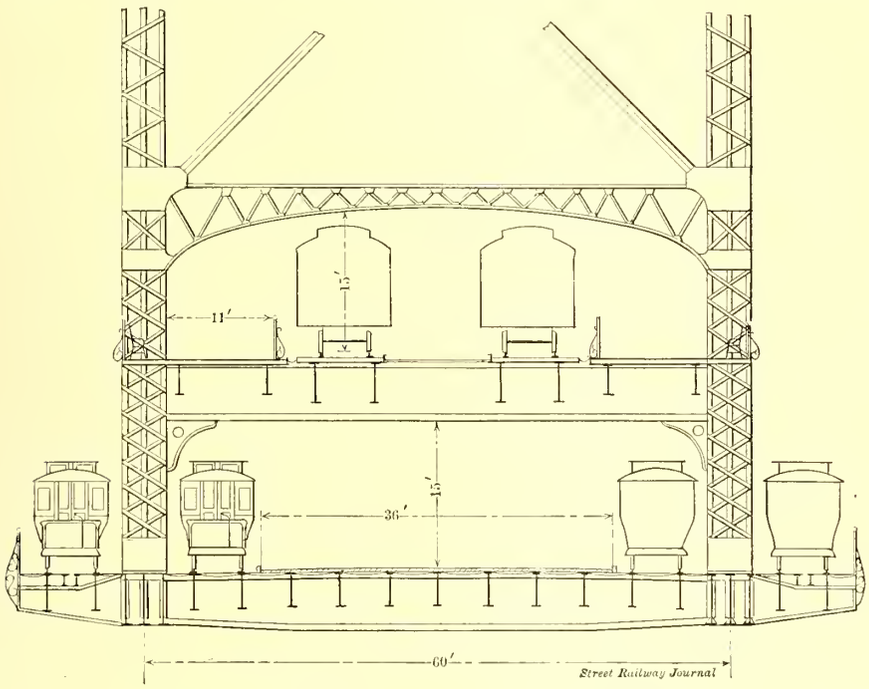
two tracks for elevated trains and four tracks for the surface trolley cars. By this arrangement it is plainly evident that the bridge is to be devoted mainly to such traffic as can be handled by the Brooklyn surface lines. There are a very large number of surface lines converging near the Brooklyn terminal of this bridge. Many of these lines are crosstown lines serving the thickly-populated central section of the city, but their traffic at present is light because of the inconvenience of reaching the business district of Manhattan by the ferry routes. There are also several long lines reaching eastward to the suburban districts, and other lines reaching northward toward Greenpoint and Long Island City, which serve thickly populated regions.

The Broadway elevated line is the only elevated road tributary to this bridge. It furnishes a direct route to East New York, and with the incline now building at Cypress Hills the trains may pass to the surface and run through to Richmond Hill and Jamaica. With a 5-cent fare and through train service to Manhattan this elevated line will certainly command a traffic which will render necessary a third track from the bridge to East New York for its fast express train service.

The traffic capacity of this bridge, when worked to the maximum, may be closely estimated. Based upon the experience with the present bridge there would seem to be no reason why the two trolley tracks, free from the interruption of team traffic, cannot comfortably handle toward Manhattan 700 surface cars per hour, 350 on each track. Figuring a maximum of fifty passengers per car would give 35,000 passengers per hour on the surface lines. If the elevated trains are to maintain a good average speed on the bridge it will not be safe to operate more than sixty per hour, or one minute apart. Figuring six cars per train and a maximum average of eighty passengers per car we have 28,800 passengers per hour, making a grand total of 63,800 passengers per hour in one direction. It is hardly possible that this maximum passenger movement will be realized at the outset, and certainly not until the plans for delivering the people near the business district in Manhattan are completed.

Bridge No. 3, known as the Manhattan Bridge, will probably not be completed before 1907. Its Manhattan terminal is to be near Canal Street and Forsythe Street, about two blocks east of the Bowery. Its Brooklyn terminal has not yet been definitely announced. The diagram indicates that this bridge is to have four tracks for the surface trolley cars and four tracks for elevated trains. Its passenger carrying capacity will, therefore, be considerably greater than any of the other bridges. Figured upon the same basis as the Williamsburg Bridge, its maximum capacity should be 92,600 passengers per hour in one direction. This bridge will serve all of the lines that are served by the present bridge, and will be capable of serving others that are not now able to run over the present bridge. It will make possible a division of lines and probably a division of territory with the present bridge that will greatly simplify the operation of both. The present bridge will have to pass through a period of reconstruction within a few years, which may make considerable interruption

if not a temporary suspension of its traffic. The Manhattan Bridge during the period of reconstruction will have to carry its full quota of the traffic. The striking feature of the Manhattan Bridge is the adaptability of its location for handling practically all the train service of the elevated railway system of Brooklyn, except the Broadway line, should it be required to do so. With the building of a small amount of connecting elevated structure this bridge will be able to serve the Myrtle Avenue, the Lexington Avenue, the Fulton Street and the Fifth Avenue elevated lines with their several suburban connections. Its completion will mark the time of the first real relief to the congestion of traffic on the present bridge. If the municipal authorities build wisely upon the knowledge that this bridge is destined to become the greatest single artery of travel between Brooklyn and Manhattan there will be ample provision made on both sides of the river for wide avenues of approach and their devotion, not to the setting out of flower beds and grass plots, but to the single purpose of facilitating interborough communication by trolley car and elevated train. At the Manhattan terminal there should be a most comprehensive plan for the distribution and collection of the traffic by means of subways or elevated structures. There should be, as one of the connections of this bridge, a crosstown line over or under Canal Street to West Street, connecting with all the north and south lines, and these connections should be made one of the important features of the operation. But the principal distributing agency of this bridge should be a subway which will be sufficiently commodious to take the passengers by trolley car and elevated train direct to the Wall Street district. When the people of Brooklyn awake to the fact that this bridge means more to their city from a rapid transit standpoint than any other single factor there will be a demand that no narrow or niggardly policy be pursued in enabling the transportation lines to use it to the full capacity.



CROSS-SECTION OF BLACKWELL'S ISLAND BRIDGE

Bridge No. 4, known as the Blackwell's Island Bridge, although different in construction, is similar to the Williamsburg Bridge in its traffic capacity. It has four tracks for trolley cars and two tracks for elevated trains. The Manhattan terminal is to be at Fifty-Ninth Street and Second Avenue, and the Long Island City terminal near Ravenswood Park. There are no elevated roads at present in Long Island City, and the provision for running elevated trains over this bridge is therefore a little obscure, unless it was intended that the Manhattan Elevated road should send a portion of its Second Avenue train service to Long Island City. It should be borne in mind that here the conditions are entirely different from those surrounding the other bridges which propose to deliver their traffic to the business district without transferring it to the local lines. The passengers coming by the Blackwell's Island Bridge must necessarily change to the local Manhattan lines and pay another fare to reach the shopping or business districts. This being the case the plan to run the Second Avenue trains to Long Island City appears to be a practicable and a reasonable arrangement.

The operation of the trolley cars of the surface lines from Long Island City to Manhattan will be a wonderful stimulus to the growth of traffic in the Borough of Queens. It is probable that the traffic capacity of this bridge is several years in advance of the actual requirements. A great many of the vacant lots in Queens must be built upon before there will be a traffic of 63,800 people coming to Manhattan in one hour. But this ample provision for the future is an invitation for an increase of population which will be certain to follow.

THE LONG ISLAND (STEAM) RAILROAD

The fact that certain of this company's lines are to be equipped for electric operation, and that the trains are to go through the new tunnels to Manhattan makes it a subject of interest. A map of the western half of its lines is shown herewith, upon which the lines to be operated electrically are indicated. This map covers all the points within a distance of 50 miles to 60 miles of the East River, which may be said to be directly tributary in passenger traffic to Manhattan, Brooklyn and Queens. As a basis for a proper understanding of the existing conditions it should be remarked that this railroad has not heretofore been a factor of great consequence in the local transportation problem of Greater New York. This has been true, because of its inability to deliver passengers direct to the business district of Manhattan within a reasonable time. On account of its terminals at Flatbush Avenue (Brooklyn) and at Long Island City being twenty minutes to thirty-five minutes away from the lower end of Manhattan, and the inconvenience of one or more transfers, it could not attract any considerable number of permanent residents doing business in Manhattan. Its passenger traffic has, therefore, been largely local. In the development of the territory of Long Island outside of Brooklyn and Queens it has done the work of a pioneer, and still remains the factor of primary importance. The fact that about 50 per cent of its gross earnings is made in the four summer months indicates better than anything that can be said of the character of its business. A glance at the map will show that its lines are located with reference to serving the territory along the Atlantic Coast and Long Island Sound, as well as Central Long Island.

Table No. XIII shows the number of passengers carried by years from 1893 to 1902 inclusive. It will be noticed that there was a decline in the passenger traffic from 1893 to 1898, since which time it has gradually increased.

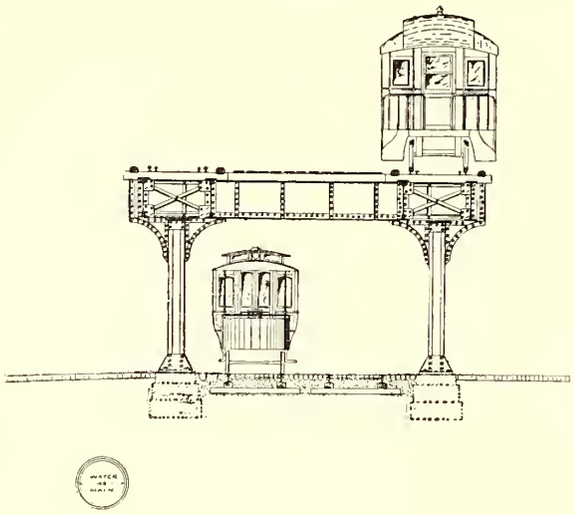
Prior to 1893 the Long Island Railroad had a practical monopoly of the available routes to the shores of Long Island, and carried almost all of the excursion travel to the South Shore resorts within an hour's ride of the East River. The development of the Brooklyn electric roads, which commenced at about that time, was continued for many years, and reached

its maximum in 1898, since which time practically no additional electric lines have been built. The enormous excursion traffic developed by the surface electric roads to the nearby shore resorts resulted in diverting passengers from the Long Island Railroad and the resorts served by it. Furthermore the surface lines started new resorts at their terminals, and succeeded in drawing to them the natural increase that otherwise would naturally have gone to the Long Island Railroad.

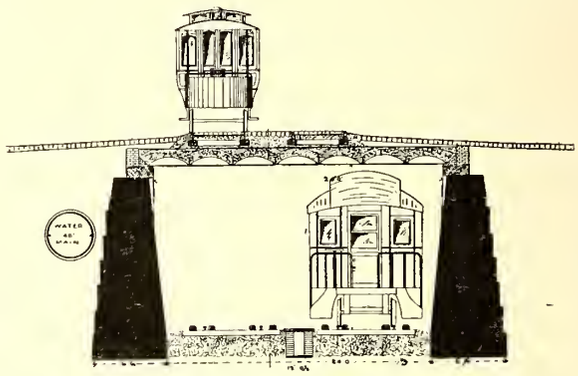
TABLE NO. XIII.

STATEMENT OF NUMBER OF PASSENGERS CARRIED—FISCAL YEARS ENDING JUNE 30, 1893 TO 1902, INCLUSIVE

1902	16,611,102
1901	14,520,218
1900	12,387,649
1899	11,777,205
1898	11,386,772
1897	No figures
1896	13,934,534
1895	13,768,163
1894	13,919,249
1893	14,498,762

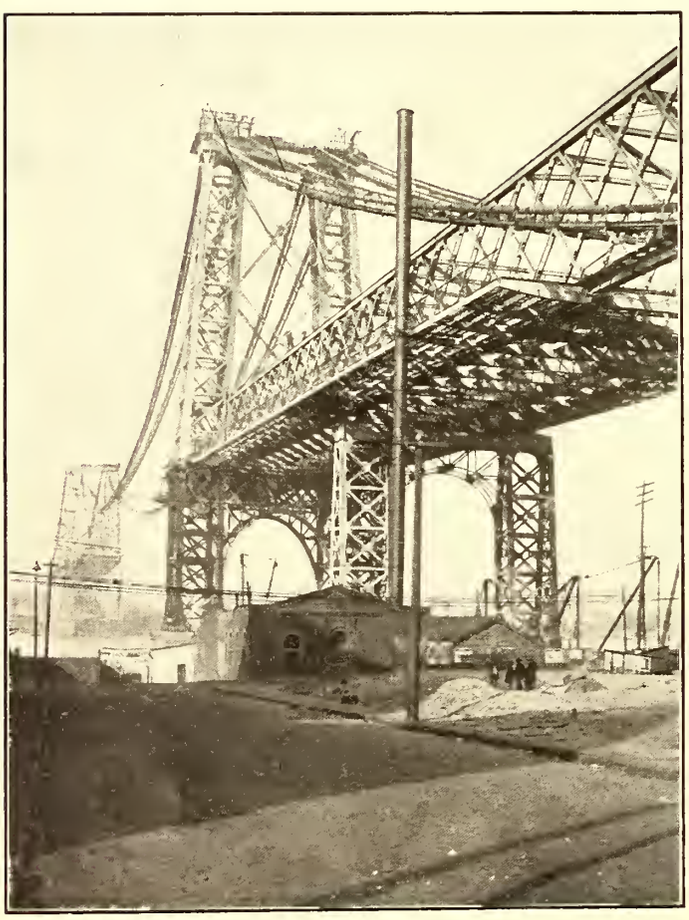


Cross Section of Elevated Railway.



Cross Section of Subway.

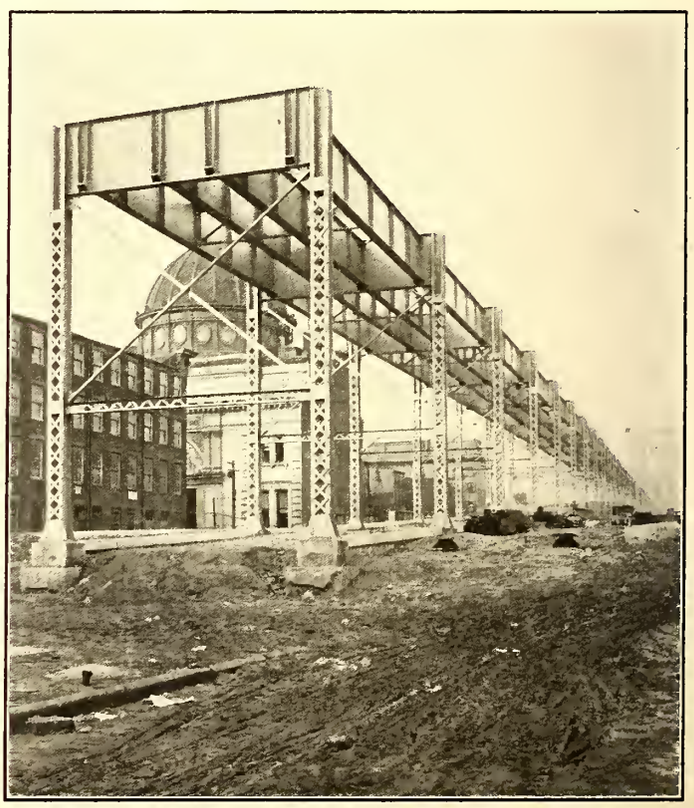
ATLANTIC AVENUE IMPROVEMENT



WILLIAMSBURG BRIDGE, FROM BROOKLYN

In 1898 the management of the Long Island Railroad inaugurated the policy of providing a train and car service considerably in excess of the actual traffic requirements for the purpose of inviting an increased passenger business. This policy has been carried out in a generous spirit during the succeeding years, and the results are reflected in a steady gain in passenger traffic.

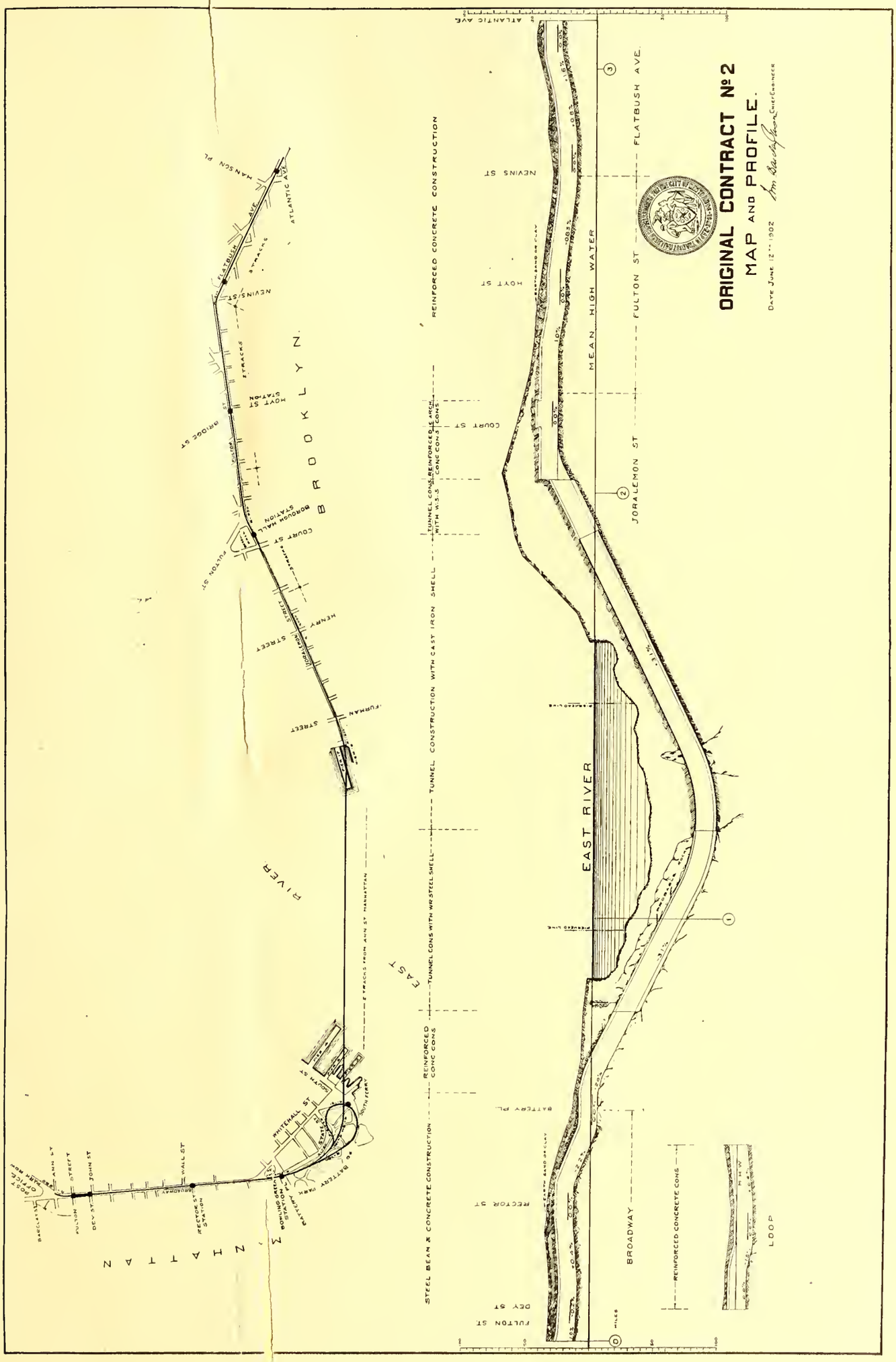
In 1899, by virtue of an arrangement with the Brooklyn Rapid Transit Company, the Long Island Railroad commenced to operate its Jamaica express trains over the Brooklyn Elevated structure from the incline at Flatbush Avenue and Atlantic Avenue to the Brooklyn Bridge, thus making



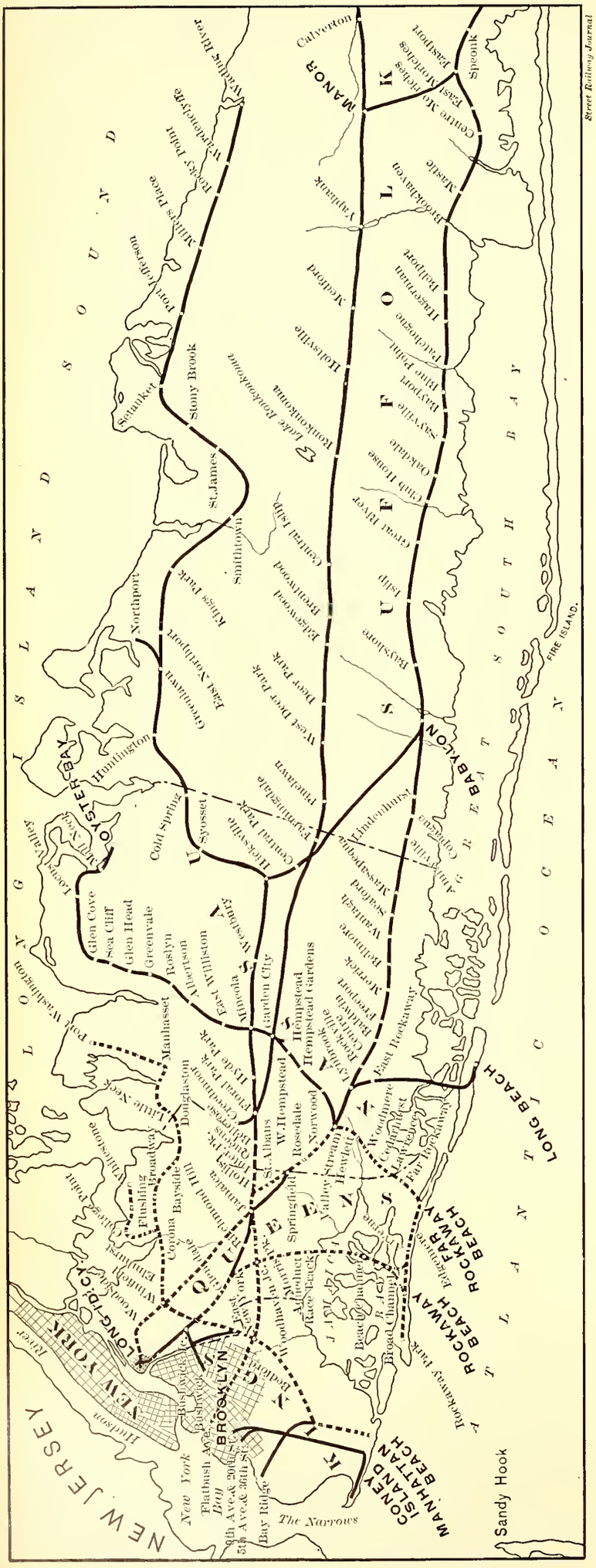
ELEVATED RAILWAY STRUCTURE—APPROACH TO WILLIAMSBURG BRIDGE, BROOKLYN SIDE

direct through service between Jamaica and the Brooklyn Bridge.

As tending still further to illustrate the existing conditions of passenger traffic Table No. XIV is presented. It shows, among other things, that each passenger was carried an average distance in 1902 of 14.49 miles, and that the average amount received from each passenger was 20.5 cents.



TUNNEL UNDER EAST RIVER FOR BROOKLYN EXTENSION OF THE RAPID TRANSIT SUBWAY, CONNECTING WITH LONG ISLAND RAILROAD AT FLATBUSH AND ATLANTIC AVENUES



THE LONG ISLAND RAILROAD LINES LEADING FROM NEW YORK. DOTTED LINES SHOW THAT PORTION OF THE ROAD TO BE OPERATED ELECTRICALLY

TABLE NO. XIV.

PASSENGER TRAFFIC STATISTICS LONG ISLAND RAILROAD.

	1898	1899	1900	1901	1902
Miles of road	375.29	379.48	379.48	380.27	395.98
Average miles each passenger was carried	13.54	14.20	13.78	13.69	14.49
Average earnings from each passenger (cents)	20.74	21.17	20.18	18.2	20.5
Average earnings per passenger per mile (cents)	1.53	1.49	1.46	1.329	1.413
Average number of passengers per train	50.93	54.45	54.25	64.52	67.06
Average number of passengers in each car	15.17	16.01	16	----	----
Passenger train mileage	3,027,461	3,071,841	3,145,658	3,081,332	3,589,109

Several years ago Mr. Theodore Cooper made a study of the traffic on the Manhattan Elevated road and discovered that the average haul per passenger was 3.4 miles, which for the 5-cent fare makes about the same rate per passenger per mile as the Long Island Railroad received in 1902, viz.: 1.4 cents. The average number of passengers per train and per car indicate that there is still opportunity for increased density of traffic without approaching the limit of crowding, with which the average New Yorker is, unfortunately, too familiar.

Table No. XV, which follows, shows the traffic by months for the calendar year 1902, and indicates the wide variation between the winter and summer traffic:

TABLE NO. XV.

STATEMENT OF NUMBER OF PASSENGERS CARRIED, BY MONTHS, FOR 1902

January	870,209
February	800,277
March	974,927
April	1,168,665
May	1,379,819
June	1,827,262
July	2,522,258
August	2,571,369
September	1,641,150
October	1,141,190
November	1,081,005
December (1901)	898,017

At the present time the average number of passengers coming from points on the Long Island Railroad and going to Manhattan in the maximum hour of the morning is estimated at 15,000. One-third of these reach Manhattan by way of Flatbush Avenue (Brooklyn), and two-thirds by way of Long Island City (Thirty-Fourth Street Ferry). The daily passenger train service in and out of Long Island City is 425 trains, with 2500 cars, and in and out of Flatbush Avenue (Brooklyn) it is 266 trains, with 1050 cars.

The average daily distribution of travel on the Thirty-Fourth Street Ferry is shown graphically by the following diagram, made up from the record of five week days in October, 1900. A considerable proportion of the passengers using this ferry is brought to it by the surface trolley lines of the Borough of Queens.

As previously stated the map presented herewith of the Long Island Railroad shows what portion of the lines tributary to Manhattan it is proposed to operate by electricity. The names and mileage of these lines is as follows:

Long Island City to Manhattan Beach	16.10	miles
Glendale Junction to Rockaway Park	10.31	"
Hammels to Valley Stream	8.37	"
Long Island City to Port Washington	18.18	"
Whitestone Junction to Whitestone Landing	4.78	"
Glendale Junction to Rockaway Junction	4.34	"
Flatbush Avenue (Brooklyn) to Jamaica	9.63	"
Total	71.71	miles

The present plan is that all the trains from these lines will be operated by the multiple unit system, with the third-rail conductor. The trains from the six lines first named will probably run to Manhattan by way of Long Island City and the

Thirty-Fourth Street tunnel. The trains from Jamaica by way of Flatbush Avenue will probably run to the Battery or the City Hall, in Manhattan, by way of the Interborough Rapid Transit Company tunnel. A map and profile of the Brooklyn extension of the Rapid Transit subway, including the tunnel under the East River, is shown herewith. The present amount of train service local to the lines affected by the proposed electrical development is as follows:

West-bound to Long Island City, daily, 150 trains, 660 cars.

East-bound from Long Island City, daily, 150 trains, 660 cars.

Maximum train movement one way, one hour, twenty trains, 135 cars.

Maximum train movement one way, one hour, to Flatbush Avenue (Brooklyn), ten trains, thirty cars.

It will be seen that the proposed electrical development will cover practically all the lines within a radius of 20 miles of the

DISTRIBUTION OF TRAVEL ON THIRTY-FOURTH STREET FERRY OF LONG ISLAND RAILOAD—AVERAGE OF FIVE DAYS IN OCTOBER, 1900

East River. Beyond that the lines to the eastward will continue to be operated by steam power as at present, or until other and more comprehensive plans are formulated. Although it has not been definitely announced, it is believed that when the steam trains from the east reach the zone of electric operation they will be taken by electric locomotives and run through to Manhattan by one or the other of the tunnels, thus affording through rapid transit to the long distance as well as to the short-haul passengers.

Taking Jamaica as a common point to illustrate the proposed saving of time under electric operation, we find that the present running time, Jamaica to Manhattan, via Flatbush Avenue, is fifty-five minutes. Under electric operation it is proposed to deliver the passenger by this route in Manhattan in thirty-five minutes, a saving of twenty minutes. The present running time, Jamaica to Manhattan, via Thirty-Fourth Street Ferry, is thirty minutes. It is proposed under electric operation to deliver the passenger by this route in Manhattan in twenty minutes, making a saving of ten minutes.

Being the most gigantic work of its kind ever undertaken in this country, the Pennsylvania-Long Island Railroad tunnel, from New Jersey to Long Island, with its great passenger terminal underground at Thirty-Third Street and Seventh Avenue, Manhattan, is naturally a subject of much interest to railroad men of all classes. While the tunnel itself is of interest the chief interest centers around matters of equipment and operation. Its completion is so many years hence that at this time many of the plans, while carefully studied out, are still too incomplete and indefinite to warrant publication. A most interesting contribution to our present study of this stupendous undertaking is shown in Table XVI, which gives figures concerning the track, car, train and traffic capacity of the proposed underground Manhattan passenger station, also the same figures for other large passenger terminals to be used in comparison:

TABLE XVI.

STATEMENT OF TRAFFIC CAPACITY OF PROPOSED PENNSYLVANIA-LONG ISLAND RAILROAD TERMINAL PASSENGER STATION AT THIRTY-THIRD STREET AND SEVENTH AVENUE, MANHATTAN, AS COMPARED WITH THE KNOWN TRAFFIC CAPACITY OF OTHER LARGE PASSENGER TERMINALS.

Station.	Number Stub Tracks Under Shed.	Number Through Tracks Under Shed.	Approximate Car Capacity.	Length Lin'l Feet Track, Clear Standing Room.	Total Trains Operated Within 24 Hours.	Greatest Number of Trains Within One Hour.
Manhattan (proposed new station)	6	19	377	26,490	*960	§120
Jersey City	12	--	160	10,860	246	22
Philadelphia	16	--	159	10,750	499	45
Pittsburg	14	2	216	14,695	288	40
Camden	12	--	144	9,760	172	28
Long Island City	15	--	110	7,420	423	35
South Boston	28	--	283	19,240	737	--
North Boston	23	--	196	14,385	700	--
St. Paul (proposed new station)	8	6	195	13,690	202	96

* 960 is about 43 per cent over the Jersey City and Long Island City stations combined.

§ 120 is about 111 per cent over the Jersey City and Long Island City stations combined.

NOTE.—It is understood there are to be two tunnels to Long Island City with four tracks, and one tunnel from Manhattan to New Jersey, with two tracks. The maximum capacity of the Long Island City tunnels, with trains two minutes apart, will be sixty trains per hour in one direction, or 120 trains per hour in both direction. The maximum capacity of the New Jersey tunnel on the same basis will be thirty trains per hour in one direction, or sixty trains per hour in both directions.

Figuring eight cars per train and a maximum of eighty passengers per car it appears that the maximum hourly carrying capacity of the Long Island City tunnel in one direction is 38,400 passengers, and the New Jersey tunnel 19,200 passengers.

Notwithstanding it is to be underground it will be seen that this passenger terminal is to have a greater number of feet of clear standing room on its tracks and a greater car and train capacity than any other large terminal in this country. Having been planned upon a most liberal scale it remains to be determined how soon there will be sufficient traffic to utilize its facilities to their maximum limit.

It is understood that practically all of the through trains and a fair proportion of the suburban trains of the Pennsylvania and Lehigh Valley roads will run to Manhattan through this tunnel. As with the Long Island road, it is believed that the through trains coming from beyond the zone of multiple unit electric operation will be drawn by electric locomotives. Information is not available at this time as to what extent the Pennsylvania Railroad intends to equip its lines for suburban electric operation. Many of the suburban trains will continue running to Jersey City for the accommodation of those whose business is convenient to the downtown ferries. An interesting detail of the tunnel operation is that it is proposed to send all the trains coming from New Jersey (except those that are to immediately return to New Jersey) under the East River to

Long Island City, stopping just long enough in the Manhattan terminal to discharge passengers, baggage, etc. In the yard at Long Island City the ordinary functions of tearing apart and making up trains, cleaning, inspecting and repairing cars will be performed. The terminal yard at Long Island City is to be another mammoth affair, and will probably rank as the largest terminal passenger yard in the world. It is planned to have a car storage capacity of 1000 cars, and will have facilities for handling over 1000 trains per day. All of the trains of the Long Island road which go to the Manhattan passenger terminal will, after a reasonable time for unloading and reloading, return to Long Island City and thence eastward. It is not at present contemplated that any trains will be run through from points on Long Island to points in New Jersey or beyond, or vice versa, although it will be possible to do so with special trains when desirable.

That portion of the Long Island Railroad, between Flatbush Avenue (Brooklyn) and Jamaica, a distance of about 10 miles, operates on the surface of Atlantic Avenue, and crosses at grade a great many busy streets. There are eight grade crossings with trolley lines between Flatbush Avenue terminal and East New York. The work of eliminating these grade crossings by the construction of a combined subway and elevated structure is now under way, and is known as the Atlantic Avenue Improvement. At present the tracks of the Long Island Railroad follow the undulating contour of the street surface. The completion of the improvement now under way will make practically a level grade for the railroad, passing underground at some points and overhead at others.

Cross-section diagrams are herewith presented, showing the subway and elevated construction. It will be noticed that when the railway is taken off the street surface a trolley line is to run over the subway and under the elevated structure. The street will then be restored to the purpose for which it was originally intended, and will become one of the principal avenues for east and west street traffic.

By means of this improvement the Long Island Railroad will have, by its connection with the Brooklyn end of the tunnel of the Municipal Rapid Transit Subway, a continuation or extension of that rapid transit route as far as Jamaica. This will render possible the operation of through train service from the business district of Manhattan to Jamaica, where connection will be made with the train service of the entire Long Island system. The maximum traffic capacity of this new rapid transit route may be figured approximately upon the basis of thirty trains per hour, two minutes apart.

The completion of the two tunnels to Long Island and the accompanying electric installation, by which this road will have direct communication with two important sections of Manhattan, is apparently destined to have almost a revolutionary effect upon the growth of suburban Long Island. The removal of its principal handicap of inability to deliver passengers within a reasonable time to Manhattan will enable the road to assume the function, for which it is most admirably adapted, of furnishing quick and comfortable transportation to the permanent population along its lines. Its effect upon the values of real estate will be almost incalculable. Suburban Long Island will then enter upon an era of improvement appreciated at the present time only by those who have an eye to the future. It will be seen that both tunnels serve with equal facility the territory of Central Long Island, and it is here that the greatest growth in permanent population may naturally be expected. The rapid transit service, made possible by these improvements, will result in building up not only the permanent passenger traffic of the road but will insure a greatly increased summer traffic to all points within a radius of 10 miles to 30 miles of the East River.

CONCLUSION

It is of value and interest to know the probable traffic capacity of the combined transportation facilities leading toward Brooklyn, Queens and suburban Long Island. The number of passengers that can be carried per year or per month, while interesting, is not of particular value. The number that can be carried in one day is getting a little nearer to a fact of greater value. The number that can be carried in one direction in one hour is the concrete fact upon which all transportation calculations of real value must be based. While it is true that all calculations at this time are purely approximate estimates, founded upon known conditions of trackage and speed, they are sufficiently accurate for the present purpose.

The following summary gives the estimated maximum number of passengers that can be handled in one direction in one hour by each one of the bridges and tunnels now authorized leading from Manhattan to Brooklyn and Queens:

SUMMARY OF ONE-WAY HOURLY PASSENGER-CARRYING CAPACITY

Present Brooklyn Bridge (present conditions)	40,000
Williamsburg Bridge No. 3	63,800
Manhattan Bridge No. 2	92,600
Blackwell's Island Bridge No. 4	63,800
Pennsylvania-Long Island R. R. Tunnel	38,400
Municipal Rapid Transit Tunnel	19,200
Total	317,800

It was shown by the figures of present ferry and bridge travel to Manhattan, on page 67 of the issue of Jan. 10, that an average of 269,000 people go from Long Island and Staten Island to Manhattan in one day. This, it will be understood, is the present movement in one direction. The proportion of Staten Island passengers to the whole is exceedingly small. It was also shown that the present rush-hour movement to Manhattan was about 64,000 in one hour. Upon the completion of the new bridges and tunnels the number of people who now go from Brooklyn and Queens to Manhattan during an entire day could be accommodated in a single hour, with all the transportation facilities, over or under the East River, utilized to their full capacity. In the matter of removing the river barriers between Manhattan and Long Island it will be seen that the municipal authorities have planned, not for the immediate needs of the present, but for the future. They have planned largely and broadly and along the lines of an enlightened public policy.

It now remains for the transportation companies who are to be placed in practical command of these new means of communication with Manhattan to plan for the future upon an equally liberal and comprehensive scale. The traffic expansion which these new bridges and tunnels make possible cannot be realized unless the railroads do their part. The vast increase in the population foreshadowed by these improvements calls for liberal additions to car equipment and to power and trackage facilities. It is a fact well understood by experienced transportation men that to attract and hold any considerable increase of population the facilities of travel must be kept somewhat in advance of the actual requirements. With ample transportation facilities and quick through transit to Manhattan the Boroughs of Brooklyn and Queens, and all of suburban Long Island, should, within a few years, enjoy advantages far superior to those of The Bronx and its northern and eastern suburbs. If the transportation managements recognize these conditions and build wisely upon them it will hasten the inevitable exodus of hundreds of thousands from Manhattan, and secure to the railroads a tremendous increase in the number of their daily patrons. The public may safely assume that the railway managers are alive to the situation, and are animated by the desire to anticipate future requirements in a broad and liberal spirit.

In conclusion, the writer desires to express to all of those who have furnished him with information and data, especially the officials of the railway and ferry companies and the Board of Railroad Commissioners, his appreciation of their courtesy.

REPORT OF THE RAILROAD COMMISSIONERS ON THE BROOKLYN SITUATION

The report and recommendations of the Railroad Commissioners on the Brooklyn Rapid Transit Company, as a result of the recent hearing, were made public Jan. 29.

The Commissioners point out that this company operates 415¾ miles of surface and 74 miles of elevated track, and had available on Jan. 1, 1903, for winter service, 125 elevated motor cars and 397 elevated trailers, with combined seating capacity of 26,100, and 768 double-truck and 514 single-truck motor surface cars, with combined seating capacity of 37,940. There were fifty-eight elevated and 203 surface cars in excess of the maximum number being operated. The chief trouble has been that the company has not had sufficient power capacity to operate, heat and light all of its cars in service during the rush hours. The service during the non-rush hours has also been materially reduced during the last six months of 1902, and it should be immediately restored. While the power capacity will not permit an increase of service, it is possible (including current purchased from the Brooklyn Edison Company) for this service to be resumed. The total power generating capacity of the company from its own plant is rated at approximately 30,000 ehp, which is equivalent to an overload capacity of 37,500 ehp. This same plant supplies a storage battery capacity (during non-rush hours) of 1470 ehp, and the Edison Company furnishes 5100 ehp during rush hours only; the total available from all sources is thus 44,070 ehp. The total required to operate, heat and light all cars on surafce and elevated lines during the winter rush hours is 39,221 ehp. Add to this 2100 ehp for outside lighting and line losses, amounting to 16 per cent., or 7871 ehp, the total requirement is 49,192 ehp, or 5122 ehp more than the available maximum. Out of this total of power 2100 ehp are used for the lighting of stations, streets and highways, by 24,519 incandescent and 205 arc lights. In view of the present shortage of power the Commissioners recommend that the company should not be either required or permitted to light streets and public places.

The company is now erecting a new station, which will contain eight units of 4000 hp each. Owing to strikes and other causes completion of this station has been delayed, but one unit will soon be put in operation, and the company is also installing a 4000-hp unit in the Kent Avenue station. Even these additions, in the opinion of the Commissioners, will not be sufficient for the requirements of 1906-07, and the company is urged immediately to place additional contracts for power station equipment. Owing to the complaints as to premature putting in operation in the spring and fall of open or closed cars, the Board recommends that the company at once take steps to procure additional motor equipments, so that it shall have enough electrically-equipped cars of either kind to suit the weather conditions.

The eleven car houses owned by the company have capacity to give covered storage room for all of the rolling stock, and are equipped with the necessary pits for inspection and repair purposes. Each house is equipped with a wrecking-car outfit; but the board is of the opinion that valuable time can be saved by the use of wrecking wagons instead of cars. The shop force of men in the repair shops for surface cars was reduced last fall from 400 men to 216 men, but in the repair shops for elevated cars and engines the force was increased from 273 men to 376 men. There was, however, reduction made in the time service during the last half of the past year. The company's records show that Jan. 1, 1903, as compared with Jan. 1, 1902, these reductions had been as follows: Motormen, from 1720 to 1516; conductors, 1757 to 1613; inspectors, 90 to 59; starters, 70 to 48; division superintendents, 8 to 6; switchmen, 36 to 24. There was, however, an increase of 25 motormen, 14 conductors, 3 train despatchers and 1 inspector in the elevated service, and a decrease of 6 car couplers, 8 gate and platform men, 12 station porters and 8 car cleaners.

In comparing power capacity with passengers carried the following figures are given: 1895, 16,890 ehp to 100,879,646 passengers; 1898, same capacity, 141,033,452 passengers; 1899, 32,922 ehp, 173,823,286 passengers; 1900, same capacity, 207,752,822 passengers; 1901, 34,759 ehp, 230,365,005 passengers; 1902, same capacity, 240,825,228 passengers.

The report concludes with the following specific recommendations for immediate improvement:

1. That the company proceed energetically to the earliest possible completion of the installation and commencement of operation of each of the nine units of electrical power hereinbefore referred to as in progress; also, that it continue in the meantime to purchase all the available auxiliary power that it can procure.
2. That the company shall forthwith restore and resume the full service of surface cars on all lines, as shown by the schedules and passenger sheets of the first six months of the year 1902.
3. That the company shall during all other than the rush hours of morning and evening, whenever the temperature of the open air is as low as 45 degs., Fahrenheit, cause heat to be turned on in all of its cars. Further, that the company shall attach to the rear outer wall of each car a standard thermometer, exposed to the open air, and that the company shall instruct its conductors, whenever such thermometers shall indicate 45 degs., Fahrenheit, to call in the first inspector, who shall be under general instructions to turn on the heat in every car in every such case.
4. That the 271 coaches in the elevated service which are now lighted by oil lamps shall be lighted with electricity by installing incandescent lamps, with temporary wiring and contact-shoes, to take current from the third rail. That the practice of changing the oil lamps in cars and the carrying of oil lamps used for the tail lights through cars, while the cars are occupied by passengers, be discontinued forthwith.
5. That the operation of the so-called "loop" on the elevated lines at East New York be improved in certain details which are specified.
6. That all cars in use shall be thoroughly swept and dusted, dirty spots sponged off and windows cleaned once in twenty-four hours, and that they shall be washed inside and outside at least once in each week.
7. That the company take prompt measurer for the earliest practicable installation of a duplicate system of power transmission lines, and that, for increased safety, these duplicate lines be laid on routes separated from the present system.
8. An appeal for ordinances for the regulation of vehicular traffic is made to the Mayor and Common Council of New York City and the president of the borough of Brooklyn.

In the direction of permanent improvement the Board finds that while the surface car accommodations have been reduced during the latter half of 1902 there has been an increase in the number of trains and cars run on the elevated lines, attributable to the installation of electric power and motor equipment for a portion of this service. But the number of trains operated is still inadequate for the rush hour service. The congested condition of the elevated tracks on certain streets, and the lack of a third track and of terminal and switching accommodations for trains over Fulton Street and at the Bridge Plaza, as well as the company's present limitations of electric motive power, combine to make any present increase of the elevated service impossible. The Board is of the opinion that additional switching and terminal facilities can and should be acquired, and that a third track should be laid on Fulton and other streets. The Board also recommends for the surface cars an elevated approach to the Brooklyn Bridge terminal over Sands Street and the regulation of the vehicle traffic.

A particular form of complaint is made relating to the necessity for passengers paying two fares for short distances of travel over two separate lines of cars in the Williamsburg district, where the Brooklyn City and the Brooklyn, Queens County & Suburban lines connect, and where no transfers are given. This matter, the Board says, involves very complex legal questions, as does the whole subject of compulsory transfers. Nevertheless, it will receive attention at as early a day as is practicable. The Board also promises to watch the practical effect of the introduction of the measures proposed.

FINANCIAL ASPECT OF INTERURBAN ELECTRIC FREIGHT SERVICE

The Lake Shore Electric Railway, of Cleveland, is confronted with a serious problem in determining the future of its package express business, and the adjustment of the affairs of this department will be one of the first matters to be considered by the management when the road is taken out of the hands of the receiver.

As is generally known the Lake Shore Electric was formed by the consolidation of four roads; two of these are concerned in the present situation, namely, the Toledo, Fremont & Norwalk, operating from Toledo eastward, and the Lorain & Cleveland, operating westward from Cleveland. Both of these roads paid considerable attention to the handling of packages, but they operated on different plans. The Toledo, Fremont & Norwalk had an alliance with other Toledo roads, and handled goods as freight and at freight rates. As outlined in an article describing the Toledo freight station, published in the Souvenir Issue of the Street Railway Journal, all goods handled through this station are classed as freight, and rates which are approximately the same as steam freight rates prevail. Collections or deliveries are not made, nor are messengers maintained on the cars. The system on the Lorain & Cleveland was entirely different. The business was handled through the Electric Package Company, which operates on all the Cleveland roads. Goods are classed and handled as express, collections and deliveries are made and messengers are maintained on all cars. Agents are maintained in the towns served, and goods may be shipped from one line to another without reshipping, since there is but one operating company.

Although the Lake Shore Electric Railway has been operating through from Cleveland to Toledo for nearly a year, no change has been made in this heterogeneous system, owing to the Everett-Moore embarrassment, which forced the road into the hands of a receiver, and this precluded the possibility of important changes, as it was not the province of the receiver to establish a new policy. To cover the new connecting link the service of the Electric Package Company was extended to Norwalk and intervening towns, and while, at the present time, it is possible to ship goods from Cleveland to Toledo it necessitates a change and reshipment at Norwalk. Goods leave Cleveland as express and arrive in Toledo as freight. They go through without delays, but the man who examines his bill and checks up the rates notices that he is charged about three or four times as much per mile on the Cleveland end as on the Toledo end, and so far as he can see the service is about the same on one division as on the other.

Of course, the full development of the business cannot be attained under such methods, and obviously one or both of the systems in operation in the terminal cities must be disrupted. Here the question arises as to which is to be sacrificed.

As a matter of fact it is known that the Lake Shore Electric officials are not fully satisfied with either plan. While the freight rate is said to be profitable on the Toledo & Western Railway, one of the partners to the Toledo union freight station, it has not been found entirely satisfactory on the Lake Shore Electric. The reason for this is that the Toledo & Western handles bulky goods and car-load shipments in standard freight cars which are hauled in trains by electric locomotives, and the goods are delivered to the freight terminal yard at West Toledo. Only the less bulky articles are handled in the package freight cars, which operate to the center of the city. Another advantageous feature of the Toledo & Western is that all sub-stations are in the centers of towns, and the attendant combines the duties of electrician and freight agent.

While the Lake Shore Electric handles nearly as much freight as the Toledo & Western the conditions are different. The towns on the line are larger and more thickly populated, and will not permit the operation of standard freight cars as trailers, and all freight must be handled on power cars, which resemble passenger cars. Then, too, the engineers who laid out this portion of the road did not consider the freight and passenger service in locating the sub-stations, and in several towns the sites selected are at a distance from the business district; the reason which governed this decision seemed paramount at that time, namely, that the land was cheaper. In several of the largest towns independent freight stations have been established, but to extend this to all the towns and to install turn-outs, as some of the municipalities are now demanding, would necessitate an outlay which would only be warranted by immense growth of business, which is not now in sight. Moreover, to increase the amount of business to a point where it would became reasonably profitable would require additional rolling stock, power equipment and probably a double-track main line.

Regarding the extension of the package express service to all parts of the system, it must be admitted that there are also objectionable features to this plan. The Electric Package Company could not handle the bulky goods frequently carried on the Toledo end of the system because the rates are too high. Such goods are shipped from Cleveland as freight on the steam roads, or, during eight months in the year, they go by boat at very low rates. In some cases goods have even been shipped to Toledo by boat and then back to a town on the electric line. This can be done without much loss of time and at a lower rate than the express companies give from Cleveland; hence it is apparent that the Electric Package Company could not maintain the prestige on Cleveland to Toledo business that it now holds for the short-haul express business around Cleveland. Even if it could it would entail great expense to equip all the towns with express service, and there would be a loud complaint from the towns which have enjoyed the low rate in and out of Toledo; particularly would this be the case if the other Toledo lines maintained their freight service.

Several plans are being considered under which matters could be equalized. One is to extend the Electric Package service to all parts of the system, and utilize it for the smaller express packages, and then institute a freight service with freight cars hauled as trailers during the hours between 8 p. m. and 5 a. m., when the passenger service is light. This plan seems feasible, and it is claimed in its favor that it would have a tendency greatly to increase the earnings of the road, but it is doubtful whether it would be favorably received by the authorities of the cities and towns along the line.

Another plan is to institute a service which would be a compromise between express and freight in the matter of rates, but the system of calling for and delivering packages would be dropped. This would offer much better service than the ordinary steam road freight service, because of the frequency and promptness of delivery, and by reason of the higher rates it would be more profitable.

The Lake Shore Electric Railway has never attempted to determine the exact cost of operating its freight business, but figuring the power consumed and the cost of maintenance for a freight car to be about equal that of a passenger car, and taking into consideration the company's share in the cost of maintaining the Toledo freight station, it is estimated that it is impossible to realize very large profits on freight at freight rates, where all goods are handled in power cars.

An ordinance has been introduced in the Cleveland City Council providing for the laying of switches from the street railroads into church property. The author of the ordinance claims that many of the large Cleveland churches are desirous of having such switches placed in order to provide for the more general use of funeral cars.

PALLIATIVE MEASURES IN CONGESTION

BY LOUIS BELL, PH. D.

The large increase in urban population generally aggravated by the condensation due to the modern steel building has driven most large cities to desperate straits for transportation. Radical remedies for congestion are extremely costly and difficult of application and too often prove ineffectual from the very time taken to complete them. The daily press sometimes talks as if this unhappy condition of things were due to the negligence of the street railways, displayed in a hardened indifference to public convenience. But if the gentlemen of the quill could stand undetected alongside a division superintendent when a first-class blockade was under way they would see a new light and gain a new richness of vocabulary. Few people seem to realize that every citizen who is forced to walk cuts down the profits of the street car company, and that it does not enjoy losing a fare much more than he enjoys walking. If people will insist on herding together in cities and piling city upon city in their greed for crowding they cannot lay all the blame for congestion upon the transportation companies, who ordinarily have only one layer of street in which to work, and that, too, obstructed in many and exasperating ways. The people have a right to insist that the street railway companies shall work the facilities they have to the utmost, but there is no way of forcing a quart into a pint bottle even if a downtown car during the rush hours does suggest that interesting process.

When popular demand outpaces the normal capacity of the streets something has to be done, and the best thing for all parties is to get to work and lend a hand. The people want to be carried, and the companies want to carry them, if possible. Elevated roads and subways can be built in time, but it ought to be possible to work the streets to better advantage than has yet been attempted. The cities have grown and street railway service has been enormously improved, but traffic-teaming stays, save in amount, just where it was forty or fifty years ago. One overloaded dray can hold up a string of electrics just as readily as it held up the bob-tailed horse cars of the last generation. We daily vault over the heirs and assigns of the same old matudinal skids that tripped up our grandfathers. It certainly seems as if modern ingenuity and the stern necessities of modern life would long ago have devised improved ways of handling the heavy goods that fill our streets and creep at a snail's pace along the car tracks. Logically, it is the freight traffic rather than the passenger traffic that ought to go below the surface; but, be that as it may, there is no doubt that a determined effort at controlling and regulating heavy traffic would result in very material relief. Rigorous restrictions against obstructing street car tracks, mercilessly enforced, would do wonders in increasing the surface rapid transit facilities. This step would involve no class legislation, for it is a case of the whole people against the encroachments of the few who drive trucks and their employers. Better yet would be a considerable extension of the policy of keeping the traffic teams off certain streets entirely, during the rush hours at least, and preferably all the time. Two or three streets well cleared are capable of doing admirable relief work. In the comparatively few streets thus actually relieved it is no exaggeration to say that the street car speeds are 50 per cent greater than elsewhere, with a corresponding increase of carrying power. Here, again, it is the interests of the many against those of the few that should prevail.

Another very important remedy lies mainly in the hands of the street railways, though requiring, as does every reform, the cordial co-operation of the people at large. This remedy lies in an improved routing of cars. In New York, where the main routes are straight and parallel, comparatively little can be done by change of route, but in some other cities much can be done. It often happens that the longest way around is the shortest way home. The really important thing is good running time, and five minutes of increase in running time due to increased distance is no more than five minutes lost in blockades. Ordinarily the tendency is to send cars over the shortest route in point of distance, but the really important thing is not the distance, but the average time taken, and it often happens that the longer route can be made the quicker one. This often happens in suburban traffic, where the main problem is how to get clear of the congested district. Any such change is usually met by a popular clamor from sheer lack of real comprehension of the situation. In this matter, as in the matter of transfers, the street railway companies would do well to take the public into their confidence. Every one wishes a liberal transfer system and good street car facilities, but every one does not understand that his personal co-operation is needed to secure them. Changes and omissions on the part of railway companies often seem arbitrary, and sometimes they may be, but more often they are, for good reasons, unknown, however, to the public at large. If the public could be made to understand the importance of judicious, even though apparently indirect, routing, a most useful remedy for congestion could be readily applied. It would not be beside the mark to say that in many cases the working capacity of a street railway system during the rush hours could be increased nearly 50 per cent by the careful regulation of teaming and the careful choice of the routes of least resistance.

MATCHING TIME-CHANGED CAR COLORS

BY H. ARNOLD FRENCH.

One of the most interesting and yet most perplexing departments of car painting is that of mixing colors to match those on an old car. The previous paint, owing to the decomposition of its pigment from the sun, is usually changed many shades from its original color, yet that which is to be applied should resemble it so closely as to deceive the casual observer. To the expert it is, of course, quite impossible to make the deception complete, as there are indications other than those of color that enable him to perceive the presence of accumulated paint on the surface. But to the public who daily view the cars in the streets the presence of stains or abrasions which are unavoidable in the life of a street car may apparently be obliterated by cleaner painting.

The ability to secure even a good match in "touching up" old cars is more of a gift than an acquisition. It is safe to say that not more than one in fifty of car ornamenters has this valuable quality in its greatest degree. Instances have many times come under my observation where old, experienced painters who claimed to be conversant with all colors have utterly failed to secure good results in touching up cars. On the other hand, some young man, after a small amount of practice, has often made a most presentable job under the same conditions with apparently no special mental exertion.

The conditions presented by the surfaces of old cars are often such as completely to puzzle those who are not apt in recognizing them. For instance, the paint directly under the numerous mouldings and guards, being protected from the sun's rays, retains some vestiges of its former shade, while from this point to the middle of the panel, which has been severely exposed, there will nearly be such a fine blending of color as to defy detection from a casual observer. Again, the same condition sometimes exists, but in a greater degree, on open car panels, which in most cases are constructed by a combination of a convex and concave formation. The convex portion of the panel being at the top offers enough protection to the center to make a decided difference in the appearance of the latter, although the blending is so fine as to escape notice.

In touching up a car the object sought is, of course, to make it appear as nearly like new as possible. The condition in which it is usually received from the wood shop by the painter after a year's service is not always encouraging. And here, in passing, some points might be suggested of advantage to the woodworker whereby holes in panels may be repaired in such a manner that after being finished and painted the best results may be obtained. For an example, where a break has been made and the edges are more or less ragged, the opening should be trimmed with care so as to avoid breaking the paint from the edges of the hole during the trimming process. When the block is inserted in the opening, if it is left flush with the surface, no space is left for the paint stock. The result is that the grain of the wood will be much in evidence. This trouble may be avoided, however, by letting the block into the surface by, say, 1-64 of an inch. This depression is ample for a coat of lead priming and three coats of filling, or, if necessary to accelerate the work, the priming may be followed by filling in with hard-lead putty. Enough of either material should be applied to raise the surface a little more than flush with that of the car. When thoroughly hard the surface can then be "stoned" down to the exact level of the varnish on the rest of the panel without injuring the latter in the least. Finally, after the surface is painted and the car is varnished, it would take an expert to discover the spot where the patch is located.

A better appearance can often be secured if, when trimming the hole around a break, a joint, letter or stripe can be conveniently reached by enlarging the hole and bringing the edge of the hole even with the division line in the decoration.

One other optical fact should be borne in mind by the matcher of colors, and that is an exposure of the eye to one color for any length of time will create illusions which, if not recognized and counteracted by making allowances therefor, will often produce unsatisfactory results. To illustrate: A "Pullman car color" panel, if examined after looking intently at bright green, will appear brown. On the other hand, if examined after the observer has gazed intently for at least a half minute at a panel painted with bright vermillion, the "Pullman color" will appear to have a distinct olive green shade. This is only one of many instances that might be cited. Almost all tints and shades of paint can be effected in the same manner with the use of some color complementary or antagonistic to it. Considering this fact, the failure to match paint accurately can to some extent be understood. It is certainly advisable, when at this work, to avoid as far as possible impressing the optic nerves with any bright primary or secondary color for any length of time.

TEMPORARY TRACK CONSTRUCTION IN HAMBURG

The city of Hamburg, which is the second largest city in the German Empire and one of the most important ports in all of Europe, has always been badly off in the way of steam railroad stations, as the two principal lines which enter the city have had separate terminals, and neither of them has been adequate to the traffic. Construction has recently been commenced, however, on a large union station, which will cost $10,500,000, and which is being built by the Prussian Government Railways, the Lubeck-Hamburg Railway, and the city of Hamburg.

INTERESTING TRACK WORK IN HAMBURG

The site selected is adjoining one of the busiest points on the line of the Hamburg Street Railway, where there is a triangular double crossing, at which ninety-eight cars pass in each direction per hour during the rush hours. This point, at the corner of Glockengiesserwall, Georgsplatz and Ernst-Merckstrasse, is illustrated in the accompanying engraving, which is also of particular interest from the fact that the company is installing at that point some elaborate special work. The site of the proposed steam railroad station is indicated by the black star at the right-hand side of the engraving.

As will be seen, a temporary track has been built over the new special work which is being installed. This track is supported on wooden blocks, which are mounted on ties or rest directly on the concrete base on which the new track is being laid. The temporary track is kept in gage by brace tie-rods.

The large numerals on the cars indicate the route upon which the car is running. All cars are marked in this way, and it is undoubtedly a great convenience to intending passengers, who can thus easily identify the car either by the sign board or by the number which is carried on the main panel and also on the front of the hood. This paper is indebted for the accompanying article and photograph to Mr. Weltzien, engineer of track construction of the Hamburg Street Railway Company.

SHAFT STRAIGHTENING IN THE LAKE STREET ELEVATED SHOPS, CHICAGO

A new shaft straightener for taking the bends out of motor shafts has been recently devised and put in use by F. D. Ward, master mechanic of the Lake Street & Northwestern Elevated Railroad Companies, of Chicago. These roads are equipped principally with General Electric 55-motors. When motor shafts are bent the bend is usually just inside the pinion. The new straightening device is intended to take out such bends without removing the axle from the armature.

Fig. 1 shows sectional drawings of the shaft straightener assembled, and Figs. 2 and 3 the appearance of the finished apparatus. It consists of two parts. The outer part, which is slipped onto the shaft first, is of such a shape as to fit in under the overhanging armature of the General Electric 55-motor, so as to get as far in on the shaft as possible. The second part slips inside the first, and is fitted so as to allow only a loose sliding fit in the outer shell one direction, but to allow considerable motion in the other. The outer part is provided with a jack-screw, which, upon being tightened, forces the inner part to one side, so straightening the bent shaft if applied in the proper direction. Both inner and outer parts fit upon the shaft with an easy sliding fit, being bored 1-64 in. larger than the new armature shaft.

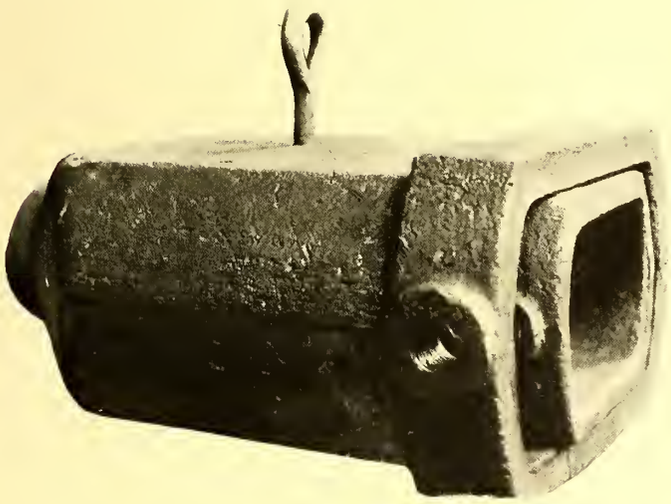


FIG. 2.—SHAFT STRAIGHTENER ASSEMBLED

These shells are all made of cast steel, and being rather heavy for manipulation by hand an eye-bolt is provided on the outer shell, so that it can be carried around with the traveling crane.

FIG. 3.—PARTS OF SHAFT STRAIGHTENER

The straightening is, of course, done in a lathe, the armature being put in the lathe with the shaft straightener on the shaft. The straightening of the shaft is then simply a question of turning the strightener to the proper angle and applying the jack-screw enough to accomplish the straightening. It has been found to work very well and to save much labor and risk of damage to armatures incidental to other methods.

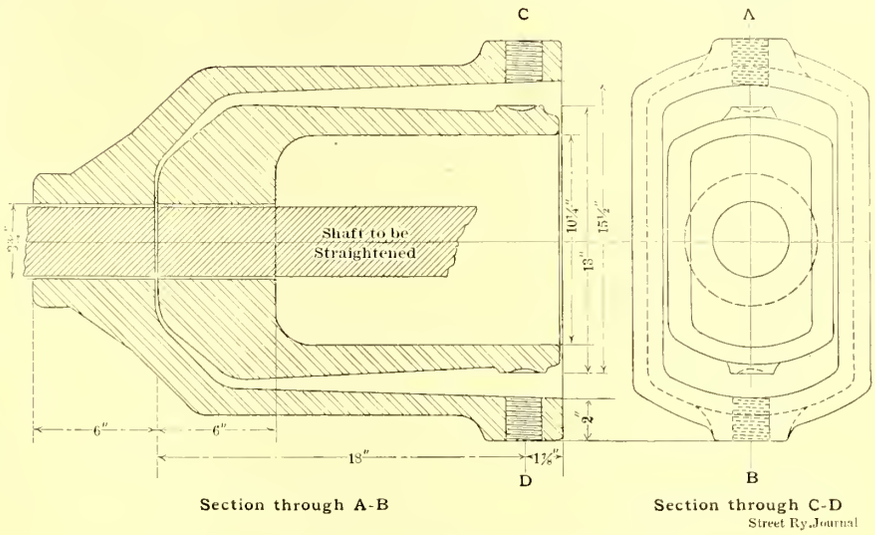


FIG. 1.—SECTION OF SHAFT STRAIGHTENER

The steel castings used for pulling off pinions in these shops are also shown here in two sizes. Their mode of operation is apparent from the engravings and drawings. Fig. 4 is from a photograph of the two sizes, and Fig. 5 is the working drawing of one of them.

All the motor cars of the Northwestern Elevated Railroad are being equipped with General Electric type M control, with a master controller in each cab, and the main current carrying contacts operated by magnets under the car. The primary object of this change is to secure a more satisfactory controller for heavy currents than was the old type L. It will also put the equipment in line for the use of a mixed multiple unit system, should such a move ever seem desirable.

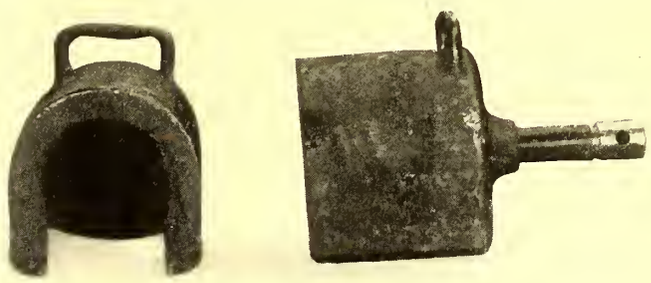


FIG. 4.—STEEL CASTINGS FOR PULLING OFF PINIONS

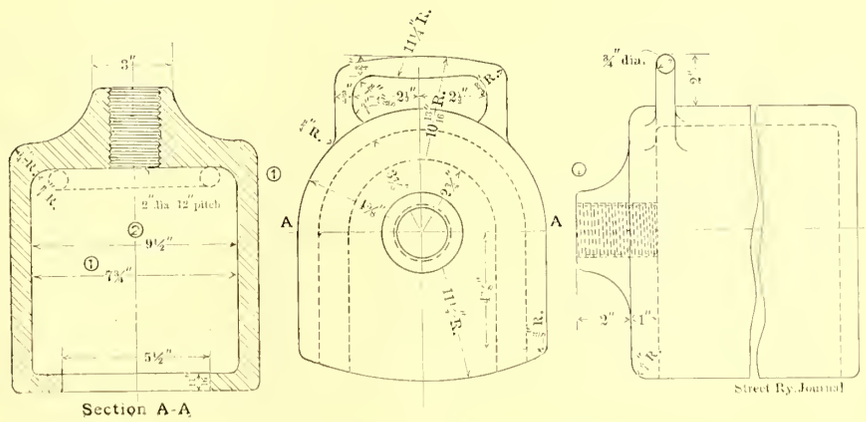
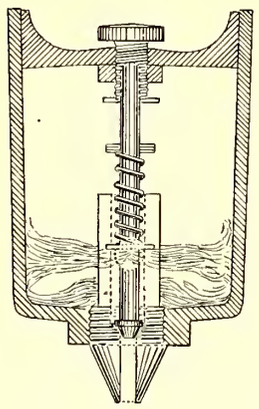


FIG. 5.—PINION DRAWING DEVICE

MOTOR LUBRICATION IN COLUMBUS

After an extensive experience covering three years the Columbus Street Railway has adopted oil for lubricating motor bearings and finds it superior to grease for this purpose. This matter has been developed along very simple lines by Charles E. Hott. No changes are required in the grease boxes, as the oil receptacles are made of rectangular form to fit into the grease box on the motor.



SECTION OF OIL CUP FOR MOTORS

The supply of oil to the bearing is regulated by wicking, which passes through a valve chamber, as shown in the accompanying cut. The oil is fed to the bearing by the capillary action of this wick. A valve is also provided, being seated in this oil chamber, which stops the supply of oil when the equipment is not in service. The oil used is Galena car oil, the lighter oil being used for winter and the heavy oil for summer. The economy effected by the substitution of oil for grease has been a reduction from 16½ cents to 11 cents per 1000 miles, and the life of the brasses have been increased 50 per cent. In addition there is a saving in the time required to apply the oil instead of grease.

The Columbus Street Railway Company is doing a considerable amount of electric welding of track. In this work the opportunity was improved to weld the cross-connecting bonds of the special work. The ends of these cables were placed in lugs and were welded under pressure. This was found to be a most effective way of connecting these cables to the rails.

SHOP KINKS ON THE GRAND RAPIDS, HOLLAND & LAKE MICHIGAN

Various means have been devised for holding armature bearings during the turning out process after the babbitt has been cast. One of the simplest in operation is that used on the Grand Rapids, Holland & Lake Michigan Rapid Railway, by G. E. Hardy, master mechanic at the company's shops at Macatawa Park. A frame for holding the bearing shell has been made, which rests and is bolted on the tool carriage of the lathe. The bearing shell is clamped into the middle of this frame. On each side of the bearing shell is a bearing of the right size for a 1¼-in. shaft. These two bearings have passed through them a boring bar, which is a piece of 1¼-in. shafting, with a boring tool mounted on a slot in it, and which is rotated in its bearings by a lathe-dog driven from the face plate of the lathe. As the boring bar is fixed in bearings which are in line with the newly-babbitted shell, and as this has been clamped in to be bored out, there is no delay in getting the shell correctly centered.

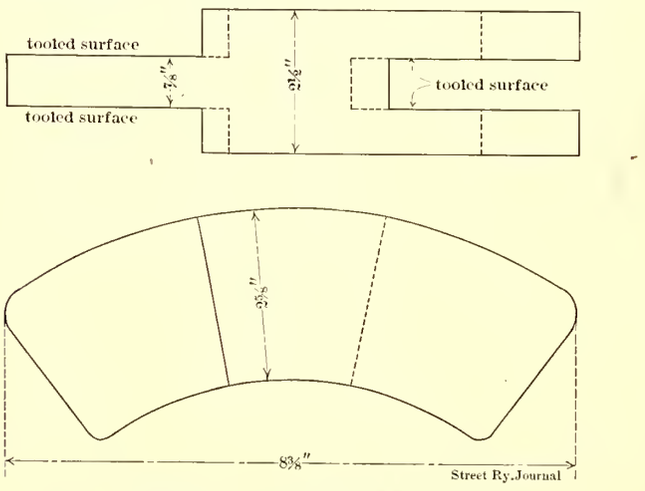


FIG. 1.—SECTIONS OF COMMUTATOR CLAMP

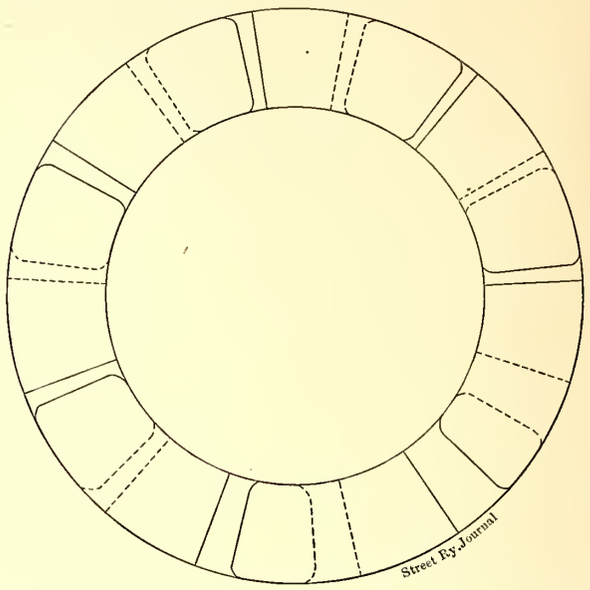


FIG. 2.—PLAN OF SECTIONAL CLAMP FOR COMMUTATOR

The sub-station at Macatawa Park adjoins the repair shops, and the sub-station attendant is also the armature winder. There is sufficient extra room in the sub-station for him to carry on his work. Thus an economy is practiced which has been frequently talked of in connection with sub-station attendance, but which is perhaps not found as often as was anticipated when distribution from sub-stations was first proposed.

For assembling commutators Mr. Hardy has made a sectional clamp, which is shown assembled in Fig. 2, and one of the sections with sizes is also shown in Fig. 1. The various sections, which are of cast-iron, dovetail into each other. When placed around a commutator a steel ring with set screws is put around it, and the set screws are brought down onto each segment of the clamp.

A similar arrangement has been for some time employed by W. W. Annable, master mechanic of the Grand Rapids Railway Company, except that the sections in Mr. Annable's device do not dovetail into each other but simply overlap on one side, so that one section can be temporarily taken out at any time during the operation by loosening the set screw over it.

REPORTS OF THE PENNSYLVANIA STREET RAILWAY COMPANIES

In the issue of the Street Railway Journal of Jan. 3, 1903, advance figures showing the operation of the street railway companies in New York State for the year ending June 30, 1902, were published, and in the issue of Jan. 17 a similar table was printed, giving information of the railway companies in Massachusetts. Through the courtesy of the Department of Internal Affairs of Pennsylvania this paper is able to present on the opposite page a table compiled from the returns of the street railway companies of Pennsylvania for the year ended June 30, 1902.

The table comprises operating companies only, and eighty roads are reported. As will be seen forty-eight of these companies show a surplus as a result of the year's operation, and thirty-one a deficit. The income and expenditure of one company just balances, making the total of eighty companies. Of the forty-eight companies showing a surplus as a result of the year's operation fifteen only paid dividends. The amount of the dividends paid is given but the rate is not published, as it is not called for in the form of return made by the companies to the Secretary of Internal Affairs.

FINANCIAL REPORTS OF THE OPERATING STREET RAILWAYS OF PENNSYLVANIA FOR THE YEAR ENDING JUNE 30, 1902

NAME	ON JUNE 30, 1902		YEAR ENDING JUNE 30, 1902				
	Capital Stock	Funded Debt	Total Receipts All Sources	Operating Expenses	Charges on Earnings	Dividends Paid	Surplus for Year
	$	$	$	$	$	$	$
Allentown & Kutztown	250,000	195,000	56,850	23,734	15,029	.....	8,088
Altoona & Logan Valley	415,350	490,500	155,462	80,139	33,491	41,535	297
Ashland & Centralia Electric	60,000	60,000	12,086	5,600	4,461	.....	2,025
Beaver Valley Traction	1,000,000	1,000,000	161,604	89,489	74,246	.....	def. 2,131
Bradford Electric	130,000	130,000	50,099	29,242	8,295	.....	12,562
Butler Passenger	50,000	.....	19,302	19,427	1,737	.....	def. 1,862
Carlisle & Mt. Holly	100,000	100,000	18,576	9,462	9,026	.....	88
Chester Traction	500,000	250,000	305,048	180,568	107,303	20,000	def. 2,823
Citizens' Traction (Oil City)	150,000	.....	50,455	42,291	300	.....	7,864
City Passenger (Altoona)	200,000	50,000	117,560	89,150	7,876	20,000	535
Conestoga Traction (Lancaster)	4,000,000	1,887,500	344,227	225,248	140,901	.....	def. 21,921
Connellsville Suburban	25,000	175,000	20,147	14,492	4,829	.....	826
Cumberland Valley Traction	446,400	277,500	27,114	26,412	1,005	.....	def. 333
Delaware County & Philadelphia Electric	300,000	64,000	79,136	57,382	11,521	21,000	def. 4,766
Doylestown & Willow Grove	500,000	500,000	56,487	22,114	50,623	.....	def. 16,250
Du Bois Traction	17,500	16,800	13,998	9,572	1,778	.....	2,647
East End Passenger (Williamsport)	18,000	18,000	4,627	5,117	1,341	.....	1,831
Easton & Nazareth	250,000	250,000	27,986	11,119	13,106	.....	3,760
Erie Electric Motor	1,250,000	1,000,000	214,172	113,343	132,559	.....	def. 31,731
Erie Traction	500,000	500,000	62,033	42,308	31,241	.....	def. 11,517
Franklin Electric	60,000	50,000	34,424	27,851	3,312	.....	3,261
Gettysburg Transit	100,000	100,000	4,214	3,373	22,861	.....	def. 22,020
Hanover & McSherrytown	30,000	.....	7,830	4,791	3,023	.....	16
Harrisburg & Mechanicsville Electric	144,500	144,500	48,201	36,434	11,360	.....	406
Harrisburg Traction	2,000,000	75,000	466,530	198,673	167,858	100,000	.....
Holmesburg, Tacony & Frankford	750,000	400,000	120,430	63,506	30,747	21,000	5,177
Johnstown Passenger	1,993,950	1,780,000	274,168	126,283	69,905	18,000	59,981
Kittanning & Ford City	50,000	27,500	35,865	23,610	5,533	.....	6,722
Lebanon Valley	500,000	500,000	69,901	29,734	28,625	11,000	942
Lehigh Traction	1,000,000	585,000	129,653	62,681	46,512	.....	20,460
Lehigh Valley Traction	2,654,080	3,000,000	740,017	351,128	352,613	95,181	def. 58,905
Lewisburg, Milton & Watsontown Passenger	150,000	150,000	22,843	18,665	8,627	.....	def. 4,449
Lewistown & Reedsville	150,000	275,000	44,473	23,992	8,748	.....	11,733
Lykens & Williams Valley	188,500	168,000	20,676	11,126	11,632	.....	def. 2,083
Mauch Chunk, Lehighton & Slatington	600,000	500,000	23,724	23,372	11,796	.....	def. 11,444
Meadville Traction	350,000	300,000	29,591	21,388	7,500	.....	703
Media, Middletown, Aston & Chester	183,000	.....	54,397	45,416	20,642	.....	def. 11,660
Montgomery & Chester	100,000	100,000	14,045	15,402	5,000	.....	def. 6,357
Montoursville Passenger	75,000	75,000	16,006	13,700	600	.....	1,705
New Castle Traction	500,000	500,000	139,626	84,553	30,688	.....	24,386
Newton Electric	300,000	300,000	64,587	42,640	22,878	.....	def. 931
Oil City	90,000	25,000	39,290	33,007	1,580	.....	def. 4,704
Patterson Heights	6,000	4,800	1,425	1,701	457	.....	def. 733
People's (Nanticoke)	100,000	100,000	28,580	20,633	6,695	.....	1,252
Philadelphia & Chester	350,000	270,000	16,504	24,625	17,034	.....	def. 25,154
Philadelphia & Lehigh Valley	1,500,000	1,932,000	74,182	88,497	5,097	.....	def. 19,412
Philadelphia & West Chester	565,175	390,000	110,409	85,092	29,525	.....	def. 4,209
Pittsburg, McKeesport & Connellsville	1,650,000	1,649,500	203,796	153,394	89,130	.....	38,728
Pittsburg, McKeesport & Greensburg	500,000	250,000	75,428	47,769	1,502	.....	26,157
Pottstown Passenger	87,500	75,000	32,945	23,604	6,056	.....	3,286
Pottsville Union Traction	1,250,000	701,000	173,769	98,103	66,463	.....	9,204
Punxsutawney Passenger	160,000	.....	34,950	26,719	1,485	.....	6,747
Ringing Rocks Electric	50,000	54,000	8,196	10,253	.....	.....	2,057
Riverview Electric	75,000	.....	6,859	6,897	2,046	.....	def. 2,084
Roxborough, Chestnut Hill & Norristown	248,400	371,000	97,487	46,430	34,488	46,624	def. 36,055
Schuylkill Traction	2,000,000	549,000	130,757	81,225	43,807	.....	5,724
Schuylkill Valley Traction	500,000	245,000	197,279	136,353	66,268	.....	def. 5,341
Scranton Railway	3,000,000	3,000,000	422,561	390,578	226,648	.....	df. 194,665
Shamokin & Edgewood Electric	60,000	60,000	32,066	27,873	3,594	.....	599
Shamokin & Mt. Carmel Electric	700,000	300,000	71,478	33,787	50,741	.....	13,050
Sharon & Wheatland	50,000	50,000	56,713	35,291	3,211	.....	18,211
South Side Passenger (Williamsport)	25,000	25,000	15,901	12,606	2,065	.....	1,231
Southwestern Street (Philadelphia)	400,000	400,000	49,222	36,406	25,123	.....	def. 12,307
Stroudsburg Passenger	51,200	7,000	7,104	5,921	238	.....	944
Sunbury & Northumberland Electric	125,000	125,000	25,074	20,664	5,144	.....	def. 733
Susquehanna Traction (Northumberland)	200,000	100,000	21,824	18,043	4,320	.....	def. 538
Tamaqua & Lansford	200,000	200,000	53,153	32,070	10,567	10,000	516
Tarentum Traction Passenger	50,000	100,000	31,525	17,768	8,165	.....	5,593
Titusville Electric Traction	100,000	100,000	31,552	17,006	6,164	.....	8,382
Union Traction (Philadelphia)	10,500,000	.....	14,118,158	6,402,338	6,637,782	.....	1,078,039

FINANCIAL REPORTS OF THE OPERATING STREET RAILWAYS OF PENNSYLVANIA FOR THE YEAR ENDING JUNE 30, 1902—*Continued*

Name	On June 30, 1902		Year Ending June 30, 1902				
	Capital Stock	Funded Debt	Total Receipts All Sources	Operating Expenses	Charges on Earnings	Dividends Paid	Surplus for Year
	$	$	$	$	$	$	$
United Traction (Reading)	400,000	149,900	509,212	261,921	220,138	20,000	7,154
Vallamont Traction (Williamsport)	101,700	100,000	22,125	12,990	7,032	.....	2,103
Valley Street (Sharon)	150,000	150,000	34,230	23,954	8,746	.....	1,529
Warren	200,000	200,000	62,332	43,573	7,079	.....	11,680
Washington Electric	125,000	125,000	50,402	21,592	6,965	.....	21,845
West Chester	60,000	34,000	15,237	13,082	3,346	.....	def. 1,191
Wilkesbarre, Dallas & Harvey's Lake	200,000	150,000	45,028	25,624	10,797	8,000	607
Wilkesbarre & Wyoming Valley Traction	5,000,000	1,817,000	634,216	299,935	148,127	212,500	def. 26,346
Williamsport Passenger	338,550	169,000	104,656	77,217	14,330	.....	13,109
York	200,000	150,000	89,035	52,935	14,945	6,000	5,155

CORRESPONDENCE

TRANSFORMERS FOR TESTING ARMATURES

Jan. 15, 1903.

EDITORS STREET RAILWAY JOURNAL:

I have built a transformer for testing armatures, following specifications as laid down in the November issue of the STREET RAILWAY JOURNAL in all except one thing, and that is, I put a wrought iron angle-plate on the outside of each end of the sheet iron, to give it rigidness, and put four ¾-in. bolts to hold all together in a solid mass. I insulated the plates of sheet iron from each other with tissue paper, although I left the paper short at alternate ends, so as to give each piece of iron a short contact with that on one side. I then put on 100 turns of No. 8 wire, well insulated. I put a 110-volt current of about 60 cycles through the transformer, and thus far I have been unable to heat any wire larger than a No. 20, and that but slightly. I placed the No. 20 in with the armature just to try what size would heat up on a short circuit, and it got barely warm. The armature was one just taken out of a motor with a short-circuited coil. Are my ¾-in. plates and bolts the cause of my non-success, or is it the lack of insulation between plates at the corners? I am anxiously waiting a solution to the difficulty, as it means a lot of money saved.

REPAIR SHOP SUPERINTENDENT.

[Answer]: We think that the trouble is due to two causes. First, the iron plates on the ends of this magnet have prevented you from getting the armature sufficiently close to the magnet to get good results. The closer the armature is to the magnet the more powerful will the induced currents in the armature be. A second reason why the results were not satisfactory was that you probably did not wait long enough for the bobbin to warm up. Even if you only succeeded in getting one-fourth of the generated magnetism in the armature you still have about one-fourth of a volt per turn. This should generate about 85 amps., or thereabouts, through a short-circuited coil of a 35-hp motor, and would heat the coil to 40 degs. Centigrade above the temperature of the atmosphere. If you would prefer to have the bobbin heat up more quickly and find it inconvenient to get the clearance between armature and magnet any less you will find that the magnetic effect increases as turns are taken off the coil. With one-half the number of turns on the coil you can expect practically double the induced currents in his armature bobbin, other conditions remaining the same.

This fact, however, should be borne in mind, if the short circuit is only partial, the coil in the armature will, of course, heat up slowly, owing to the resistance of the bad contact. But if, during the test, the resistance of this bad contact suddenly diminishes and the transformer is wound with a low-resistance coil, the armature coil will heat up with tremendous rapidity, and it may burn out during the test. If the short circuit in the armature is complete we believe there should be no difficulty in heating up the coil of the armature with the original winding. If, however, you want to detect a partial short circuit rapidly and are willing to take the chances of a completely short circuited coil heating up too rapidly, we suggest that you wind your transformer with thirty turns of No. 6 wire. Then if you put your armature into the field and use a good-sized fuse in your primary circuit, we believe you will have no difficulty in feeling heat in the armature coils.

WHEEL AND AXLE FITS

Cleveland, Ohio, Jan. 17, 1903.

EDITORS STREET RAILWAY JOURNAL:

Where can I find a table showing what size to bore wheel so that it will press on an axle at a definite pressure. If there be no such table published can you tell me what should be the difference of diameter between the hole in a wheel and diameter of the axle where the axle is 5 ins. in diameter so that the wheel can be pressed upon the axles with about 35 tons. The length of the hub is about 5 ins. G. H. K.

[Answer]: The "old rule of thumb" method still applies to mounting wheels on axles, and as a matter of fact seems to be better than the more scientific methods of doing this work. Different companies have tried in numerous instances to bore a lot of wheels to a certain size and turn a lot of axles to another size, expecting to get what is known as a "pressure fit." But while this may be obtained in perhaps 75 per cent of the cases, in the other 25 per cent either there was no pressure at all or else the pressure secured was so great as to burst the wheel. The method of mounting wheels in all shops that we know about, is first to bore the wheel and then caliper the axle to fit. Machinists have an expression that they can "tell by the feel" as to how much metal to leave on the axle, this, of course, being the result of experience. We have never seen such a table as you suggest, and do not think it would be of value if made up, as it would only apply to the wheels from one manufacturer. Every make of wheel varies in density of iron, and hence in its elasticity. This is shown by the trouble experienced by railway companies when they change the make of wheels they have been using for a long time. We might say, however, in the case you mention that for 35-ton pressure the axle should be about one one-hundredth of an inch (0.01 in.) larger than the bore of the wheel.

The cars of the Boston & Northern Street Railway Company are to be equipped with red bullseye lanterns, which will be hung on the rear dash.

ALLEGED AMERICAN CONSERVATISM

Boston, Mass., Jan. 15.

EDITORS STREET RAILWAY JOURNAL:

One is prone to look back on the prodigious growth of electric railways in this country, and smile the smile of complacency that American enterprise has wrought so great a work. And truly the feat has been one that we may well be proud of, but with our patriotic fervor there comes at least a shadow of regret that the daring enterprise and resourceful ingenuity of the American pioneer has not inspired the present as it did the past. As a matter of fact, so far as electrical engineering is concerned, the electric railway in this country has for the past five years remained on a dead level of self-satisfied standardization. It is not necessary for engineers and investors to go in for all sorts of costly experiments, but they should be reminded that no art has ever yet been advanced by sitting down in well-fed contentment and letting well enough alone. And that is precisely what Americans have been doing in the electric traction business. To be sure, we can count up a yearly score of some hundreds of miles of track and more hundreds of cars, but the track and the cars and the rest of the plant show little evidence of the restless enterprise by which the way to electric traction was won. If our present methods and equipments could be regarded as full, perfect and complete, there might be some excuse for the present national attitude, but, as every practical man fully realizes, there is still much to be desired. We have not reached or even remotely approached finality in the evolution of electric traction, and yet we seem to be content to let improvements slide.

Truth to tell, the most important advances are now being made by foreign engineers on foreign soil. One may denounce their work as needless or damn it as experimental—that last epithet of outraged conservatism in the presence of dreaded innovations—but good, bad, or indifferent, it is not ours but theirs, and if any great advances come through their labors theirs will be the reward. Americans cannot hope to repeat indefinitely the story of the Inner Circle. Abroad engineers are busy with innovations—traction by alternating motors, high-speed service, surface contact systems, monorail elevated roads and locomotive systems to invade the domain hitherto held undisputed by steam. Americans having no practical experience with such things are disposed to denounce them as impractical, visionary or experimental—but no one of them looks half so hare-brained as did the trolley system itself barely fifteen years ago. Engineers look wise and say they are unsuited to American conditions; which may be true, but cannot be proved by any amount of assertion. Meanwhile in this country we wrangle over whether the same old motor should be rated on a heating limit of 56 degs. for three hours or for three hours and twenty minutes, or how much better Smith's system is than Brown's, when the one will give acceleration sufficient to pitch the passenger over two seats and the other merely flattens him against the front door. We read long-winded papers on the conversion of trunk lines to the third-rail system, when a few hours of sleet recently disorganized half the traffic of the metropolis. And in general we are contented to believe that we are the whole thing in electric traction, and that no improvements are needed save in what we are pleased to called minor details.

Now this attitude is unquestionably based on very great and striking success, and just now when we are on the crest of a tidal wave of industrial supremacy it will pass for vice-regal dignity, but the day will soon come when we shall have to show cause, and that day may prove to be one of tribulation. It is doubtless a good thing in the progress of an art to sit down for a while when all goes well and to calmly smooth out one by one the minor difficulties. But it will not do to be caught napping at the task, and unless we much mistake there is some danger of such a denouement. American enterprise came near to getting a severe setback in the Inner Circle affair, and escaped only by the potent interposition of Pull—the deus ex machina of American life. The final decision in that famous case was doubtless sound, but it was a precious close call, all the same. There are indications that the lesson has not been altogether lost, and that American engineers are recovering some of the old-time hustle. The Zossen tests, the Elberfeld-Barmen road, and the recent choice of the monorail system for an important line ought to serve as additional goads to experimental activity. If American electric traction is to be the world's model we must do something besides standardizing existing apparatus and buying roads to install it on. Now, every-one of the innovations we have cited may prove in the last resort to be unwise, but they cannot safely be assumed to be so without further proof. Our contention is that the art must keep moving, and that doing even radical things is preferable to doing nothing at all in the way of innovation. There is much still untried in electric traction, and there are many obvious improvements still to be made. It is time to be up and doing.

AN OBSERVER.

[We cannot agree with the opinion of our correspondent, so fervidly expressed in the above letter. Not only are the most important commercial installations abroad at present being equipped with apparatus which practically follows the same standards as are in force in America, but American engineers themselves have and are showing no marked tendency toward the self-complacency to which our correspondent refers. The wide adoption of polyphase systems of power distribution for railway work, and the development of high-speed trolley and third-rail roads are examples only of the progress which has been made in this country during the past two or three years; while the future promises to be even more fertile in important results in electric railway development. In our opinion it is to a large extent due to the fact that American engineers and investors have not been mislead into installing, on a large scale, many of the delusive schemes with which the progress of electric traction in other countries have been burdened that the American electric railway industry occupies the position which it now possesses.—Eds.]

AMERICAN CAPITAL IN HOLLAND

The Netherlands Tramways Corporation has recently been organized, under the laws of the State of Connecticut, with a capital of $3,500,000 to purchase, build and operate electric lines in Holland and elsewhere. The officers of the company are: Directors, Henry J. Pierce, W. Caryl Ely, Pendennis White and Charles W. Goodyear, of Buffalo; William B. Rankine, of Niagara Falls; G. L. Boissevain, F. S. Smithers, N. W. Halsey, J. G. White and James M. Edwards, of New York, and M. J. Boissevain, of Amsterdam, Holland. The officers are: Henry J. Pierce, president; G. L. Boissevain, vice-president; W. Paxton Little, secretary, and Edwin Henderson, treasurer.

The company has purchased all the street railroads in the city of Haarlem, consisting of part horse and part electric lines, and will equip the former with electricity. It has also purchased a road running from Haarlem 5½ miles to Zandwort, on the North Sea, the second largest Dutch seaside resort. Franchises have been obtained, through F. Anderheggen, Jr., and L. J. Neümeyer, of Amsterdam, for a double-track road, to run from the center of the city of Amsterdam to Haarlem, a distance of 10 miles. The contract for the construction of this road has been awarded to J. G. White & Co. The speed of the cars will be about 22 miles an hour. The line, which will be known as the "Electrische Spoorweg Maatschappy," will probably be in operation early in 1904.

STREET RAILWAY ACCOUNTING

CONDUCTED BY J. F. CALDERWOOD, ASSISTANT TO THE PRESIDENT, BROOKLYN RAPID TRANSIT COMPANY, AND MEMBER INSTITUTE OF SECRETARIES OF LONDON

THE ACCOUNTING DEPARTMENT

BY J. F. CALDERWOOD

The Accounting Department of the Street Railway Journal was commenced by the writer in the issue of May, 1902, and has, therefore, been conducted for ten months. During this time, from three to six pages have been devoted each month to a discussion of various topics of interest to street railway accountants, and the contributors to the department have included many of the best known street railway accountants in this country. One of the main objects in the establishment of this department was to give prominence to the accounting end of street railway operation and to emphasize the undeniably important function which the modern street railway accountant occupies in the successful conduct of the affairs of a well-organized and operated railway company. In the opinion of the writer, the mission of this department, as outlined above, has been accomplished. Accounting methods are now generally recognized as being as much integral features of street railway operation as are management or construction; and mistakes or errors of judgment in the conduct of the affairs in this department will exercise just as disastrous effects upon the fortunes of a company as if committed in the others mentioned. It seems, therefore, unnecessary, and even to a certain extent unwise, to continue the separation of articles on this subject in these columns, for the same reasons that the separate departments of "Construction" and "Operation," which were formerly conducted in this paper, were omitted.

This in no sense signifies that articles on different subjects connected with street railway accounting will not be welcomed by the editors or by the writer for publication in future issues of this paper. On the contrary it is because the importance of the subject is so great the opinion has been reached by the writer and those with whom he has consulted that these articles should not be confined to the limits of a single department. The writer will continue to act in an advisory capacity to the editors of the Street Railway Journal in the discussion of matters of this kind, and all accountants who have problems to suggest or information to give on methods which have proved of value on their roads are cordially invited to use the columns of this paper for the purpose. These articles will be given the same prominence as those on construction or operation or any other important branch of railway work.

HANDLING THE MONEY FROM THE CONDUCTOR TO THE BANK

In standard steam railway practice the revenue from passengers is handled almost entirely by the ticket agents. So convenient and so perfect is the ticket system that it is seldom found necessary for the conductors to handle cash. In fact a premium is placed upon the purchasing of tickets by the cheaper rates for limited tickets, excursion or round-trip tickets, mileage books, etc.; and there is likewise a small penalty for paying cash to the conductors, which, however, is usually refunded upon the presentation by the passenger to any ticket agent of the conductor's duplex cash receipt. On the elevated roads the revenue is also handled almost entirely by ticket agents.

The principal distinguishing feature of the handling of street surface railway revenue from passenger service is that no way has ever been found to avoid the necessity of conductors receiving the money. In many cities inducements are offered for passengers to purchase tickets, but it is not done to any great extent. On a large street railway system with passenger earnings of $20,000 to $40,000 per day, the revenue is collected by 1500 to 3000 conductors. To call attention to some of the customary methods of handling the money after it leaves the conductor's hands and to indicate the strong points of each is the present purpose.

The two methods in general use of taking the money from the conductors are:

First. Having the conductors turn the money over to receivers at the depots, or, on smaller roads, to the cashier at the company's headquarters.

Second. Having the conductors place their money in a bag and deposit it, properly tagged, in a safe of special construction, at the depots or at the company's headquarters.

Under the first plan the transfer between the conductor and the company's authorized fiscal agent is direct. The money is counted in the presence of the conductor, and any errors or omissions are corrected on the spot. Furthermore, it is the usual custom under this method of having the conductor's day card or trip sheet handed with the money to the receiver, who sees that the money turned in agrees with the face of the day card. The receiver does not, as a rule, attempt to "prove" the day card or the conductor's figures, leaving this work to be done at headquarters. The receiver's function, so far as the conductor is concerned, is to see that the money turned in agrees with the face of the conductor's report of the day's collections, and to be sure that the money is legal tender. The strong point claimed for this plan is the counting of the money in the conductor's presence, and the immediate detection of shortages or counterfeit money. The directness of the plan and the immediate settlement between the conductor and the company's fiscal representative of any errors is to be considered its principal recommendation.

Under this plan it is usually customary for the receivers to recount and verify the total amount of all money received, and at the end of their day's work to put it in shape for transmission with the proper reports. The transmission is made in two ways. Some roads prefer the plan of having each receiver transmit direct to the bank, each receiver being charged or credited with any short or over amounts discovered. Other roads believe it better to have each receiver transmit to the main office, where the money is rehandled and all money sent to the bank at one time, the bank charging or crediting the company with any short or over amounts discovered.

Under the second plan the money in the bag is not usually accompanied by the day card. It is, however, usually accompanied by a blank form, giving the necessary information concerning the run number, the line, the number of trips made, the conductor's name and badge number, and the total collections. There is also usually a more or less definite description of the money as, so many bills of the denomination of $5 and over, so many $2 and $1 bills, and so many coins of each denomination. The bag is tied, sealed and tagged by the conductor and placed by him in a safe (through a protected rolling slot somewhat like a United States mail box), from which it can be removed only by the company's authorized agent. The day card is forwarded by the conductor under separate cover to the accounting department. It is claimed for this method that by throwing upon the conductor the responsibility of counting and describing his returns by the denominations of the bills and coins there is less liability of error on his part. The manner in which the money must be handled and transmitted, it is claimed, makes the conductor exceedingly careful. Where this method is in vogue there are no receivers at the depots. The concentration of the receivers' work at the main office under the supervision of the cashier enables this part of the work to be performed with fewer receivers and at less expense. The strong point claimed for this plan is its economy and the con-

centration of the handling of the money at one central point. It is also claimed that by its operation the conductors are not delayed by standing in line at busy hours waiting their turn to reach the receiver's window. They can "turn in" promptly and go home.

Under this plan, it will be seen, errors and omissions cannot be corrected in the presence of the conductor. He may be ever so sure of his correct remittance, but must in the end take the word of the receiver for the accuracy or inaccuracy of his returns. It is claimed by the advocates of this plan that with proper methods of supervision of the work of the receivers each and every error discovered is immediately called to the attention of the chief of the department, and the count is by him verified and certified to, and with this certification the account is sent to the conductor, who, in the case of a shortage or a counterfeit, must make good. In the operation of this plan the money is handled only once between the conductor and the bank, but there are two transmissions.

The fact that some of the larger roads have changed from the first to the second plan, while others have retraced their steps and changed back from the second to the first plan would appear to indicate that no definite conclusion has been arrived at as to which of the plans is the better. Of course, local conditions in some cases may become the determining factor, but this, like other questions of accounting and finance, is less susceptible to the influence of local conditions than are matters of operation and construction. As a rule, correct theory is more easily applied to questions of accounting and finance than to questions of another character. The primary consideration in all methods of transmitting money through several different hands is the question of safety of transmission. The secondary considerations relate to accuracy of accounting and economy of handling in order of importance named. As a general proposition it will not be disputed that the more hands through which it passes the greater is the opportunity for loss and for error. Each additional transmission and handling increases the risk.

It may be assumed that any company working under either of the plans mentioned will safeguard the actual transmission of the money from one point to another, or from the hands of one person to another, in a manner which, in the judgment of its officers, is thoroughly reliable. At the same time the fact is indisputable that to reduce the number of transmissions and handlings is to reduce the risk. It would appear, therefore, that the correct theory is to make the number of transmissions and handlings as few as possible between the conductor and the bank. Carried to its logical conclusion this would make it appear that the ideal method would be to require the conductors to put up their money in shape for direct transmission to the bank. But such a method being impracticable it appears that one handling and one transmission are necessary. Whether additional handlings and transmissions are desirable seems to be the question open for discussion. The plan of having the receivers at the depots remit direct to the bank requires only one handling and one transmission. If the receivers at the depots remit to the main office and the main office rehandles and remits to the bank, there are two handlings and two transmissions. If there are no receivers at the depots and the conductors remit direct to the main office, and the main office handles the money and remits to the bank, there is one handling and two transmissions.

The method of having receivers at the depots remit to the main office may be left out of consideration, because it makes at least one unnecessary handling. The decision seems to rest between the depot receivers remitting direct to the bank, and the conductors remitting to receivers at the main office, who in turn remit to the bank. Assuming that the additional transmission required by the latter method can be safeguarded beyond question the choice between these two plans would appear to rest primarily upon considerations of accuracy in accounting and economy of operation. Other minor considerations dependent upon local conditions may also have to be taken into account by certain roads. It was not the intention to undertake to render a decision or express a preference as between these plans, but rather to indicate those points in each which are worthy of discussion.

STANDARD FORM OF REPORT

BY H. L. WILSON

The discussion of the income account adopted at the Detroit convention, taken up by Mr. Emerson and continued by Mr. Smith, is one that may be carried on indefinitely and no conclusion would probably be reached that would be thoroughly acceptable to all, but if uniformity of system is to be obtained individual ideas must be waived in favor of what the majority of the accountants think is correct.

If power is sold as a commercial product to outside parties it seems perfectly proper to put the returns into the income account. But there are many companies who have no charter that permits them to go into the power supply business, and yet are so situated in relation to other companies that it is absolutely necessary that they both supply power to and receive power from another. It would hardly be proper to put the amounts received for the use of this power into income account and the amounts paid into operating expenses as no proper comparison (which is the object of the uniform system) could be made with the accounts of another company which supplies only the power it consumes. Again, as Mr. Smith points out, some companies pay a tax on gross earnings, and burdens of this kind are now heavy enough to bear without unnecessarily adding to the load.

This brings up again the old question of where taxes belong in the accounts. Mr. Emerson says in operating expenses, the Interstate Commerce Commission says in charges, the Street Railway Accountants first said operating expenses, and when they found this was not acceptable to the Association of Railroad Commissioners, transferred the account into charges, where the highest authorities seem to agree it belongs.

There are so many methods of levying taxes that many arguments may be brought forward in individual cases to prove that one or the other is the only correct place for it to appear.

If taxes are paid on a basis of a percentage of the earnings, a per car mile or car day basis, operating expenses would seem to be the proper place; if the tax is on real estate or personal property or on the value of the capital stock of the company such a disposition would not be correct, as taxes of this kind would be assessed whether the property was operated or was idle. It would be undesirable to put part of the taxes in one place and part in another, so taking all things into consideration it seems better to call it a fixed charge.

There is still another account or rather three accounts that may be considered together. These are the "interest on deposits" and "income from securities owned," under "miscellaneous income," and "interest on floating debt," under "deductions from income."

The question that might be brought up is whether or not, if there is a charge to the latter account, it would not be proper to take part or the whole if necessary of the credits to the former two to offset or cut down this charge on the ground that it would not have been necessary to borrow money if the securities had not been purchased and that there would not have been any or as large a sum of money on deposit if none had been borrowed.

While a standard system is greatly to be desired in order to facilitate comparisons, it must always be kept in mind that there

are many reasons why no thoroughly satisfactory results are to be obtained from this source alone and that a knowledge of the individual conditions that govern each separate property must be considered.

Frequently directors of one company wish to know why it is that their property is not operated as cheaply as some other from whom they have obtained a carefully prepared analysis of expenses, and it is difficult or impossible for the accounting officer to tell them without a personal knowledge of the local conditions under which both operate, and these same local conditions, I am sorry to say, frequently have a very direct bearing on some accounting methods.

Mr. Smith's suggestion for a final ending of the income account seems to have no advantages over that adopted. On the other hand it would have the disadvantage of making the person examining it go to a little trouble to discover whether the dividends declared had actually been earned during the fiscal year or whether some previous prosperous year or some premium account was called upon to help the invalid out.

STANDARD CAR IN DENVER

The standard type of car employed in Denver for city and suburban service differs materially from that in any other city in the country, but it has proved very popular in that city.

From the views and plans which accompany this article it will be seen that the car is both a combination and semi-convertible car. That is to say, it is divided into two sections like a combination car, but each end is fitted with a very deep sash to secure the convertible feature in either end as desired.

The seating capacity of the car is forty-eight, twenty-four in each end of the car. The seats in the forward end, or that usually run closed, are of the Hale & Kilburn reversible rattan type, and those in the rear end are reversible oak, manufactured by the same company. The forward part of the car has one set of eight Consolidated heaters; the rear end not heated.

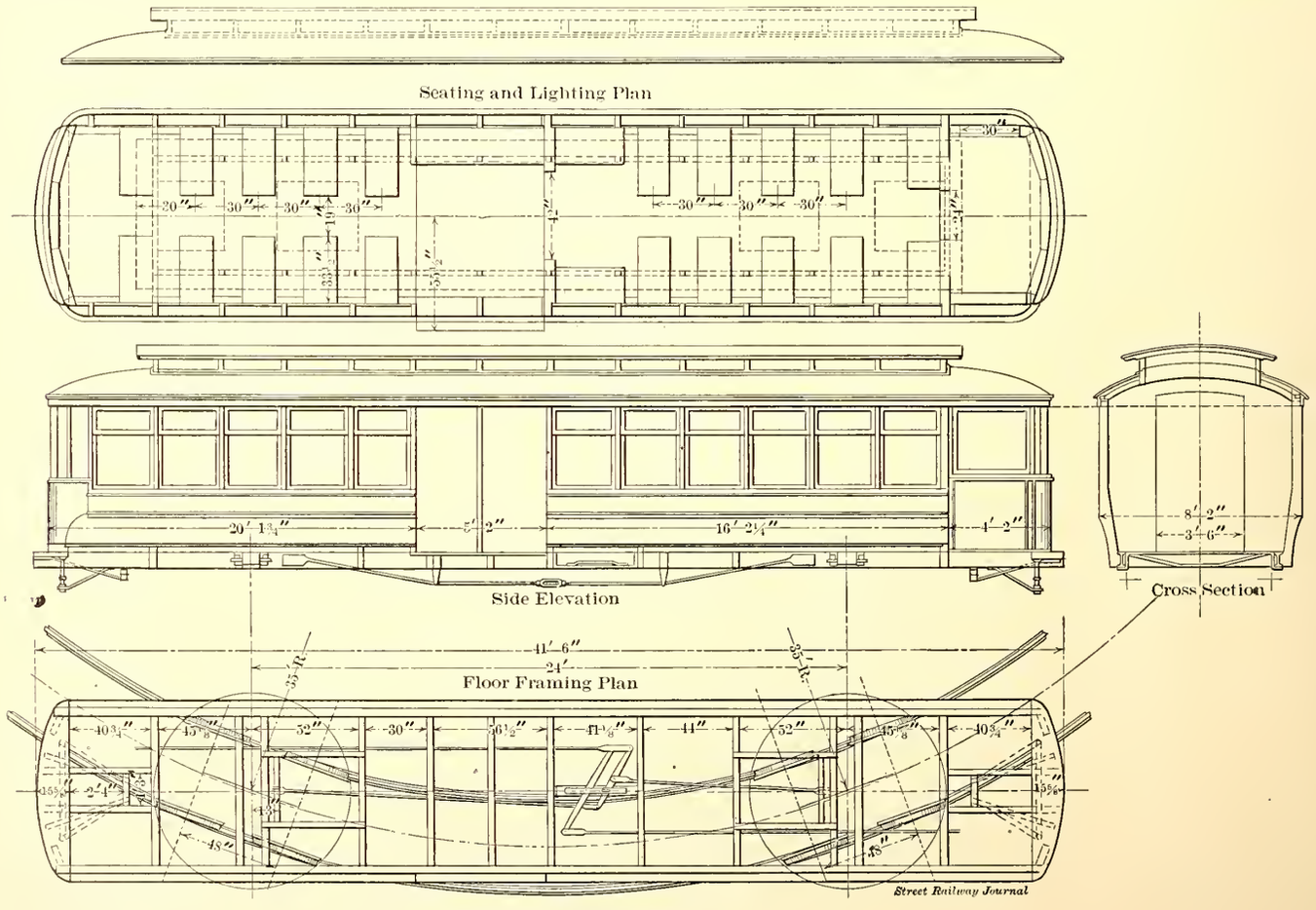
The car has an entrance in the middle of one side, 5 ft. 2 ins. in width. This is one of the features of the car. Mr. Beeler, manager of the Denver Tramway Company, is very enthusiastic over the use of side entrances, as the conductor, it is thought, can keep better control of the passengers by standing in the

INTERIOR OF FORWARD END OF DENVER CAR

middle of the car. The sash rail is only 26 ins. from the floor, and is fitted with sash pockets, so that when the sash are down practically all the advantages of an open car are obtained. The system of sill construction used is illustrated in the section of the sill, which shows that it is made up of a 7-in. I-beam, with a 3¾-in. x 7-in. Oregon pine timber.

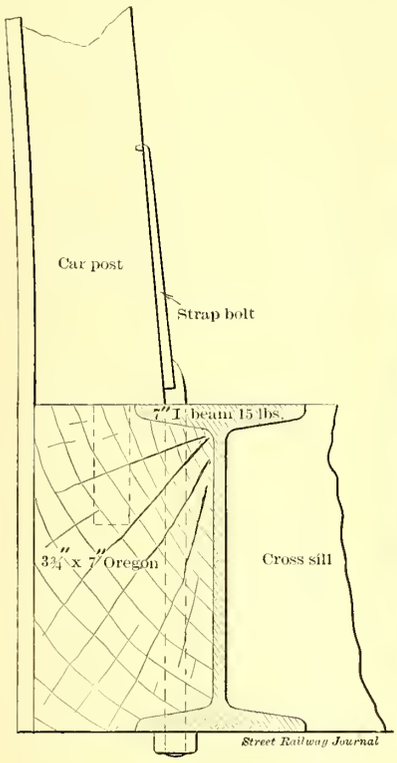
The car is painted the standard Denver Tramway color, which is coach painters' red for the main panel, and a dark straw color for the lower panel and upper framework. The interior of the car is finished throughout in antique oak.

Some of the cars are equipped with four G. E.-58 motors, and

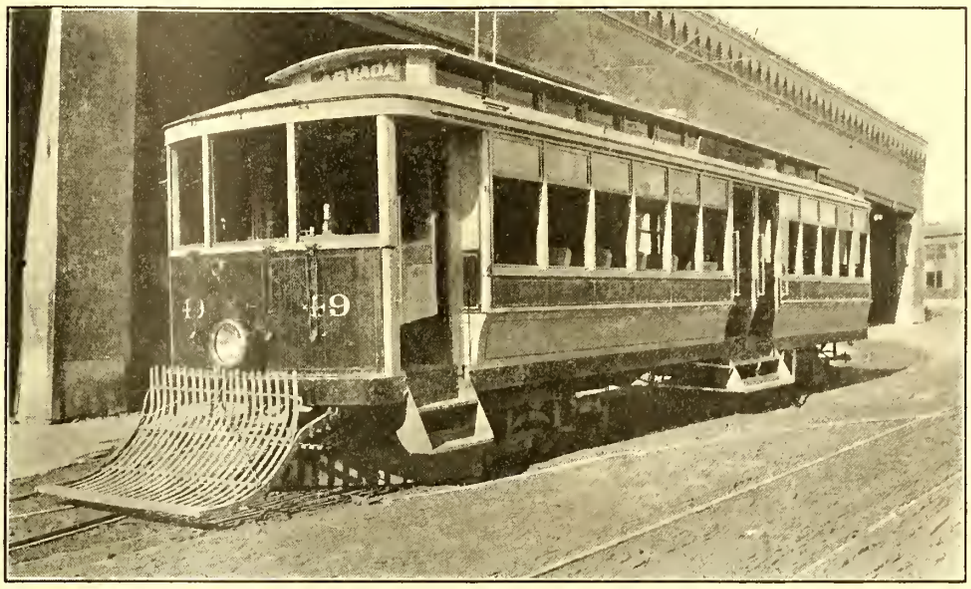


PLAN, SIDE ELEVATION AND SECTION OF DENVER CAR

are geared for 30 miles an hour. Other cars, intended for city service only, are equipped with only two motors of this type, and are geared for 18 miles an hour. K-6 controllers are used.



SECTION OF SIDE SILL



SIDE VIEW OF STANDARD DENVER CAR

The cars were built by the Woeber Carriage Company, of Denver, and are mounted on Brill No. 27-G trucks, with 33-in. plate wheels. The cars are equipped with Christensen air brakes.

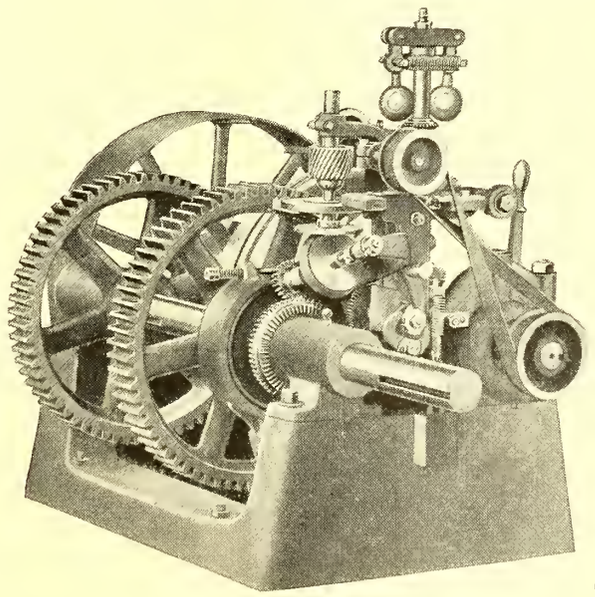
WATER-WHEEL GOVERNOR FOR ELECTRIC PLANTS

The accompanying illustration shows the latest design of a friction water-wheel governor, which is especially designed for the exacting requirements of electric light, railway and power service. This governor has been subjected to severe commercial tests during the last year, including one at the three-phase power plant at the United States arsenal at Rock Island, Ill., which proved highly satisfactory to the officers in charge. The installation, when complete, will consist of twenty 50-in. turbines and four size B governors, and will furnish power, light and heat for all of the arsenal buildings. The total capacity of the station will be 1750 kw. At present fourteen wheels and three governors are in use. The governors are geared to close the gates from full-open in six seconds, and with the severe changes due to the operation of large induction motors the largest temporary fluctuation does not exceed 3 per cent.

The Ottawa & Hull Power & Manufacturing Company, of Hull, Que., has had one of these governors in use for some time on a temporary plant, and is now installing two of them on a large station, which, when complete, will have an output of 10,000 hp. Each governor will control four 51-in. horizontal cylinder gate turbines, operating the full range of the gate in five seconds. Each set of four wheels is connected to 1500-kw generator. Two small vertical-type governors are installed on the exciter units.

The Rochester (N. Y.) Gas & Electric Company has had one of this type in successful operation for some time. It is controlling a 1000-hp horizontal turbine under 90 ft. head, driving street railway generators.

INTERIOR OF REAR END OF DENVER CAR



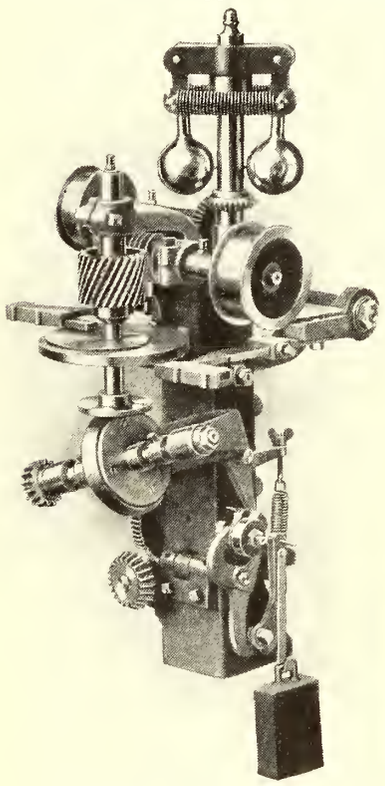
WATER-WHEEL GOVERNOR

This governor is large and powerful. The friction wheels are 24 ins. in diameter and 12 ins. wide, and are made with sufficient surface to transmit, if necessary, 5000-ft. lbs. per second to the turbine gates. The gears are cut from the solid, and are wide-faced and coarse pitch. The shafts are supported

on ample bearings. Ring oiling bearings are supplied for the friction shaft, which is the only one run continuously, and a continuous supply of oil is carried to the hubs and pans, which are loose on the shaft and are so constructed that it is impossible for oil which may work out of the bearing to get onto the friction surface.

Power is supplied from the main shaft of the water-wheel installation, and is delivered to the shaft of the governor by the large pulley. On this shaft is mounted a compressed paper friction. Supported by sleeves on this main shaft are two pans, which, when pressed against the friction, moves the gates of the turbines in either direction through suitable gear connection to an intermediate shaft, shown in the front of the cut. This intermediate shaft is connected in turn to the turbine gate shaft.

The speeder balls of the governor are separately driven from the main shaft of the installation. There is also a cam continuously revolved by means of the belt. As the speed changes the rod of the speeder raises and lowers, carrying with it the tappets arms and tappets, and one of the tappets is engaged by the cam and forced out from its center. This motion is then conveyed through suitable crank shafts to the main shaft, on which is mounted the friction, and as this shaft is forced back and forth the friction is brought to bear on either the opening or closing pan. When the speed is normal this cam revolves between the upper and lower tappets without engaging either.



REGULATING DEVICE

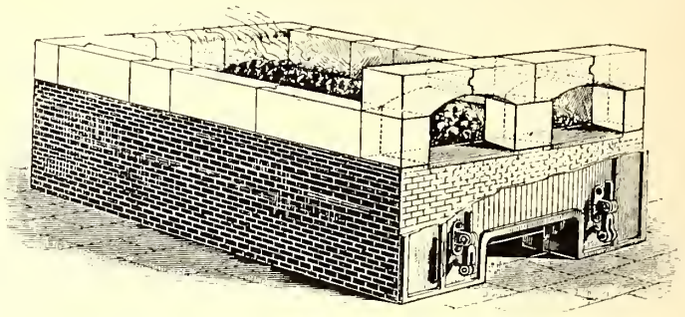
Just below the cam and fastened to the same shaft is a concave disc and a compensating wheel, which travels loosely upon an oblique shaft. This compensating mechanism is the same as that on the vertical model and is intended primarily to prevent racing. The apparatus is manufactured by the Woodward Governor Company, of Rockford, Ill.

STEEL MIXTURE FIREBRICK

In the construction of fire-boxes and furnaces it is of the greatest importance to have strong and durable, as well as refactory material. In an effort to combine these desirable qualities in a high degree, the McLeod & Henry Company, of Troy, N. Y., have put on the market the "steel mixture" block and arches manufactured especially for this purpose.

While iron boiler-door arches melt at a temperature of 2200 degs., it is claimed the "steel mixture" arches will not fuse until a temperature of 4000 degs. is reached.

The fire-box blocks are tongued and grooved, and come in sizes from 12 ins. to 16 ins. high and 6 ins. thick. When in place they make a wall the height of the fire all around the fire-box, and this wall is and remains smooth and solid, whereas, when ordinary small fire brick is used the clay shrinks and leaves space for clinkers. The accompanying engraving gives a good odea of the arrangement and appearance of this brick when used in furnace construction.



BOILER, WITH STEEL MIXTURE BRICK SETTING

NEW LONG CARS FOR NEW ORLEANS

The New Orleans Railways Company has recently been adding to its rolling stock and has secured from the St. Louis Car Company a number of long cars of the type illustrated in the engraving. The main dimensions of these cars are as follows: Length over corner posts, 34 ft.; length over bumpers, 45 ft.; width, 8 ft. As will be seen the cars do not have vestibules.

In spite of the fact that New Orleans is in a warm latitude open cars have never been popular in that city. The principal reason is that heavy showers are apt to come up very suddenly during the summer time, and when such storms do occur an open car is an extremely uncomfortable vehicle to be in. As a result, the semi-convertible car has proved very popular in New Orleans, and the car illustrated is of this type. The sills are of channel steel, of the Robertson pattern, in which the sash drop between the panels. The sash itself is of two sections, both being arranged to drop into the sash pocket, the top of which is within 24 ins. of the floor. The floor itself is double with a layer of felt paper between the floors.

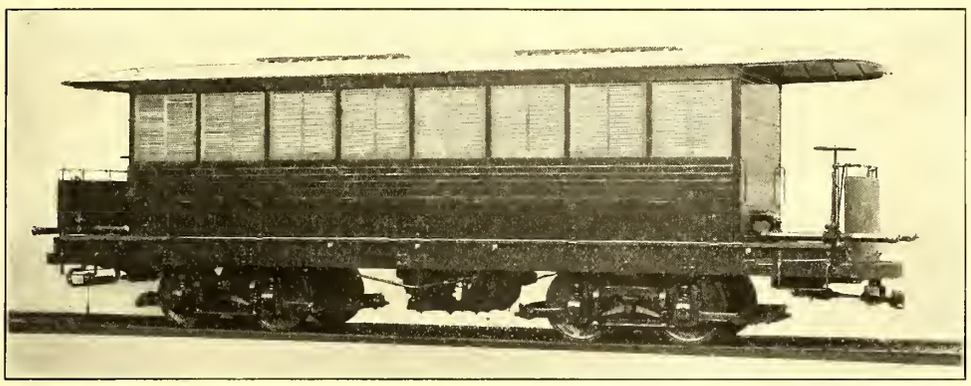
LONG CAR FOR NEW ORLEANS

The interior finish of the cars is in mahogany, and the same material is used in the ceilings. The cars are fitted with double door, St. Louis walk-over seats, Stanwood steps, Pantasote curtains and vertical ratchet-brake wheels. The car is mounted on 23-A trucks, M. C. B. type, and is fitted with Westinghouse air brakes and arc headlights.

The Lake Shore Electric Railway is considering the operation of belt cars running both ways, and making the circuit of Norwalk, Ceylon, Sandusky and Milan. This would not interfere with the schedule of the main line. At present each leg of the triangle is on a distinct division and is operated separately.

SPRINKLING CAR WITH CENTRIFUGAL FILLING PUMP

In getting ready for summer the subject of sprinklers is always important and sometimes a perplexing matter. Interurban lines, and lines which run far into the suburbs, are often left out of consideration entirely when the sprinkling schedule is made up, because of the expense, difficulty, and sometimes impossibility of obtaining a water supply. The need of laying the dust is doubtless generally appreciated so far as more fares is concerned; but the economy of operating over a dustless road, as regards truck and motor wear and non-arcing of current by keeping the wheels and rails in contact, is probably not so often considered. The friction which follows the entrance of dust into even the most carefully guarded motor bearings and axle-boxes heats the revolving parts, and not infrequently results in permanent injury. Arcing of the current, caused by dust and sand on the track, is a waste of power, and may even cause serious injury to generators, motors or even controllers.



SPRINKLING CAR WITH SUCTION PUMP

The sprinkler shown in the illustration is one of several of this type, built by the J. G. Brill Company, of Philadelphia. The novel feature in connection with it is an electrically-operated centrifugal filling pump, located under the car at the center. The purpose of the pump is to fill the tank from a stream or pond through a hose having a foot-valve. This makes the sprinkler independent of hydrants and the heavy tax usually imposed for their use, or saves the expense of elevated tanks and pumping outfits.

The Bergen Turnpike Company, of Hoboken, N. J., has ordered two of these cars, with 4000-gal. tanks, capable of sprinkling 6 miles to 8 miles of roadway, according to speed and character of surface. A 500-volt motor operates the pump, which has a capacity of 400 gals. per minute. The tank can, therefore, be filled in ten minutes. The cars are provided with special spraying devices, conical stop nozzles, having separate leads for washing rails and distributing the water uniformly over 9 ft. to 11 ft. outside the rails. The "Geyser" air compressor, made by the same company, for delivering the water 35 ft. to 45 ft. on either side, is also applicable to a double-truck sprinkling car, and may be mounted on a truck and axle-driven or operated by the motor which serves the centrifugal pump.

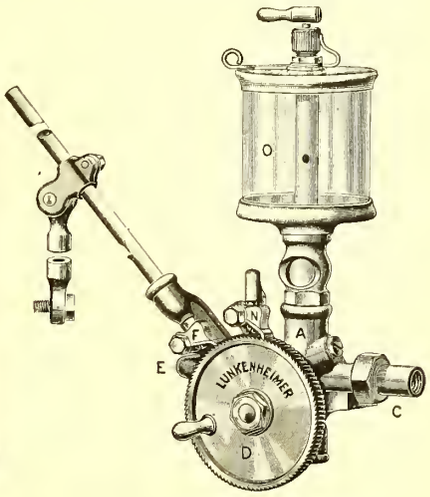
The tank in the Bergen cars is 5 ft. 4 ins. in diameter, and 24 ft. long, and is composed of ¼-in. sheeting, with 5-16-in. ends. Three swash plates are provided. An opening at the top is furnished in order that the tank may be filled in the usual manner. The car measures 24 ft. 7 ins. over the body, and 34 ft. 8 ins. over the bumpers. The width over sills is 7 ft. 6 ins. Doors at the ends are hinged down. As horses are liable to be frightened by unusual-appearing cars, the tank is enclosed and the cab provided with slat blinds.

The cars are mounted on No. 27-G trucks. The weight, without motors, is 32,200 lbs., and the total weight with motors and with tank filled 77,800 lbs.

MECHANICAL OIL CUP

The Lunkenheimer Company, of Cincinnati, has just brought out a mechanical oil cup for cylinder lubrication, which it recommends as more reliable than lubricators hydrostatically operated. When properly constructed the company believes that with mechancial lubricators all of the oil fed to the pump is bound to be forced to the steam chest or cylinder of the engine.

As will be seen the driving mechanism is of the ratchet type, and is operated by two clutches, that work co-operatively by the motion of a rod, which can be attached to the eccentric rod or other moving parts of the engine by couplings. The motion thus obtained is transmitted to the piston E by the crank-pin mechanism.



MECHANICAL OIL PUMP

The ratchet wheel D is provided with a handle whereby it can be rotated by hand in case it is desirable to force a quantity of oil at any time, as, for example, when starting the engine.

By moving the coupling up or down the operating rod, the stroke of the pump can be lengthened or shortened as desired, thus regulating the amount of oil fed by the pump independent of the feed from the oil cup. The joints of the cup are, of course, tight, the sight-feed glass being packed so as to prevent the access of air that would have a tendency to cause the cup to feed after the engine had ceased running. The outlet C is piped to the steam pipe or chest of the engine. The bottom of the pump is tapped ½-in. pipe thread to receive a stand so that it can be placed wherever desired.

A FINE FACTORY MACHINE SHOP

Street railway companies may study modern manufacturing methods with profit, because the car shops of the largest street railway companies approach the larger manufacturing enterprises in point of size and in the nature of the work done.

The new factory of the Brown-Corliss Engine Company, at Corliss, Wis., the machine shop of which has been in operation for some time, is well worth the inspection of those interested in economical shop methods and machine work on a large scale. This machine shop, an interior view of which is shown herewith, is 442 ft. long by 118 ft. wide on the ground. On one side is a gallery, extending about half the total width of the shop. The rest of the shop is left clear from the floor to the roof, and is served by two 35-ton Pauling & Harnishfeger traveling cranes. In the ordinary operation of the shop these two cranes are kept busy most of the time, and this fact illustrates how important a factor the traveling crane is in modern machine-shop practice, and what an immense amount of labor it saves

In one end of the building there is a railroad siding, so that the crane can place heavy machinery on and off the cars. All the heavy machine tools, of which, of course, there are a number of very large ones for the manufacture of the largest sizes

VIEW IN THE BROWN-CORLISS ENGINE WORKS

of Corliss engines, are placed within reach of the traveling crane. The small machine tools are in a machine shop in the gallery. The gallery itself cannot be reached by the traveling crane, but the platform projecting out from the gallery enables machinery to be run from the gallery onto the platform, and there picked up by the crane.

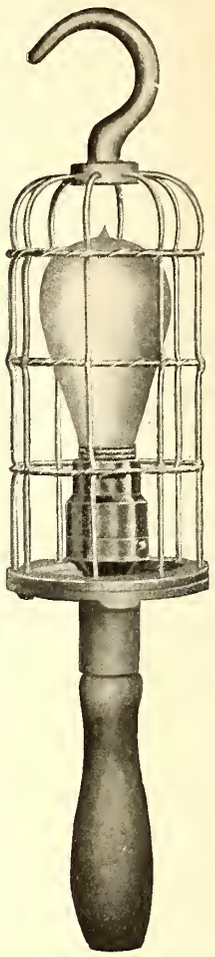
All the machine tools in this shop are driven by electric motors. The four-wire system of the Bullock Electric Manufacturing Company is employed, which gives a wide range of speed for each motor. The small machine tools in the gallery are driven in groups, but the large machine tools have their individual motors, geared directly to the tool.

During a recent visit of a representative of the Street Railway Journal to this shop, one of an order of six 3000-hp cross-compound vertical engines was being set up. One of these units in the first stages of erection can be seen at the left in the foreground of the accompanying engraving. This order was to go to the North Jersey Traction Company. These engines are 32-in. and 64-in. x 54-in. stroke.

The Brown-Corliss Engine Company is building its own foundry on land adjoining this machine shop.

AN IMPROVED PORTABLE LAMP GUARD AND HOLDER

The portable lamp guard and holder, which is illustrated herewith, is made in two sizes, suitable to take either 16-cp or 32-cp lamps. The guard is made very strong and compact, yet not too heavy to be handled conveniently. There are a good many places in and around car houses, pits, store rooms, shops, etc., where a portable light would be very convenient, and for this purpose the portable holder is especially adapted. The hook at the upper end of the guard is made of a size suitable to be attached to almost any form of support, and by this means a man using it can readily find a temporary place for it. This device is particularly recommended for 500-volt work, for the reason that the socket is thoroughly insulated from the guard, thus obviating any trouble from "grounds" on railway circuits.

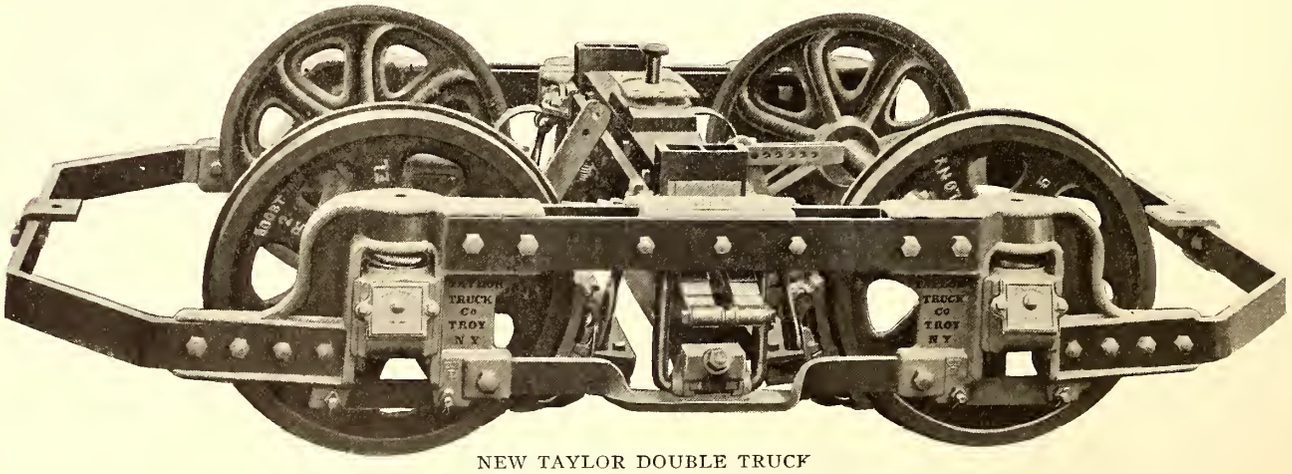


PORTABLE LAMP

The outfit, which is made by Porter & Berg, of Chicago, is furnished complete with the exception of the incandescent lamp, and in addition a soft rubber socket protector is supplied, the latter serving as a protection to the socket when used in exceptionally moist places.

A NEW TRUCK FOR LONG CARS

The accompanying illustration shows a truck of novel design, which has recently been brought out by the Taylor Electric Truck Company, of Troy, N. Y. It has been perfected after a long experience with the necessities of the service for which it is intended, and it is confidently expected to meet the requirements of all work where a small wheel-base truck is required. It is of such dimensions and its parts are so arranged that it can be applied to long cars that are framed narrow on the sills, and yet accommodate itself to curves



NEW TAYLOR DOUBLE TRUCK

having short radii. The truck is built in two sizes, one having 33-in. wheels and a 4-ft. 6-in. base, the other having 30-in. wheels and a 4-ft. 3-in. base.

A novelty of the truck is the swing motion of the bolster frame and the supporting elliptical springs. It is claimed that this is the only short wheel-base truck which combines these desirable properties. The elliptical springs from which the car body is supported rest against a beam, which is hung by the link shown in the engraving. The lower side-bar is twisted in the middle, so as to present a flat surface immediately below the end of this beam, and should the link break the car body could only descend a short distance, and no further injury could be experienced by the truck or car body. The springs which support the car are constructed according to the standard practice of the Master Car Builders' Association.

The brakes, which are placed on the inside of the wheels, are made extra strong, so that they can be operated by air or other automatic systems. They are of the live-and-dead lever type.

Both operating men and car builders will appreciate the advantage of having a short wheel-base truck which is applicable to narrow framed cars, and the manufacturers of the one illustrated think they have solved the problem. The truck is designed especially for long double-truck city cars, but it can be used with safety on high-speed interurban railroads as well.

ANNUAL MEETING OF THE BROOKLYN RAPID TRANSIT COMPANY

At the annual meeting of the stockholders of the Brooklyn Rapid Transit Company, held on Friday, Jan. 30, President J. L. Greatsinger withdrew from the board of directors and his place was filled by E. W. Winter. The election resulted in the following directorate: Directors to serve for one year, John G. Jenkins, Horace C. Duval, R. Somers Hayes and David H. Valentine; directors to serve for two years, Norman B. Ream, E. W. Winter, Henry Siebert and T. S. Williams; directors to serve for three years, Anthony N. Brady, H. H. Porter, E. H. Harriman, W. C. Oatman and Anson R. Flower. This board is the same as last year except for the change mentioned above and the substitution of Norman B. Ream for August Belmont. Mr. Ream is a Chicago financier who has been closely associated with Mr. Belmont, and it is not thought that this indicates the withdrawal of the Belmont interests from the directorate, but that Mr. Belmont's position as president of the Interborough Rapid Transit Company makes his place among the directors of the Brooklyn Rapid Transit Company anomalous. Mr. Winter, who succeeds Mr. Greatsinger on the board, was on Feb. 2 elected president of the company. Since Mr. Greatsinger came to Brooklyn Mr. Winter has been very closely associated with the management, and it was at his suggestion or by his advice that many of the changes which have occurred during the former administration have taken place. It is therefore probable that few other changes in the personnel of the company will be made, as the present organization, which was installed soon after the coming of J. F. Calderwood last summer, was made under Mr. Winter's direction. The new president, like the retiring one, is an old steam railroad man, having been president of the Northern Pacific Railroad, and having held many other important positions. He has long been in close touch with H. H. Porter, the dominant factor in the internal affairs of the Brooklyn Rapid Transit Company, and holds the confidence of the board of directors, which carefully attends to all questions of finance and operation on the road.

THE NEW MANHATTAN SCHEDULE

The new train schedule of the Manhattan Elevated Railway, of New York, as approved by the Railroad Commissioners, went into effect Feb. 2 on the Second, Sixth and Ninth Avenue lines of the company. The new schedule on the Third Avenue line will not go into effect until Feb. 9, because of the non-completion of the Bronx Park station and terminal. By the new schedule the rush-hour trains are not run on any shorter headway, the additional trains being all provided for the non-rush hours, but the longer trains are put in service earlier and continue later, and more cars are run in both rush and non-rush-hours.

Details of the schedule include an increase of trips on the Third Avenue line of eighty-two, with 53,952 additional seats; on the Sixth Avenue line of ninety-eight, with 79,200 additional seats, and on the Ninth Avenue line of ninety-seven, with 33,436 additional seats. No increase of trips is given on the Second Avenue line, but 186 cars are added, giving 8928 additional seats. The total carrying capacity of the various lines will be:

	Trips	Cars	Seats
Second Avenue	538	2,652	127,296
Third Avenue	1,062	5,824	279,552
Sixth Avenue	1,118	6,018	288,864
Ninth Avenue	669	2,945	141,360
Total	3,387	17,439	837,072

On the Second Avenue line fourteen extra six-car trains will be run during the rush hours between 4:37 a. m. and 9:34 a. m., but from that hour until 3 o'clock in the afternoon the number of trains is reduced from the present schedules. The schedule for the rest of the day remains unchanged.

On the Third Avenue line, the South Ferry service from midnight to 5 a. m. is reduced by two three-car trains, but from 5 a. m. to 10 a. m. it is increased by twenty six-car trains. From 10 a. m. to 2:30 p. m. there is a reduction of eighteen trains, but an additional car is placed on each train, so that the car capacity is little lessened. From 2:30 p. m. until 8 p. m. there is an increase of twenty-eight six-car trains. From that hour until midnight there is a decrease of twenty trains.

In the City Hall service on the Third Avenue line the principal changes made between 5 a. m. and midnight are in increasing the headway of trains by putting on nearly seventy-four additional trains.

On the Sixth Avenue lines, the changes are mostly made in the headway of trains between the hours of 5 a. m. and midnight. On the South Ferry and Rector Street service, fifty trains are added, with 1080 cars.

In the Fifty-Eighth Street service there will be an increase in the electric trains of four and an enlargement of all the trains from three to five cars, giving an increase of 344 cars on the day. The steam service to Fifty-Eighth Street will be increased by 220 cars and forty-four trains.

On the Ninth Avenue line there will be an increase of seventy-six trains for the local service, with 592 cars, while in the express service there will be an increase of five trains of five cars each in the morning hours, or an increase of twenty-five cars. There will also be run as specials sixteen five-car trains between 7:02 and 9:50 in the morning.

FIRE AT THE NIAGARA FALLS PLANT

The Niagara Falls Power Company was compelled to shut down temporarily Jan. 29 owing to a fire in the transformer room of its plant at Niagara Falls, N. Y. It is said that the fire was caused by a bolt of lightning which entered the transformer room and set fire to one of the cables upon which the insulation was worn. The flames communicated to the cables in the stone arch over the intake, and in a short time the roof of the arch and the transformer house were ablaze. The cables were destroyed in a short time and it was necessary to shut down power house No. 1. Operations in power house No. 2 were not interfered with in any way. There was no damage to machinery in either power house. In all, about 7000 ft. of cable were destroyed.

As a result of the cutting off of power the many industrial establishments in Niagara Falls, Buffalo, Lockport and North Tonawanda that depend on the plant for power were also compelled to suspend operations. The International Traction Company, which also depends on the plant for power, was compelled to suspend operations almost entirely. At 6:30 p. m. Jan. 30 temporary repairs had been completed.

STRIKE AT WATERBURY ASSUMES SERIOUS ASPECT

The strike of the employees of the local lines of the Connecticut Railway & Lighting Company at Waterbury, Conn., assumed a very serious aspect Jan. 30. The strikers and their sympathizers, who up to that time had been held in restraint to a degree that did not admit of much open violence, concentrated their forces and conducted a series of assaults on cars that resulted in much damage to the company's property. Crowds surrounded the cars run by non-union men in the center of the city, while in the outskirts cars were stoned and open assaults were made on those operating the cars. A torpedo was used at Hopeville in an effort to wreck a car. Every pane of glass in the car was broken and the motorman and conductor were slightly cut by flying glass. There were no passengers on the car. On Jan. 31 the State militia was called on to preserve order.

LONDON LETTER

(From Our Regular Correspondent.)

The London Motor Omnibus Syndicate has had a number of motor omnibuses running between Cricklewood and Oxford Circus for some time, and they seem to be meeting with considerable success. This is a new syndicate for London and not an outcome of any of the large omnibus proprietors who have from time to time experimented with large double deck-motor omnibuses, without, however, incurring any success. This was generally owing to the large, lumbering nature of the omnibuses which they adopted, which made a hideous noise and did not attract passengers. The London Omnibus Syndicate has contented itself with small buses capable only of conveying twelve passengers, somewhat like the type of motor buses which are running on Princes Street, Edinburgh, with the difference, however, that they are covered in the winter time. They present a somewhat neat appearance and are able, in a journey between Cricklwood and Oxford Circus, to pass several of the horse-drawn buses on the route.

Though the new tube of the Great Northern & City Railway is not yet ready for service, an experimental trip recently took place, when a number of persons interested in the line traveled in one of their new trains from the city terminus at Moorgate Street to Drayton Park station, which is as far as the line is at present finished. There is consideration of the question of opening the line from the city to Drayton Park, but no decision has yet been rendered. We have already described the interesting features of London's newest tube, but it might be well to recall here that the tube is considerably larger than any tubes in existence at present, having a diameter of 16 ft. and being capable of accommodating the regular rolling stock of the Great Northern Railway. Last month we illustrated the train of carriages which has been built by the Brush Electrical Engineering Company, which reflected great credit on the builders. This tube has been built by S. Pearson & Son, E. W. Moir, one of the directors of the company, having had special charge of this work. Mr. Moir is the originator of the peculiar construction of this tunnel, the top half of which is iron and the lower half of brick.

The city of Bournemouth has now got its system of tramways in operation, and is therefore the first city in Great Britain to have an underground electric conduit system. The slot of the Bournemouth tramways conduit is at the rail and not midway between the rail, like the system now being installed by the London County Council. This conduit system is installed through the central potions of the city, though on the outskirts of the city the overhead system has been adopted. The cars are, therefore, fitted both with plows to go into the conduit and with trolleys to connect with the overhead system. The plows have been specially designed by Mr. Connett, of J. G. White & Company, who are the contractors for the work, and the operation of changing from the underground to the overhead system is easily accomplished in a fraction of a minute.

The Colchester Town Council has adopted, by a vote of 18 to 9, an electric tramway scheme involving an expenditure of £63,414 and an estimated annual loss of £300.

Important electric tramway developments are expected to ensue from negotiations in progress between the Bolton Tramway Department and those of Manchester, Bury and South Lancashire. The proposals are to the effect that a junction of the Bolton and Bury systems be made at Black Lane, thus adding a link to a prospective connection with Yorkshire, and also to provide for the transport of cotton and bleaching goods between Bolton and Manchester and to secure a parcels service between Bolton and the South Lancashire towns.

The tramways committee of the Brighton Town Council issued its report yesterday respecting the tenders received for the construction of tramroads and laying down wood paving in certain streets, which have been considered in conjunction with the works committee. The committee recommends that the tender of E. Alcott, of Westminster, for the sum of £24,983 19s. 9d., be accepted.

The bill to incorporate the Nottinghamshire & Derbyshire Tramways Company has been duly deposited for next session in the private bill office of the House of Commons. The proposed tramways amount in the aggregate to just over 79 miles of new lines. In connection with these tramways power is sought to acquire numerous strips of land for widenings along the route of the proposed lines. The gage of the proposed tramways is to be 4 ft. 8½ ins. The capital of the company is fixed at £750,000, with the right to raise a further sum of £250,000 by the issue of debenture stock. Provision is made to enable the company to acquire the tramway or light railway authorized by the Mansfield & District Light Railway Order, 1901, and for adapting the tramways of the Corporation of Ilkeston, which are constructed on a gage of 3 ft. 6 ins., so as to enable the company to run over these tramways.

Mr. J. Clifton Robinson, of the London United Electric Tramway, has been elected a director of the Metropolitan District Railway Company.

The negotiations which have been pending since autumn between Mr. William Murphy and the Paisley Tramway Company as to the purchase of the local tramway system preparatory to the introduction of electric cars have now been practically completed, and the definite terms of purchase will be made known in a few days. Plans of the new system, it is understood, will shortly be laid before the Town Council. The eastern terminus is expected to reach the end of the burgh boundary and there effect a junction with the Glasgow Corporation line when continued from Crookston. At the western terminus the extension will be to Johnstone, a distance of 2½ miles.

The service of electric tramcars between Manchester and Middleton, provided the Manchester Corporation, was recently inaugurated. The through fare is fixed at 3½d., making 7d. for the double journey. The lines in Middleton are owned by the Middleton Corporation and are leased to Manchester for a period of twenty-one years, and the current in the Middleton area is supplied by the corporation of that town, who charge the same price per unit as is charged to the department by the electricity committee of the Manchester Corporation.

Mr. Arthur Jacoby recently resigned his position with the Johnson-Lundell Electric Traction Company and has been appointed general manager of the British Schuckert Electric Company, whose offices are at Clun House, Surrey Street, Strand. Mr. Jacoby has had a large experience in heavy electrical engineering and is a valuable acquisition to the Schuckert Company. He is now engaged in thoroughly reorganizing the company.

The Manchester Corporation tramways committee has decided to reduce the hours of the men in their employ from sixty to fifty-four per week and has sanctioned increases of wages amounting, it was officially stated, to £60,000 a year. The changes come into effect on April 1.

A meeting of representative men from various parts of Lancashire, convened by Mr. Alderman Petrie as chairman of the special committee of the Liverpool Corporation tramways committee appointed to consider the question of the carriage of merchandise on the electric tramway systems of Lancashire, was recently held in the town hall, Liverpool. It was unanimously resolved "That this meeting of gentlemen connected with various towns of South Lancashire and the County Council of Lancashire approves of the principle of the scheme for the transport of merchandise from the Liverpool docks to the towns of South Lancashire by means of the Liverpool Corporation and other tramways, and recommends that a committee be appointed to consider the details of the scheme and with authority to take such action in the matter as they in their opinion may think desirable in the interests of the scheme." The committee appointed subsequently met, when Mr. Alderman Petrie was appointed chairman, Mr. Alderman F. Smith vice-chairman, Mr. Pierce (deputy town clerk of Liverpool) honorable secretary, and Mr. Bellamy (manager of the Liverpool tramways) honorable treasurer.

The Hamilton, Motherwell & Wishaw Tramway Company, who are constructing a line between Blantyre and Wishaw, passing through the burghs of Hamilton and Motherwell, are now promoting a larger scheme, of which the original Blantyre-Wishaw line will form a very small part, which will not only unite the various communities on both sides of the Clyde, but will also meet the Glasgow system at Cambuslang. If powers for these schemes are granted, the result will be that in the near future one will be able to travel from Glasgow by tramway, not merely to Cambuslang, but also to Hamilton, Motherwell, Wishaw and the other important Lanarkshire business centers.

The eighth annual convention of the Incorporated Municipal Electrical Association will be held at Sunderland on July 15-18, 1903. Members or associates willing to read a paper must send in their names to the secretary before Jan. 31, 1903, together with the title of the paper, for the consideration of the council. Prizes of the value of 5 guineas, 3 guineas and 1 guinea are offered by the council of the Incorporated Municipal Electrical Association for the best papers presented by associates on some approved subject connected with municipal electrical engineering.

The Huddersfield Corporation tramway committee has ordered ten covers for the electric cars. They will be of wood and after the style of the old steam car tops, but removable.

The report of the tramways committee of the Leicester Corporation shows that the tenders for the first section of the electric tramways have been accepted, as follows: Erection and mainte-

nance for a limited period of overhead trolley wires, etc., R. W. Blackwell & Company, Ltd., of London, £23,194 12s. 2d.; bolts, nuts and bars, R. W. Blackwell & Company, £1,921 5s.; stoneware pipes and conduits, T. Wragg & Company, Swadlincote, £3,368 14s. 4d. (less 2½ per cent discount); feeder cables, telephone and test wires, etc. (with twelve months' maintenance), W. T. Glover & Company, Ltd., Manchester, £7,382 14s. 2d.; engines, generators, condensing plant, motors, switchboards, etc. (with one year's maintenance), Dick, Kerr & Company, Ltd., London and Preston, £28,417; Lancashire boilers, economizers, etc., Yates & Thom, Blackburn, £9,609. A. C. S.

BRITISH TRAMWAYS STATISTICS

For the first time we have a complete analysis of the accounts of electric tramway undertakings which enables comparison on a common basis to be made of the working of the principal systems throughout the United Kingdom, the *Electrical Times*, which has hitherto published frequently consulted tables dealing with electric supply undertakings, having issued corresponding figures for traction schemes. Glasgow occupies a very satisfactory position among local authorities owning electric tramways. It is true that the length of the track is greater than in any other town; the nearest approach being Liverpool, with 93 miles of single track, as compared with 103 miles, and further that the volume of traffic is greater than in any other city.

According to the *Electrical Times*, of London, the rides per capita per annum in different British cities is as follows: Glasgow, 155; Liverpool, 148; Halifax, 126; Blackpool, 123; Sunderland, 93; Hull, 87; Bolton, 72; Southport, 69; Aberdeen, 59; Dundee, 48. The gross receipts per passenger are as follows: East Ham, 0.69d.; Glasgow, 0.90d.; Dundee, at 0.95d. for the electric lines and 0.86d. for the steam lines; Aberdeen, 0.98d.; Sunderland, 0.99d.; Hull and Halifax, a penny; Liverpool, 1.11d.; Southport, 1.13d.; Bolton, 1.17d., and Blackpool, 1.11d. The cost of producing power per kw-hour is: Glasgow, 0.60d.; Dublin, 0.63d.; Hull, 0.99d.; Liverpool, 1.43d.; Dundee, 1.50d.; Bolton, 1.64d.; Southport, 1.67d.; Sunderland, 2.04d.; Halifax, 2.12d.; East Ham, 2.25d.; Blackpool, 2.37d., and Aberdeen, 2.52d.

ANNUAL MEETING OF J. G. WHITE & COMPANY

The third annual meeting of J. G. White & Company, Ltd., of College Hill, London, was held Dec. 29. The secretary of the company, A. H. Beatty, stated that the business of the company continues to be very satisfactory. The profit and loss account for the year, including £3,649 carried forward from the previous year, amounted to £29,480. Dividends to August 31, 1902, at the rate of 8 per cent per annum on the preference and ordinary shares, were declared; £10,000 were placed to the reserve fund, and £11,469 were carried forward to next year's account. J. G. White and W. C. Burton, the retiring directors, were re-elected.

RAILWAY EMPLOYEES DANCE AT BUFFALO

The International Railway Employees' Association, of Buffalo, gave its second annual ball on the evening of Jan. 8. The function was held in Convention Hall, and was one of the pleasantest events of Buffalo's midwinter season, the spacious auditorium being elaborately decorated with flags, bunting and holly, beautifully lighted with hundreds of electric lamps, arranged artistically in clusters, and other designs, and hidden behind the decorations was the music, furnished by the Sixty-Fifth Regiment Band, leaving nothing to be desired. Many of the officers of the company attended the ball and added greatly to the enjoyment of the evening by the evident pleasure which they took in witnessing the success of the entertainment. Among those in the boxes were the Hon. Caryl Ely, president of the International Traction Company, T. E. Mitten, general manager, and many of their friends, while it was estimated that at least 6000 were present on the floor. An elaborate collation was served during the intermission. The association contains members from every grade of employee of the Buffalo lines, as well as the Niagara Falls, Tonawanda and Lockport routes, from the president down to the trackmen. The objects, as set forth in its constitution, are to collect and disseminate knowledge of the construction and maintenance of street railways and street railway equipment, to promote good fellowship and to aid its members and their families in case of injury, sickness or death. In April, 1901, a handsome suite of rooms was opened for the use of the members, which included card, billiard, reading and reception rooms, together with a large and fully equipped gymnasium. These accommodations were described in these columns soon after the opening. Since that time many additions have been made to the facilities in all the departments, and the membership of the association has been more than doubled.

NATIONAL CONVENTION ON MUNICIPAL OWNERSHIP AND PUBLIC FRANCHISES

This convention, of which a preliminary notice was published in the STREET RAILWAY JOURNAL for January 17, will be held under the auspices of the New York Reform Club, committee on city affairs, in the rooms of the Reform Club, 233 Fifth Avenue, New York, on Wednesday, Thursday and Friday, Feb. 25, 26 and 27, 1903. The meetings of the convention will be open to the public.

A series of very interesting papers are announced from authorities on this subject. The programme in detail follows:

Wednesday, Feb. 25.—Morning Session, 10 a. m.—Address of welcome by Mayor Low, of New York, and John G. Agar, chairman.

"Recent History of Municipal Ownership in the United States." Brief contributions by William Wirt Howe, former president American Bar Association, New Orleans, La.; Clinton Rogers Woodruff, of Philadelphia, secretary of the National Municipal League; L. N. Case, manager of water and light plants, Duluth; members of the staff of the New York School of Commerce and by others.

"Recent British Experience of Municipal Ownership," by Robert Donald, editor of the Municipal Journal, London.

"Recent German Experience of Municipal Ownership." Ed. T. Heyn, of Berlin.

"Comparison of European and American Methods and Results." Hon. Robert P. Porter, director of the Eleventh Census of the United States.

Discussion.

Afternoon Session, 2:30 p. m.—*Transportation.*—Paper by Chas. T. Yerkes, of London and New York.

Address by Mayor Harrison, of Chicago.

Discussion.

"City Owning and Leasing of Transportation Lines," by Edward M. Shepard, counsel to the Rapid Transit Commission, New York.

"Massachusetts' Experience," by Louis D. Brandeis, of Boston.

Discussion.

Thursday, Feb. 26.—Morning Session, 10 a. m.—*Gas and Electric Lighting.*—"Electric Lighting," by Lieutenant J. B. Cahoon, secretary and ex-president of the National Electric Light Association.

Discussion.

"Gas Lighting," by Walton Clark, general superintendent Gas Improvement Company, Philadelphia, Pa., and past president American Gas Lighting Association, and Alton D. Adams, engineer, Boston, Mass.

Discussion to be opened by Professor Ed. W. Bemis, water commissioner, Cleveland, Ohio.

Afternoon Session.—*Water and Telephones.*—"European Experience of Public Ownership of Telephones," by Mr. Bennett, engineer for Glasgow and other British municipal telephone systems.

"Argument for Public Ownership of Telephones," by Professor Parsons, of the Boston Law School.

"The Superiority of Corporation Ownership of Telephones," by U. N. Bethell, general superintendent New York Telephone Company.

"City Ownership of Water Supply," by William R. Hill, president of the American Water Works Association.

Discussion.

Friday, Feb. 27.—Morning Session, 10 a. m.—"How Should Public Service Corporations Be Controlled?" by R. K. Bowker, formerly of the Edison Electric Illuminating Company, New York.

"Regulation and Taxation of Public Service Corporations," by Allen Ripley Foote, editor of Public Policy.

Discussion to be opened by Professor John R. Commons, secretary taxation committee National Civic Federation.

Afternoon Session.—"Labor Clauses in Franchise Grants and the Labor View of Municipal Ownership," by ex-Mayor Chase, of Haverhill, Mass.

Discussion.

"Taxation of Franchise Values," by Frederick Howe, of Cleveland.

Discussion to be opened by Wheeler H. Peckham, president of City Club, New York.

CHICAGO TRACTION MATTERS

It is becoming generally understood in Chicago now that the matter of granting a franchise to the Chicago City Railway Company will be taken up soon without waiting for the action of the Union Traction Company's protective committee. The Chicago City Railway is willing to accept a twenty-year franchise; the Union Traction Company desires a longer grant. There is a serious question whether the city will grant this latter.

A protective committee has been selected by the stockholders of the Chicago City Railway Company to represent their interests. Part of the stock of this company being held by persons not posted on the situation, there was some fear that these stockholders would sell out because of the rumors that Union Traction interests were securing control of the company for purposes of consolidation, hence the committee was formed to secure concerted action and confidence on the part of as many stockholders as possible. This committee is as follows:

James B. Forgan, president First National Bank.
Ernest A. Hamill, president Corn Exchange Bank.
Byron L. Smith, president Northern Trust Company.
Nelson Morris, president Nelson Morris & Company.
Levi Z. Leiter.

As indicating the popular sentiment, the suggestions formulated for the settlement of the franchise question by the Chicago Record-Herald are herewith given, since they are claimed to represent, as near as anything can, the average views of the citizens of Chicago as to what the franchise renewal ordinances should be.

The Record-Herald is of opinion that the traction question should be settled on lines substantially as follows:

First—When the council has formulated a measure acceptable to it, a pause should ensue and an opportunity given voters to demand a referendum.

Second—Such an ordinance should provide for municipal ownership and operation (or municipal ownership with operation by a lessee) if desired by the voters of Chicago, after a fixed period, probably not more than ten years.

Third—The franchise should be for a period not exceeding twenty years, and should provide that at the expiration of that time.

(a) The plant should be taken over by the municipality on the payment of the arbitrated value of the tangible property as a going concern, or

(b) A new franchise should be granted to the existing company or to another company with which more desirable terms could be made, the new company to pay for the plant at the same arbitrated value, or

(c) In default of the acceptance by the municipality of either alternatives, a or b, the company should be permitted to continue as tenant at will until the city availed itself of one of these options.

Fourth—The ordinance should require a compensation to the city of a percentage of gross receipts, such compensation to be in lieu of all license and franchise taxes, but not of real estate (aside from right of way) or personal taxes as paid by private citizens.

Fifth—The traction companies should be required to waive all alleged rights under the ninety-nine-year act, and all franchises should be made to expire at one time. In fixing the rate of fare and compensation to the city due weight should be given the equities of the companies in their unexpired franchises, the present tangible property and even to their alleged rights under the ninety-nine-year act, but the enormous overcapitalization of the Union Traction Company and its underlying companies should be entirely disregarded.

Sixth—Above all, the franchise should provide for the very best attainable service from the beginning to the end of its term, and this should include unification of the various lines, at least so far as service is concerned, a complete system of subways (possibly owned by another or subsidiary company) in the congested district and the use of the underground trolley in the densely populated section of the city.

Seventh—The council should ask for whatever enabling legislation is necessary to carry out this general programme, and no more.

THE STANLEY GENERAL ELECTRIC DEAL

As this paper is going to press the best evidence tends to show that the proposed sale of the Stanley Electric Manufacturing Company to the General Electric Company, which was currently reported last week as having been fully accomplished, is not yet completed. It is admitted that negotiations for a change of ownership of control of the Stanley Company are pending, but that any change of this kind has yet been effected is denied. It is also reported that the plan to increase the capital stock of the company to $10,000,000 has not been abandoned, and that the permanency and enlargement of the works at Pittsfield is one of the details agreed upon in any event.

ANNUAL REPORT OF THE DETROIT UNITED RAILWAY

The annual meeting of the Detroit United Railway was held Jan. 21. No change was made in the officers of the company, and the directors are the same as last year. H. A. Everett retains the chairmanship of the board. The officers re-elected are as follows: H. A. Everett, of Cleveland, chairman of the board; J. C. Hutchins, of Detroit, president and general manager; Arthur Pack, of Detroit, vice-president; George H. Russel, of Detroit, treasurer; Edwin Henderson, of New York, secretary; A. E. Peters, of Detroit, assistant secretary; H. A. Everett, of Cleveland; E. W. Moore, of Cleveland; H. R. Newcomb, of Cleveland; R. A. Harman, of Cleveland; J. C. Hutchins, of Detroit; George H. Russel, of Detroit; Arthur Pack, of Detroit; R. B. Van Cortlandt, of New York, and H. S. Holt, of Montreal, directors. The only new name in the list of directors at the annual meeting is that of H. S. Holt, of Montreal. Mr. Holt was elected some months ago to replace J. G. Schmidlapp, of Cincinnati.

The report of the treasurer shows that on Jan. 1, 1902, the number of miles of street railway operated was as follows: Detroit United Railway, 379.46; Rapid Railway, 109.57; Sandwich, Windsor & Amherstburg Railway, 11.89; total, 500.92. There has since been added: Detroit United Railway, 1.84; Rapid Railway, 11.14, making the total number of miles in operation, including side and yards tracks, Dec. 31, 1902, 513.902. The passenger statistics show:

	D. U. Ry.	R. R. Sys.	S., W. & A. Ry.	Total
Revenue passengers...	71,891137	3,495,828	1,463,824	76,850,789
Transfer passengers...	20,133,999	185,114	128,228	20,447,341
Employee passengers.	1,010,681	49,153	20,463	1,080,297
Total passengers....	93,035,817	3,730,095	1,612,515	98,378,427
Receipts per rev. pass..	.0469	.1019	.0448	.0494
Receipts per pass.....	.0363	.0955	.0406	.0386
Car mileage.....	18,016,870	1,889,517	437,211	20,343,598
Earnings per car mile..	19.28	22.34	15.14	19.47
Expenses per car mile.	10.92	13.43	9.20	11.11
Net earn's per car mile.	8.36	9.91	5.94	8.36

The following is a summary of the business for the year ending Dec. 31, 1902:

DETROIT UNITED RAILWAY

Gross earnings.		$3,473,140
Operating expenses, including taxes		1,967,532
Net earnings from operation		$1,505,608
Income from other sources		28,614
Gross income from all sources		1,534,222
Deductions—		
Interest on funded and floating debt	$815,004	
Dividends.	500,000	$1,315,004
Surplus income.		$219,218

RAPID RAILWAY

Gross earnings.		$422.070
Operating expenses, including taxes		253,003
Net earnings from operation		$169,067
Income from other sources		3,850
Gross income from all sources		$172,917
Deductions—		
Interest on funded and floating debt	$127,319	
Dividend to Detroit United Railway	2,750	130,069
Surplus income.		$42,848

SANDWICH, WINDSOR & AMHERSTBURG RAILWAY

Gross earnings.	$66,192
Operating expenses, including taxes	40,250
Net earnings from operation	$25,942
Income from other sources	9,409
Gross income from all sources	$35,351

Deductions—		
Interest on funded debt	$6,580	
Dividend to Detroit United Railway	7,875	14,455
Surplus income		$20,896

DETROIT UNITED RAILWAY, RAPID RAILWAY SYSTEM AND SANDWICH, WINDSOR & AMHERSTBURG RAILWAY

Gross earnings		$3,961,403
Operating expenses, including taxes		2,260,786
Net earnings from operation		$1,700,617
Income from other sources		31,247
Gross income from all sources		$1,731,864
Deductions—		
Interest on funded and floating debt	$948,902	
Dividends	500,000	
		$1,448,902
Surplus income		$282,962

The Detroit United Railway earned in 1901, after providing for expenses, fixed charges and dividends, a net surplus of $170,129.

Following is a balance sheet of the Detroit United Railway of date of Dec. 31, 1902:

Capital stock		$12,500,000
Mortgage bonds		17,380,000
Current liabilities		1,565,455
Accident fund		969
Insurance fund		93
Unredeemed tickets		29,688
Surplus		444,895
Investment	$28,920,433	
Current assets	2,499,367	
Suspense account	19,160	
Discount on bonds	176,693	
Prepaid taxes, insurance, etc	72,500	
Stores	4,586	
Cash	228,361	
	$31,921,100	$31,921,100

Balance sheet of the Rapid Railway System:

Capital stock		$2,000,000
Mortgage bonds		2,465,000
Detroit United Railway		138,911
Current liabilities		15,625
Surplus		37,988
Investment	$4,618,794	
Current assets	1,309	
Stores	25,612	
Prepaid taxes, insurance, etc	7,338	
Accident fund	4,471	
	$4,657,524	$4,657,524

Balance sheet of the Sandwich, Windsor & Amherstburg Railway:

Capital stock		$297,000
Mortgage bonds		140,000
Accident fund		729
Detroit United Railway		149,271
Accrued interest		1,097
Unredeemed tickets		53
Surplus		33,518
Investment	$615,461	
Accounts receivable	1,225	
Stores	3,325	
Prepaid taxes and insurance	647	
Cash	1,010	
	$621,668	$621,668

ANNUAL REPORT OF THE TORONTO RAILWAY

The annual meeting of the Toronto Railway Company, of Toronto, Ont., was held Jan. 21. The annual report was presented, together with the financial statement for the year ended Dec. 31, 1902. The gross earnings amounted to $1,834,908, as compared with $1,661,017 for the previous year, being an increase of $173,891 during the year. The net revenue of $506,443 is accounted for mainly by the higher prices paid for material used in maintenance and repairs, by the abnormally high price of coal and a very large increase in wages of employees in the several departments. The company has declared out of the net profits four quarterly dividends of 1¼ per cent, aggregating $302,439, leaving, after deducting pavement charges paid to the city, the sum of $133,729. The total expenditure on capital account during the year amounted to $191,656, which has been devoted to the purchase of motor equipments and the construction of additional mileage of track, overhead system, new rolling stock and buildings to accommodate the increased business.

The directors consider it advisable to set aside a portion of the accumulated earnings for the purpose of providing against heavy or special renewals, and have adopted the policy of establishing an account for such contingencies by transferring $75,000 from the surplus to the credit of a contingent account. On Oct. 6, 1902, they sanctioned an increase in the capital stock of the company by $1,000,000 and authorized the issue of the additional shares. An allotment of 6000 new shares out of the amount authorized has been subscribed in full. The company paid to the city during the year, under the terms of the franchise, the sum of $255,551, as compared with $226,453 last year, and also paid the provincial tax levied under the revenue act.

A comparative statement of the gross earnings, operating expenses, net earnings, passengers carried, transfers and percentage of operating expenses to earnings for 1902, 1901, 1900 and 1899 follows:

	1902	1901	1900	1899
Gross earnings	$1,834,908	$1,661,017	$1,501,001	$1,333,542
Operating expenses	1,015,361	857,612	775,981	650,324
Net earnings	819,547	803,405	725,020	683,278
Passengers carried	44,437,678	39,848,087	36,061,867	31,826,940
Transfers	15,974,220	13,750,038	12,570,704	10,538,279
Percentage of operating expenses to earnings	55.3	51.6	51.0	48.8

The general balance sheet shows:

ASSETS.			
Road and equipment, real estate and buildings, including pavements and suburban lines			$10,835,767
Stores in hand			108,555
Accounts receivable			362,304
Cash in bank		$97,153	
Cash in hand		22,167	
			119,320
			$11,425,946
LIABILITIES.			
Capital authorized		$7,000,000	
Capital allotted		6,600,000	
Capital issued			$6,268,414
Bonds—Tor. Ry. Co., 4½% sterling		$2,030,373	
Tor. Ry. Co., 4½% currency		843,000	
Tor. Ry. Co., 6 % debentures		600,000	
Tor. & Mim. Elec. Ry. & Lt. Co.		100,000	
Tor. & Scar. Ry., L. & P. Co.		40,000	
		$3,613,373	
Less bonds not sold and in hands for future requirements of the company		$140,000	
			3,473,373
Mortgages			70,000
Accrued interest on bonds			61,577
Accounts and wages payable			113,710
Unredeemed tickets			12,925
Dividend No. 26, payable Jan. 2, 1903			77,439
Contingent account			75,000
Profit and loss as at Dec. 31, 1901		$1,255,514	
Less payment of pavement charges to city withheld during yrs. of litigation	$37,236		
Less directors' fees for 1901	3,500		
		40,736	
		$1,214,777	
Balance Dec. 31, 1902		58,729	
			1,273,507
			$11,425,946

The old board of directors and officers were re-elected, as follows: William Mackenzie, president; James Ross, vice-president; E. H. Keating, manager; J. C. Grace, secretary-treasurer; Hon. George E. Cox, Frederic Nicholls, W. D. Matthews, H. M. Pellatt and James Gunn, directors.

LAKE STREET ELEVATED EARNINGS AND FINANCIAL CONDITION

The Lake Street Elevated Railroad, of Chicago, makes the following financial statement for the year ending Dec. 31, 1902:

PROFIT AND LOSS ACCOUNT FOR YEAR ENDING DEC. 31, 1902

Cost of operation		$430,292
Taxes (reserved)		24,235
Interest on floating debt and car trust notes		64,794
Interest on first mortgage bonds outstanding (including interest accruing Jan. 1, 1903)		236,727
Rental of leased roads		84,385
Mileage tax (reserved)		1,767
Passenger earnings	$796,621	
Miscellaneous income: Advertising and news privileges, etc	18,663	
Deficit	26,916	
	$842,200	$842,200

COMPARATIVE STATEMENT OF TOTAL EARNINGS, OPERATING EXPENSES AND NET EARNINGS FOR THE YEARS 1902 AND 1901

	1902	1901
Total earnings	$815,284	$786,462
Operating expenses	430,292	388,799
Net earnings	$384,992	$397,663

Percentage of operating expenses to total earnings, 52.78 per cent in 1902, as against 49.43 per cent in 1901.

Total passengers carried, 15,849,411 in 1902, as against 15,394,038 in 1901.

The daily average for 1902 was 43,423, while the daily average for 1901 was 42,175.

As seen, the statement shows a deficit of $26,915.

President Knight, at the annual stockholders' meeting, made the following statement, which led up to the appointment of a committee on reorganization. There was some talk of a receivership for the road, but this has been postponed, pending action of this committee.

Prior to recommending the appointment of a committee President Knight had the following to say:

"Another stage has now been reached in the history of the company as to what should be done with reference to adjusting its present affairs. At the present time there are outstanding bonds amounting to $4,627,000. In addition, there is a floating debt, consisting of notes payable amounting to $1,321,000. In addition to these amounts we have car trust notes out for the balance due on the purchase of twenty trailers and eight motor cars, amounting to $116,000, $14,000 having been paid.

"There are other liabilities that must be provided for to the amount of $607,192.27. The account would therefore stand about as follows:

Notes payable	$1,321,000
Car trust notes	116,000
Amount noted above	607,192
	$2,044,192
Brought forward	2,044,192
For first mortgage bonds outstanding	4,627,000
Total	$6,671,192

"In addition to the above there is of other accounts matters that must be paid, about $40,000, making a total of $6,711,192.

"It is safe to say that in order to meet the necessities of the company in clearing up its floating liabilities and its bonded debt, and to complete during the coming year the necessary repairs to the structure, stations and rolling stock, there should be raised, in round numbers, $7,000,000. In this computation we have not taken into acocunt the income bonds outstanding to the amount of $1,026,050.

"By an examination of the balance sheet we find that we have paid out in labor items alone during the year $21,590 more than we paid in 1901. On July 1 we increased the wages of the conductors from 17½ to 19½ cents an hour. This accounts for some of the increase in the labor account. The cost of electric current during 1902 over that of 1901 was $33,943, which more than offsets our deficit of $26,915.

"During the year we operated 4,346,505 car miles, as against 4,078,880 in 1901. This is owing to the fact that we had in operation more trains.

"Our gross receipts for the year were $815,284, as against $786,462 in 1901."

The committee appointed to consider plans for reorganization was as follows: H. N. Higinbotham, H. A. Haugan, president State Bank, of Chicago; Thomas Templeton, Cory E. Robinson, of Joliet. A committee of this character has been under consideration for some months.

NORTHWESTERN ELEVATED ANNUAL REPORT

The Northwestern Elevated Railroad Company, of Chicago, which held its annual meeting last week, makes the following showing for the year ending Dec. 31, 1902:

INCOME ACCOUNT OF THE YEAR ENDING DEC. 31, 1902

Passenger earnings		$1,167,529
Other earnings (including loop net earnings)		243,470
Total earnings		$1,410,999
OPERATING EXPENSES		
Maintenance of way and structure	*$58,068	
Maintenance of equipment	51,261	
Conducting transportation	306,143	
General expenses	48,934	464,401
Net earnings		$946,598
CHARGES		
Loop account (½ cent per pass. carried)	$116,774	
Taxes	86,309	
Interest on bonds	554,091	757,174
Surplus for year		$189,424

* Includes $36,000 which has been set aside in monthly instalments, incash, for betterments and maintenance of structure.

GENERAL BALANCE SHEET—DEC. 31, 1902

ASSETS	
Cost of road and equipment	$24,789,321
Bonds in treasury	1,000,000
Due from companies and individuals	420,137
Current assets	91,768
	$26,301,226
LIABILITIES	
Capital stock: Preferred, $5,000,000; common, $5,000,000	$10,000,000
Bonds	15,000,000
Mortgages	119,000
Current liabilities (including contracts for new equipment and additions to power house)	387,457
Reserved for taxes and interest	272,040
Reserved for maintenance	51,000
Surplus	471,729
	$26,301,226

COMPARATIVE STATEMENT OF DAILY AVERAGE PASSENGER TRAFFIC PER MONTH DURING THE YEARS 1900, 1901 AND 1902

Month	1900	1901	1902	Increase over 1901	Per cent of increase
January		52,022	62,010	9,988	19.20
February		55,256	64,760	9,504	17.20
March		57,193	65,362	8,169	14.29
April		58,623	65,430	6,807	11.59
May		56,999	63,199	6,200	10.87
June	41,972	53,586	60,813	7,227	13.48
July	40,816	48,559	56,110	7,551	15.55
August	43,961	49,770	57,911	8,141	16.35
September	47,092	54,065	63,950	9,885	18.28
October	50,808	59,044	69,562	10,518	17.82
November	53,345	59,857	67,236	7,379	12.33
December	53,798	63,375	71,607	8,232	12.99

Total number of passengers carried in 1900 (seven months), 10,185,141; total number of passengers carried in 1901 (twelve months), 20,327,005; total number of passengers carried in 1902 (twelve months), 23,354,729.

Daily average passengers carried in 1901 (twelve months), 55,690; daily average passengers carried in 1900 (seven months), 47,594; average daily increase, 8,096, equal to 17 per cent.

Daily average passengers carried in 1902, 63,986; daily average passengers carried in 1901, 55,690; average daily increase, 8,296, equal to 14.9 per cent.

Ratio of operating expenses to earnings (including maintenance reserve), 38.80 per cent; ratio of operating expenses, maintenance reserve, loop account and taxes to earnings, 55.77 per cent.

This road shows the largest per cent of increase in traffic of any transportation line in Chicago.

MAYOR JOHNSON'S NEW TACTICS

Mayor Tom L. Johnson, of Cleveland, has adopted new tactics in his fight against the existing street railways of Cleveland. Through his lieutenant, Charles P. Salen, director of public works, he has issued a manifesto to the public announcing that "by reason of numerous complaints regarding the service given by the street railway companies the city officials had decided to take action to take away the franchises of the companies unless they improved the service." All good citizens were asked to keep a careful record of dates and times when unsatisfactory service was noted and turn same into headquarters to be used as evidence. In view of the fact that it is universally acknowledged that the street railway service of the city is as good, if not better, than that of any large city in the country, the manifesto created considerable comment and is being commonly set down as a political play preparatory to the opening of the spring election campaign.

Almost in the same breath the wily Mayor made a slip which is likely to cost him more votes than he could have gained had his crusade against the street railways been justified. In an unguarded moment he expressed the opinion that the recent report of the committee chosen by the Allied Trades and Labor Council to investigate the street railway situation had been compiled out of whole cloth in the offices of the attorneys for the street railways. The Allied Trades and Labor Council, which represents all the leading trades unions in the city, is exceedingly wrathy over the statement, and the Mayor has been invited to appear before the organization and make good his statements reflecting on the committee. If he does not apologize he is likely to find the organization openly arrayed against him.

AN EXTENSIVE SYSTEM IN WESTERN PENNSYLVANIA

Inside of a year Western Pennsylvania will have an electric railway system equaling those of some of the Central States. This system will have Pittsburg as its western terminus and will likely be controlled by a corporation having $30,000,000 capital, to be formed in the spring. The Pittsburg, McKeesport & Connellsville Railway and the old Greensburg, Jeannette & Pittsburg Railway will form the chief stems of this system, which will be joined by the early completion of the line from Connellsville to Greensburg. It is stated that arrangements have been made with the Pittsburg Railways Company by which the 70-ft. vestibuled cars, seating 100 persons and running on a fast schedule, will start from some central point in Pittsburg and run in both directions, making a complete belt line, covering the most important manufacturing and mining districts of this section of the State. The through cars leaving over the Monongahela route will pass through Wilkinsburg, East Pittsburg, Turtle Creek and North Versailles Township to McKeesport, there striking the almost completed double-track line between McKeesport and Connellsville, which follows the Youghiogheny several miles off.

LARGE RAILWAY CONTRACT IN ENGLAND

The most important contract which has ever been awarded by a steam railroad company for electrical equipment has just been given out by the North Eastern Railway Company, of England. It will be remembered that several engineers of this company were in this country last summer inspecting American electric railway installations. Largely as a result of this investigation the company has decided electrically to equip 40 miles of track between Newcastle and Tynemouth. The contract has been awarded the British Thomson-Houston Company, of London, and calls for fifty complete motor car equipments and two electric locomotives. Trains will be run and the speed with stops is to be 22 miles per hour.

ANNUAL REPORT OF THE LOUISVILLE RAILWAY RELIEF ASSOCIATION

The Louisville Railway Relief Association, composed of employees of the Louisville Railway Company, of Louisville, Ky., has made public its report for the year ending Dec. 31, 1902. A vast amount of good was accomplished by the association during the year in the way of relief to members. More than $1,800 was paid out in sick benefits alone, while $750 was paid in death benefits. The association begins the year 1903 with the most flattering conditions; the magnificent gift of $2,000 by the directors of the Louisville Railway Company has placed the institution upon a most solid basis, and it now has on hand and in the treasury $4,395. The report of the financial secretary shows that the receipts from all sources amounted to $4,902. The amount paid in dues was $2,839. The total receipts were $4,902, and the disbursements were $2,931. One hundred and twenty-three members drew sick benefits amounting to $1,807. The general expenses for the year were $374.

THE BOSTON & WORCESTER ELECTRIC COMPANIES

The Boston & Worcester Electric Companies, organized after the plan of the Massachusetts Electric Companies and the Boston Suburban Companies, has acquired control of the Boston & Worcester Street Railway Company, Framingham Union Street Railway Company and Framingham, Southboro & Marlboro Street Railway Company. The association has outstanding 18,786 shares of 4 per cent preferred stock and 19,989 shares of common stock; total authorized issue of each, 50,000, no par value. The company has been financed and the securities will be listed on the Boston Stock Exchange. The officers are: James F. Shaw, president; George A. Butman, secretary and treasurer; N. W. Jordan, Philip Stockton, J. E. Toulmin, H. L. Burrage, Percy Parker, Robert Treat Paine, Jr., Charles Hayden, P. W. Moen, Arthur E. Childs, William M. Butler, H. Fisher Eldridge, James F. Shaw, E. P. Shaw, Phineas W. Sprague and W. H. Trumbull, trustees.

PLAN FOR CONSOLIDATION AT HARRISBURG

At a meeting of the board of directors of the Harrisburg Traction Company, of Harrisburg, Pa., Jan. 27, it was unanimously decided to submit to a special stockholders' meeting the first week in April a proposition for the organization of a holding company to take over the present Harrisburg company and all the smaller independent lines in the vicinity of Harrisburg, including the Harrisburg & Mechanicsburg, Harrisburg & West Fairview, West Fairview & Marysville and Linglestown & Blue Mountain Railways. The capital stock of the new company is to be $5,000,000. New lines will also be built to Dauphin, 9 miles above Harrisburg, and to Hummelstown, 9 miles east of Harrisburg. A number of new cars will be purchased, and an additional power plant is to be erected. Under the plan proposed, the present stockholders of the company will be guaranteed an annual dividend of 6 per cent on their total holdings of $2,000,000, and, in addition, will receive a stock dividend of $100,000, representing surplus earnings over and above operating expenses, fixed charges and dividends already paid. Not all of the $5.000,000 capital stock of the new company would be issued at once. It is the design of the promoters of the new organization to so finance it as to be able to equip the lines in the best possible manner and provide for the future growth of the system. The Mayor has just signed an ordinance providing for about 15 miles of street paving within the next two years, and as the trolley company is required to pave between its tracks on paved streets and for a certain distance on either side, this work will entail a heavy expenditure. It will be optional with the present stockholders whether they retain their present stock or exchange for shares of the new company. Each stockholder of the present company will be entitled to subscribe for an equal number of shares of the proposed corporation. Improvements and extensions will be considered after the organization of the new company. Heretofore, money for equipment and extensions has been taken from the earnings. The board of directors declared a semi-annual dividend of 3 per cent Jan. 27.

A NEW BENEFIT FUND IDEA

The Corning & Painted Post Street Railway Company, of Corning, N. Y., operating 5 miles of line, has established a voluntary disability benefit fund, to which the employees are not asked to contribute. All employees who have been regularly employed by the company for one year are entitled to share in the fund. In case of sickness or injury incapacitating an employee for longer than one week a sick benefit equal in amount to his average weekly wages is to be paid for a period not to exceed four weeks at any one time and not to exceed eight weeks in any one year. In the case of disability caused by any injury received in the company's service, the right to a sick benefit is to accrue at once, and in case of the death of an employee his widow is to be entitled to draw a sum equal to eight weeks' wages, less any such sum as may have been drawn by the employee himself within the preceding twelve months. Any employee who for a year draws nothing from the fund because of disability is to be entitled to a week's vacation at full pay or to a bonus of one week's wages, as he may elect.

PERSONAL MENTION

MR. P. ALBERT POPPENHUSEN, president of the Green Engineering Company, of Chicago, was in New York on business recently.

MR. A. E. WORSWICK, electrical engineer of the Federal District Railway Company, of Mexico, has resigned from that position.

MR. H. K. SURBECK, passenger solicitor for the Lake Shore Electric Railway, has resigned from that company to accept a position with another company.

MR. H. M. BRINCKERHOFF, general manager of the Metropolitan West Side Elevated Railway Company, of Chicago, was married on Jan. 20 to Miss Florence Louise Fay, of Chicago.

MR. E. IRVING DOW has been appointed to the position vacated by Mr. F. J. Green as superintendent of construction for the various properties controlled by the Appleyard syndicate.

MR. F. O. NOURSE, of Boston, has been appointed purchasing agent for the various roads controlled by the Appleyard syndicate in Ohio. He will probably make his headquarters at Columbus.

MR. R. N. BROWN has been appointed superintendent of the Dayton, Springfield & Urbana Railway, of Dayton, O. He was formerly superintendent of the Columbus, Buckeye Lake & Newark Traction Company.

MR. JOHN B. JUDGE, who has been connected with the Fair Haven & Westville Railroad, of New Haven, Conn., for a number of years as starter, has been appointed assistant superintendent of the entire system of the company.

MR. GRAFTON W. APPLER, who has been connected with the Westinghouse Electric & Manufacturing Company for the past four and one-half years, has accepted a position with the Northern California Power Company as electrical superintendent.

MR. CHARLES UPDYKE, formerly superintendent of the Toledo & Maumee Electric Railway, has been appointed to succeed Mr. H. H. Smith as superintendent of the Cleveland-Norwalk division of the Lake Shore Electric. Prior to his going to the Toledo & Maumee, Mr. Updyke held the position of superintendent on the Toledo & Monroe, which at one time was part of the Everett-Moore system.

MR. W. P. JACKSON, general manager of the Marion Street Railway Company for the past six years, has resigned here to accept a position with the Union Traction Company of Indiana as local superintendent at Anderson. As a token of their esteem, the employees of the Marion Street Railway Company last week presented Mr. Jackson with a handsome watch chain and diamond-studded charm. Mr. Jackson leaves for his new position in Anderson on Feb. 1.

MR. GEORGE H. GIBSON has resigned his position with the Westinghouse Companies' publishing department, of Pittsburg, Pa., to accept a position with the B. F. Sturtevant Company, of Jamaica Plains Station, Boston. Mr. Gibson was formerly a member of the editorial staff of the Engineering News, of New York City, and is a graduate of the engineering school of the University of Michigan. Mr. Gibson is a frequent contributor to the technical journals, especially those devoted to electrical engineering, as he is particularly interested in that department.

CAPTAIN JOSEPH M. DICKEY, of Newburg, shipping commissioner of New York, was appointed State Railroad Commissioner by Governor Odell on Jan. 29 to succeed Colonel Ashley W. Cole, of Brooklyn, who has resigned this place. Colonel Cole was Governor Morton's private secretary, and was first appointed Railroad Commissioner by Governor Morton Dec. 29, 1896, in place of Mr. Samuel A. Beardsley. Colonel Cole was appointed to his present term by Governor Black Feb. 16, 1897. This term expired Feb. 16, 1902, but no successor was nominated. Colonel Cole has proved an exceptionally able officer in the position from which he now retires. Many very important problems have been solved by the Commissioner during his term. Captain Dickey has been a successful business man of Newburg and a prominent Republican leader in Orange County. He was elected a member of the Assembly from the First Assembly District of Orange County in 1880, and was also a member in 1881. The Senate railroad committee considered Captain Dickey's nomination and decided, by a vote of 7 to 3, to confirm it. The nomination was later confirmed by the State Senate as a body.

MR. WILLIAM J. WILGUS, who has been chief engineer of the New York Central Railroad for many years, has been appointed fifth vice-president of the company, an office created at the last meeting of the board of directors. Owing to the constantly growing importance of the position occupied in the organization by Mr. Wilgus and the magnitude of the new work in connection with the New York terminal improvements which will be immediately under his supervision, it was deemed advisable to confer upon him an office whose title and dignity would be in keeping with the responsibility of the position. Moreover, the work now under consideration will bring the engineering department into closer relation than ever before with the executive department, and it was believed that it would be of advantage to have the head of this department represented in the executive branch of the organization. Mr. Wilgus will, accordingly, have general charge and supervision of all construction work and will assist the third vice-president, Mr. W. C. Braun, in matters pertaining to the maintenance of way and structure. The fifth vice-president will also perform such other duties as may be assigned to him from time to time by the president, subject to the approval of the board of directors or of the executive committee. Mr. Wilgus was empowered to appoint a chief engineer to succeed himself.

NEW PUBLICATIONS

Steam Power Plants; Their Design and Construction. By Henry C. Meyer, Jr., M. E. 160 pages, 16 plates and 65 illustrations. Price, $2. Published by the McGraw Publishing Company, New York.

This book is an elaboration of a series of articles which appeared originally in the Engineering Record, and is intended to assist owners and managers of manufacturing plants or buildings requiring power installations. From time to time they are called upon to specify or purchase the machinery needed for the equipment of their buildings with a view to efficiency and economy in operation. It is not the intention of the author to offer this work as a substitute for the recommendations or services of an expert or consulting engineer, but more as a supplementary aid and guide in mechanical and power matters. It is recognized that the great bulk of steam installations are made under the direction of men experienced in the details of manufacturing in their special lines, but devoid of expert knowledge in power plant engineering. To this class it is believed the information presented will prove suggestive and valuable, as well as to the engineer, architect and student who desires general information on the subject treated This will give some idea of the manner in which the subjects are treated, but it should not be assumed that the work is interesting only to this class. Experts will find much valuable data, in accessible and convenient form.

Traité Pratique de Traction Electrique. Vol. I. By L. Barbillon and G. J. Griffisch. 752 pages. Illustrated. Price, Frs. 30. Published by E. Bernard & Company, 29, Quai des Grands-Augustins, Paris.

The present tendency in America in electric literature is toward the publication of books on subdivisions of the art. In France, so far as electric railway construction and operation is concerned, the complete treatise seems to be more popular. As a result, we have the large and complete volume just from the press of Bernard & Company, as well as the exhaustive treatise in two volumes by Blondel and Paul DuBois, published by Beaudry & Company, in 1898. If we should attempt to draw a distinction between these two books, we might say that that by Messrs. Barbillon and Griffisch was descriptive, while the earlier book was analytical. No disparagement is intended to either work by these definitions, for both are very complete, and by their difference in treatment cover the field very thoroughly. The authors of the present volume are well fitted for the task, Prof. Barbillon being conected with the University of Grenoble, while Mr. Griffisch is chief engineer of mechanical traction, with the General Omnibus Company, of Paris. American practice is naturally referred to to a considerable extent in the treatise under consideration, but European methods, particularly those employed on the Continent, are given more prominence. The chapters on track construction, power stations, etc., are concluded in each case with an extended set of tables giving statistics of the amount of material required, cost of construction, etc. We can recommend this work without qualification to the engineer and student of traffic problems. It is understood that the second volume will be issued in a few months and will be sold for Frs. 10 or both books for Frs. 40.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. *a* Comparison is made with 1900 because in 1901 the earnings were abnormal on account of the Pan-American Exposition. *b* Exposition opened Dec. 1

Company	Period	Total Gross Earnings	Operating Expenses	Net Earnings	Deductions From Income	Net Income, Amount Available for Dividends
AKRON, O.						
Northern Ohio Tr. Co.	1 m., Dec. '02	64,155	35,650	28,505	13,817	14,688
	1 " " '01	53,484	30,968	22,516	13,259	9,257
	6 " June '02	318,937	185,362	133,575	77,556	56,018
	6 " " '01	268,967	164,458	104,510	63,494	41,016
	12 " Dec. '02	745,044	410,793	334,251	155,068	179,183
	12 " " '01	617,011	350 845	266,166	136,162	130,004
ALBANY, N. Y.						
United Traction Co.	1 m., Sept. '02	132,606	81,990	50,616	23,866	26,750
	3 " " '02	414,635	251,739	162 897	71,598	91,299
BINGHAMTON, N. Y.						
Binghamton St. Ry. Co.	1 m., Nov. '02	15,975	9,135	6,840	------	------
	1 " " '01	15,107	8,304	6.803	------	------
	5 " " '02	98,335	53,810	44,525	------	------
	5 " " '01	95,150	48,621	46,529	------	------
BOSTON, MASS.						
Boston Elev. Ry. Co.	12 m., Sept. '02	11,321,030	7,862,571	3,458,458	2,836,560	621,898
	12 " " '01	10,869,496	7,336,597	3,532,899	2,896,359	636,539
Massachusetts Elec. Cos	12 m., Sept. '02	6,090,168	3,827,372	2,262,796	1,391,239	871,557
	12 " " '01	5,778,133	3,915,486	1,862,648	937,206	925,442
BROOKLYN, N. Y.						
Brooklyn R. T. Co.	1 m. Dec. '02	1,076,193	655,896	420,296	------	------
	1 " " '01	1,038,158	686,623	351,536	------	------
	6 " " '02	6,836,370	3,785,175	2,051,194	------	------
	6 " " '01	6,513,239	4,083,729	2,429,510	------	------
	12 " June '02	12,789,705	*8952214	3,837,490	------	------
	12 " " '01	12,101,198	*7970635	4,130,563	------	------
BUFFALO, N. Y.						
International Tr. Co.	1 m., Dec. '02	309,871	169,957	139,914	132,822	7,092
	1 " " '01	270,651	174.824	95,827	128,241	†32,444
	6 " " '02	1,923,690	999,655	924,035	774,555	149,480
	6*a* " " '00	1,557,057	722,790	834,267	764,428	69,839
CHARLESTON, S. C.						
Charleston Consol'ted Ry. Gas & El. Co.	1 m., Dec. '02	45,872	29,364	16,508	12,605	3,903
	1 " " '01	*b* 60,092	29,957	30.134	12,673	17,461
	10 " " '02	524,654	312 584	212,669	125,921	86,148
	10 " " '01	427,174	267,941	159,233	128,092	31,141
CHICAGO, ILL.						
Chicago & Milwaukee Elec. Ry. Co.	1 m., Dec. '02	12,859	6,580	6,280	------	------
	1 " " '01	12,719	5,781	5,988	------	------
	12 " " '02	190,110	79,364	110,746	------	------
	12 " " '01	171,172	74,015	97,157	------	------
CLEVELAND, O.						
Eastern Ohio Traction Co.	1 m., Oct. '02	17,365	10,142	7,224	6,033	1,190
	10 " " '02	161,071	89,603	71,468	54,574	16,894
Cleveland, Elyria & Western	1 m., Dec. '02	24,711	16,249	8,462	------	------
	1 " " '01	19,406	11,098	8,309	------	------
	12 " " '02	300,846	171,074	129,771	64,250	65,521
	12 " " '01	249,260	136,865	112,394	57,023	55,371
Cleveland, Painesville & Eastern	1 m., Dec. '02	12,473	8,435	4,038	------	------
	1 " " '01	11,920	6,681	5,239	------	------
	12 " " '02	189,187	105,670	83,518	74,552	8,966
	12 " " '01	164,971	87,102	77,869	71,296	6,573
COVINGTON, KY.						
Cincinnati, Newport & Covington Ry. Co.	1 m., Nov. '02	99 15'	*53,192	45 959	21,223	24,736
	1 " " '01	68,131	*40,287	27,844	15,416	12,427
	11 " " '02	1,003,408	*556,495	446,913	231,987	214,925
	11 " " '01	749,403	*443,089	306,314	172,139	134,175
DETROIT, MICH.						
Detroit United Ry.	1 m., Dec. '02	302,665	176,214	126,451	70,627	55,825
	1 " " '01	273,889	153,404	120,485	64,229	56,256
	12 " Dec. '02	3,501,754	1,967,532	1,534,222	815,004	719,218
	12 " " '01	3,063,503	1,684,453	1,379,050	726,744	652,307
Detroit and Port Huron Shore Line (Rapid Ry. System)	1 m., Nov. '02	32,117	*21,187	10,930	------	------
	1 " " '01	27,979	*17,446	10,533	------	------
	5 " " '02	204,644	*117,364	87,280	------	------
	5 " " '01	184,935	*99,350	85,585	------	------
DULUTH, MINN.						
Duluth-Superior Tr.	1 m., Dec. '02	48,769	28,699	20,070	10,054	10,016
	1 " " '01	40,541	25,042	15,499	9,212	6 287
	12 " " '02	538,031	288,373	249,658	116,275	133,382
	12 " " '01	453,704	251,315	202,389	109,967	92,422
ELGIN, ILL.						
Elgin, Aurora & Southern Tr.	1 m., Dec. '02	34,999	22,414	12,585	8,333	4,251
	1 " " '01	30,199	18,579	11,621	8,333	3,287
	12 " " '02	410,431	243,653	166,778	100,000	66,778
	12 " " '01	361,665	206,005	155,660	100,000	55,660
FINDLAY, O.						
Toledo, Bowl'g Green & Southern Traction Co.	1 m., Nov. '02	24,289	13,173	11,116	1,991	9,126
	1 " " '01	15,833	11,067	4,766	635	4,130
	7 " " '02	142,108	76 228	65,880	28,989	36,890
	7 " " '01	105,329	67,679	37,649	20,752	16,898
HAMILTON, O.						
The Cincinnati, Dayton & Toledo Trac. Co.	1 m., Dec. '02	36,452	21,377	15,075	15,952	+ 877
	1 " " '01	31,117	17,926	13,191	16 456	† 3,264
	7 " " '02	302,668	155,951	146,717	113,860	32,857
LONDON, ONT.						
London St. Ry Co.	1 m. Dec. '02	15,042	7,820	7,222	1,939	5.283
	1 " " '01	12 947	6,280	6,667	1,859	4 808
	12 " " '02	154,704	93.248	61,456	25,983	35,473
	12 " " '01	141,846	84,557	57,289	23,835	33,454
MILWAUKEE, WIS.						
Milwaukee El. Ry. & Lt. Co.	1 " Dec., '02	282,484	118 747	163,738	71,257	92,480
	1 " " '01	243,927	105 659	138 267	67,162	71,105
	12 " " '02	2,776,293	1,286,035	1,490,258	803,546	686,713
	12 " " '01	2,442,342	1,185,534	1,256,808	755,139	501,669
MINNEAPOLIS, MINN.						
Twin City R. T. Co.	1 m., Dec. '02	331,331	151,456	179,875	60,518	119,357
	1 " " '01	294,341	114,106	180,235	46,850	133,385
	12 " " '02	3,612,211	1,630,170	1,982,041	711,718	1,270 324
	12 " " '01	3,173,976	1,415,452	1,758,524	666,637	1,091,886
MONTREAL, CAN.						
Montreal St. Ry. Co.	1 m., Dec. '02	177,367	113,917	63,450	17,406	46,044
	1 " " '01	158,196	105,607	52,589	15,185	37,404
	3 " " '02	531,645	313.965	217,680	49,474	168,207
	3 " " '01	479,169	287,307	191,862	44,536	147,326
NEW YORK CITY.						
Manhattan Ry. Co.	12 m., Sept. '02	11,583,546	5,545,395	6,038,151	2,712,089	3,326,062
	12 " " '01	10,455,872	5,328,649	5,127,223	2,683,132	2,444,091
Metropolitan St. Ry.	3 m., Dec. '01	3,887,936	1,723,972	2,143,964	1,151,140	992,824
	3 " " '00	3,786 030	1,699,649	2,086,381	1,138,467	947,914
	12 " June '02	15,866,641	7,385,883	8,480,758	4,815,421	3,665,337
	12 " " '01	14.720,767	6,755,131	7,965,636	4,534,068	3,431,567
OLEAN, N. Y.						
Olean St. Ry. Co.	1 m ,Dec. '02	6,347	4,274	2,073	1,268	805
	1 " " '01	4,638	2,884	1,753	1,146	608
	6 " " '02	36,383	19,047	17,336	8,303	9,033
	6 " " '01	30,513	13,961	16,553	8,305	8,247
PEEKSKILL, N. Y.						
Peekskill Lighting & R. R. Co	1 m., Oct. '02	9,023	5,706	3,317	2,083	1,234
	4 " " '02	37,696	21,586	16,110	8,333	7,777
	12 " June '02	86,795	*56,392	30,402	23.125	7.277
PHILADELPHIA, PA.						
Union Traction Co.	12 m., June '02	14,118,159	6,402,338	7,715,820	*6637781	1,078,038
	12 " " '01	13,431,681	5,836,186	7,595,494	*6734328	861,266
American Railways	1 m., Dec. '02	96,159	------	------	------	------
	1 " " '01	82,262	------	------	------	------
	6 " " '02	639,655	------	------	------	------
	6 " " '01	501,210	------	------	------	------
	12 " June '02	1,009,509	------	------	------	------
	12 " " '01	844,298	------	------	------	------
PUEBLO, COL.						
Pueble & Suburban Traction & Lt. Co.	1 m., Nov. '02	37,584	24 348	13,236	4,583	8,653
	1 " " '01	23,733	15,590	8,143	3,388	4,755
ROCHESTER, N. Y.						
Rochester Ry.	1 m., Dec. '02	103,156	52,913	50,242	29,037	21,205
	1 " " '01	98,002	49,833	48,169	29,135	19,034
	12 " " '02	1,107,738	576,922	530,816	302,061	228.754
	12 " " '01	1,022,009	589,199	432,810	301,138	131,671
SYRACUSE, N. Y.						
Syracuse R. T. Co.	1 m., Dec. '02	67,405	36 804	30,601	19.025	11 576
	1 " " '01	63,471	34,374	29,097	19,025	10,072
	6 " " '02	371,734	203,068	168,666	114,150	54,516
	6 " " '01	346,670	188,286	158,384	114,096	44,288
TOLEDO, O.						
Toledo Ry. & Lt. Co.	1 m., Dec. '02	139,608	*63,889	75,719	------	------
	1 " " '01	126 378	*63,631	62,747	------	------
	12 " " '02	1,459,091	*726,779	732,312	------	------
	12 " " '01	1,311,084	*636,407	674,677	------	------
Lake Shore Elec. Ry. Co.	1 m., Nov. '02	42,540	30,982	11,558	------	------
	1 " " '01	27,778	20 064	7,714	------	------
NEW BRIGHTON, S. I.	11 " " '02	416,390	275,693	140,697	------	------
	11 " " '01	329,376	217,518	111,858	------	------
Richmond Light & R. R.Co.,formerly Staten Island Elec. Ry.	3 m., Sept. '02	73 687	43,950	29,737	18,950	10,807
	3 " " '01	80,197	42,103	38,094	27,221	10,873
YOUNGSTOWN, O.						
Youngstown - Sharon Ry. & Lt. Co.	1 m., Dec. '02	47,857	*24,729	23,129	------	------
	12 " " '02	444,986	*244,972	200,014	------	------

CONSTRUCTION NOTES

LOS ANGELES, CAL.—Henry E. Huntington, president of the Pacific Electric Railway Company, has purchased a large, highly-improved ranch property of 664 acres, about 12 miles east of Los Angeles, for more than $200,000, which he proposes to sub-divide into high-class suburban property. It lies out beyond Pasadena, being about 2 miles east of Alhambra, and the same distance north of San Gabriel. It is the declared intention of the Pacific Electric Railway Company to add to its transportation facilities so as to bring the land into direct and constant communication with Los Angeles.

FLORENCE, COL.—The Florence Electric Street Railway Company, which plans to build between Florence and Canon City, a distance of 25 miles, will award contracts for construction in ninety days. The president of the company is Thomas Robinson, and the secretary is Harry Robinson.

WILMINGTON, DEL.—The Keystone Electric Railway Company, of Wilmington, Del., has been incorporated, with a capital stock of $2,000.

GAINESVILLE, GA.—Considerable track has been laid in the city by the Gainesville & Dahlonega Electric Railway. The plan of the company is to begin work on the line to connect Gainesville and Dahlonega at an early date.

ROCHESTER, IND.—Henry Township, Fulton County, has voted an appropriation of $15,000 in aid of the Wabash & Rochester Traction Company, which this spring is to build an electric railway to connect Rochester and Wabash, via Roann. There had been subsidies aggregating $95,000 previously voted, and this makes a total of $110,000. President Tuttle, of the company, says nearly all the right of way has been secured, and that work will commence as soon as the frost leaves the ground. The distance is 35 miles.

MOUNT VERNON, IND.—The City Council has granted a fifty-year franchise to the Evansville, Mount Vernon & Union Town Traction Company. The company will enter the city over Third and Fourth Streets and along Main Street. The power house and machine shops are to be located at Mount Vernon.

RICHMOND, IND.—The Richmond Street & Interurban Railway Company is planning an extension to Connersville from Milton, the present terminus of its lines. The extension is to be completed by July.

WARSAW, IND.—The Huntington & Winona Traction Company has secured nearly all the right of way for its line from Huntington to Winona by way of South Whitely. Construction work will start in the spring.

FORT WAYNE, IND.—The International Construction Company, of New York, is preparing to construct the Goshen & Indiana Railway. The project has been financed and many of the contracts for material have been placed.

JEFFERSONVILLE, IND.—Preliminary surveys have been started for the Jeffersonville & Madison Electric Railway. The road will be constructed by way of Charleston, New Washington and Hanover.

WABASH, IND.—Surveys have been completed for the Wabash-Rochester Electric Railway. Construction work will start as soon as the weather permits.

FORT WAYNE, IND.—Senator S. B. Fleming has secured an extension of the time in which to construct the interurban railway in which he is interested until four months after May 1 The franchise provided originally that the line should be completed from New Haven to the center of the city by that date, but litigation interfered and caused delays. Since the original grant negotiations have been practically closed for consolidation of the Fleming line and Fort Wayne, Van Wert & Lima line. The same persons interested in these two companies are also interested in the purchase of the Fort Wayne Traction Company, controlling the city lines.

INDIANAPOLIS, IND.—The Indianapolis Northern Traction Company expects to have its line ready for operation by July 1, 1903. Johnson & Berry, of Anderson, have the contract for the construction of the roadbed from Indianapolis to a point south of Carmel, and the line from Carmel to Noblesville practically has been completed by R. G. Kirkpatrick & Company. The forces of the traction company are working on the division from Noblesville to Tipton. R. J. Forrestal is preparing the road between Kokomo and Peru. The traction company itself has practically finished the grade from Kokomo to Galveston. Eaton, Campbell & Henderson have the contract from Galveston to Logansport and will work all winter preparing the line. J. N. Bick & Company, of Chicago, are working between Bunker Hill and Peru. One-half the poles for the entire line have been delivered and contracts have been let for erecting the overhead system from Indianapolis to Tipton and from Tipton to Logansport. The rails and ties for the entire line have arrived and track work will begin early in the spring. Contracts have been let for erecting substations at Tipton, Noblesville and Broad Ripple. These stations will be brick structures. The one at Tipton has been completed and the one at Noblesville is very nearly finished. The Westinghouse Electric Company will equip the Anderson power plant and the six sub-stations along the line. The Electric Storage Battery Company, of Philadelphia, will install the storage batteries at each of the sub-stations.

CEDAR FALLS, IA.—The Cedar Falls & New Hartford Railway Company has been incorporated to build an electric railway to New Hartford.

WORCESTER, MASS.—The Worcester & Northern Street Railway Company, which plans to build 11 miles of line to connect Holden and Westminster, will award contracts in February or March. The office address of the company is 452 Main Street, Worcester.

GREENFIELD, MASS.—After a hearing of the Railroad Commission, the Greenfield & Turners Falls Street Railway Company and the Conway Street Railway Company have come to an agreement over the joint use of tracks in Greenfield. Each Company owns a single track line, and the plan is to operate the two as a double-track system.

UXBRIDGE, MASS.—It is stated here that the Linwood Street Railway Company, of Whitinsville, will ask for franchises to extend its line through Sutton and Douglas to East Douglas.

UXBRIDGE, MASS.—The Uxbridge, Whitinsville & Douglas Street Railway Company has petitioned for a location in Sutton.

WESTFIELD, MASS.—The Woronoco Street Railway Company will extend its track during the coming year. The company plans to purchase a dynamo and an engine.

GREENFIELD, MASS.—The Huntington & Westfield River Street Railway, which was originally intended to be built from Huntington to Shelburne Falls, will, it is said, have Greenfield as its northern terminus.

HOLYOKE, MASS.—The Holyoke Street Railway Company has voted to petition the Railroad Commissioners for authority to issue bonds to the amount of $265,000.

WORCESTER, MASS.—The Boston & Worcester Street Railway Company has appealed to the Legislature for authority to cross the Boston & Albany Railroad tracks at grade in Newton and Natick.

WORCESTER, MASS.—The Worcester & Northern Street Railway Company is asking for locations from the terminus of the Worcester & Holden Street Railway in Holden to connect with the Gardner, Westminster & Fitchburg Street Railway at Westminster.

WORCESTER, MASS.—The Worcester Consolidated Street Railway Company has placed an order for six thirteen-bench open cars with the Laconia Car Company, of Laconia, N. H.

SPRINGFIELD, MASS.—It is believed that the Springfield & Eastern Street Railway will renew its efforts to secure an independent entrance into Springfield, instead of using the tracks of the Springfield Street Railway Company. A petition for a separate location was brought and denied over a year ago.

CLINTON, MASS.—A proposition is being considered by the Worcester Consolidated Street Railway Company to build a branch line in Clinton, reaching the Clinton-Lancaster Driving Park and one of the largest cemeteries in the town.

TAUNTON, MASS.—The Norton & Taunton Electric Railway in the spring plans to extend its lines from their present terminus in Norton, through East Norton, to a point beyond East Mansfield, where connections will be made with the present Easton branch.

HOLYOKE, MASS.—The Holyoke Street Railway Company has bought from the American Thread Company, of Holyoke, a centrally located lot containing 76,000 sq. ft. for about $28,000. No announcement has been made as to the purpose to which the lot will be put.

JACKSON, MICH.—The Jackson & Battle Creek Traction Company, through Spitzer & Company, of Toledo, has placed a contract with the G. C. Kuhlman Car Company, of Cleveland, for six interurban cars of the latest pattern.

GREENVILLE, MISS.—The Delta Electric Light, Power & Manufacturing Company is said to have completed all arrangements for building a 4-mile electric railway here.

KANSAS CITY, MO.—The Metropolitan Street Railway Company has opened its Twenty-Fourth Street electric line. The new line extends from the stock yards, across the Allen Avenue Viaduct, north to Nineteenth and Main Streets, and thence east to Cleveland Avenue, returning on Eighteenth Street.

OMAHA, NEB.—It is said that plans have been perfected by the Omaha Street Railway Company for building a new power house in the city and that the work of preparing the site will be begun in the spring.

NEW YORK, N. Y.—A franchise has been granted to the New York Interborough Railway Company by the Board of Estimate and Apportionment for the operation of an electric railway in the Bronx. The franchise is for a term of fifty years, and gives the company the right to run cars across Macomb's Dam Bridge and other Harlem River structures, and contains the provision that at the expiration of the franchise the city can purchase the plant necessary for the operation of the road at a fair price, to be fixed by the Board of Estimate and Apportionment.

TROY, N. Y.—The Forest Park Railway Company, recently incorporated, has applied to the Council for a street railway franchise. The purpose of the company is to build an electric railway to accommodate patrons of Forest Park Cemetery.

UTICA, N. Y.—D. W. Lewis, of New York, and his associates, are said to have in contemplation the construction of an electric railway from Utica to Deposit.

TOLEDO, OHIO.—The Interurban Construction Company has been incorporated, with $10,000 capital stock, by H. R. Klauser, A. E. Klauser, N. Schmidt, J. H. Pheat and H. F. Shunck. The company will promote and construct electric railways, build bridges, etc.

YOUNGSTOWN, OHIO.—The Youngstown Consolidated Gas & Electric Company and the Youngstown & Sharon Railway Company have moved into a fine new office building at Boardman and Champion Streets, which was constructed expressly for their service. Street car and light-supply shops have been established in the basements of the building.

CLEVELAND, OHIO.—The Cleveland Construction Company has elected the following officers: Will Christy, president; W. E. Davis, vice-president; C. W. Foote, treasurer; R. E. Inskeep, secretary. The above, with J. R. Nutt, are directors. The company builds electric roads.

TOLEDO, OHIO.—The Toledo & Western Railway Company has re-elected the following directors: Hon. Luther Allen, Judge C. M. Stone, J. R. Seagrave, W. L. Hayes and E. B. Allen, of Cleveland; F. E. Seagrave and C. E. French, of Toledo. At the recent annual meeting plans were discussed for the financing and building of the Garret, Auburn & Northern and the Chicago & Indiana, which will be a part of the proposed through system from Toledo to Chicago.

COLUMBUS, OHIO.—The State Board of Public Works has adopted a resolution giving the consent of the State, as an abutting property owner, to the construction of the proposed Miami & Erie Terminal Railway, which will connect the canal with the Ohio River.

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EDITORIAL NOTICE

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Running by Signals

It is generally believed to be the primary function of a block signal to give an indication of safety, of caution or of danger to the approaching car or train. It then remains for the motorman or the engineer to perform three important and necessary duties: First, to see the signal; second, to interpret its meaning correctly, and third, to obey the instruction given by it. Assuming for the sake of simplicity that the signal is automatically displayed it appears that the three important functions just named are dependent upon human agency. That human agency is not always infallible has been shown by so many disastrous accidents that it did not need the recent rear-end collision between a standing local and a following express train near Westfield, N. J., in which more than a score of persons lost their lives, to drive the lesson home.

The question now naturally arises whether the system of signalling, when it has displayed the stop signal, has done all that should be expected of it, and whether there is any known way to render the human element less liable to err. If reports are true the signals approaching the point of the Westfield collision worked properly and displayed all the warning signals usually considered necessary to protect the standing local train from a rear-end collision. There was not only the stop signal properly displayed, but also the caution signal three-quarters of a mile in advance of the stop signal. Whether the engineer on the following express train saw these signals, whether he saw them but failed to interpret correctly their meaning, or whether he saw them and interpreted correctly their meaning, but failed to be governed by them we do not know. The fact remains, as all accounts agree, that the caution and stop signals were properly displayed and the engineer ran past them under full speed into almost certain death.

Owing to the inability of the general public to comprehend practical operating conditions, the occurrence of accidents of the kind just mentioned are usually followed by a popular demand for remedies which are not always the ones best adapted to the situation. The fact that these remedies are exceedingly expensive in maintenance and operation, would not be considered if they could be depended upon to insure greater safety in operation. Just at present there is a demand that the railroads place two engineers on each engine, one of them to do nothing but watch for signals. This second man would be likely to conclude that his was a secondary, if not an entirely useless, duty because the man at the throttle was also watching the signals, and upon him was the responsibility for action. The usual objections to a divided responsibility, and which have recently been discussed in these columns, seem to apply in this case with peculiar force. So stringent are the present regulations on most railroads that no one but the men actually in charge of the train are permitted to ride on engines except by special permit. The particular reason for this is the fear that the presence of another person might draw the attenion of the engineer and fireman from their duties. The transition from the proposed plan of two engineers on each engine to that of two motormen in the cab of every electric high-speed train is but a short step. In fact the demand for two motormen on electric elevated trains in New York has already been heard, and it is likely to be made again when the subway operation begins. The tendency of the public mind upon these subjects is, therefore, plainly evident and must be taken into account.

The thing which the public is seeking seems to be something that will absolutely prevent a train or car running past a danger signal. What shall that something be? Shall it be two engineers or two motormen in the cab; shall it take the form of a derailing switch which will absolutely stop the train opposite the danger signal; shall it be an apparatus that will invariably set the air brakes at the stop signal, or shall it be some other expedient as yet unknown? There are well-known instances in steam railroad practice where, with one or more experienced employees beside the engineer and fireman on the engine, the stop signal has been disregarded and all on the engine carried to certain disaster and death. The lesson has been learned by sad experience that their own safety is often not sufficient incentive to inspire among men ordinary and necessary vigilance. It is considered dangerous practice to have many facing point switches in the main line track because, in most cases, a derailment might be as disastrous as a collision. In Chicago several years ago an apparatus was tried on the elevated roads by which the air brakes were set in the emergency application at the stop signal. We understand

that the apparatus was frequently out of order, and because it could not be depended on was finally discarded. An improved apparatus of the same kind was installed on the Boston elevated and subway lines, and is still in use. The natural conservatism of railroad officers in matters of safety has thus far prevented the more extensive adoption of any kind of apparatus that is likely to be frequently out of order and give false indications. Many superintendents claim that the use of such an apparatus which teaches the runner to depend upon the machine and relax his own vigilence is wrong in principle. Yet it is said, to the credit of the apparatus used in Boston, that in one case where the motorman fainted the trigger at the stop signal did its work and brought the train to a standstill.

In view of the tremendous rapid transit developments now taking place, or about to take place, in and around New York, Chicago, Boston and other large cities in which high speed with maximum density of traffic are the distinguishing features, the lesson conveyed by the Westfield and other similar accidents ought not to be entirely lost upon those who are planning the safe and rapid movement of a great city's teeming millions. An accident of the Westfield kind, with the crowded trains of a city road, would naturally be much more appalling in its consequence. We grant that the problem to be solved is difficult, but this is only a greater reason why it should engage earnest attention.

The Waterbury Situation

For the second time in six months a New England city is the scene of disorder, bloodshed and rioting, growing out of the strike of motormen and conductors of the local street railway company, and the State officials have been obliged to step in and proclaim martial law in order to protect the lives and property of the community. This is certainly a deplorable condition of affairs, especially in staid old New England, where law and order should reign supreme if anywhere in the country. Had the disturbances and lawlessness of Waterbury been reported from a Western mining camp, a cattle ranch, or even a coal field, a convenient excuse might be found in the explanation that the population was largely composed if illiterate foreigners, who were unacquainted with American institutions, and had not yet become accustomed to the ways of the country and the legal means at hand to redress industrial grievances. But we must look elsewhere for an explanation of the conditions which make possible the enactment of scenes such as have recently occurred in Waterbury.

The entire number of street railway employees engaged in this strike, eighty altogether, is ridiculously small in comparison with the amount of discomfort they have caused the rest of the community and the injury they have inflicted upon the person and property of those who have opposed them. Back of this movement, however, is concentrated the power and influence of trade unionism, for it was really the desire of labor agitators to control the situation in Waterbury that led to the present conflict. This is plainly shown by the fact that the pretext upon which the strike was originally ordered—the discharge of two men for drunkenness—has been abandoned by the union, yet the strike continues with no immediate prospect of settlement. The strikers disclaim responsibility for all acts of violence, but they are willing to take advantage of the reign of terror which has been instituted for the purpose of coercing the company into submitting to their demands. In this respect the situation strongly resembles that which prevailed in England prior to the verdict against the Amalgamated Society of Railway Servants for conspiracy in ordering a strike against the Taff Vale Railway Company in August, 1900. This action was brought to recover damages caused by a strike which had been brought about by the defendants. The case was tried in the King's Bench Division last December, and the judge who presided charged the jury that the evidence was overwhelming against the defendants, and showed that they had conspired by unlawful means to molest and injure the plaintiffs in their business. In boycotting cases in this country the conspirators are, as a rule, elusive; criminal responsibility is often evaded by secrecy and perjury, and justice miscarries because of the practical difficulty of bringing home to particular individuals the responsibility for offences of which they are known to be guilty. This sort of evasion was scored by the English jurist in his charge to the jury. He criticised the subtle intricacies of the defendant's case as the perpetual shuffling of cards and the continual production, after the manner of an experienced conjuror, of the card of non-responsibility, which was contrary to common law, common sense and justice.

It is contended, and it may be true, that under American laws it is practically impossible to hold labor unions or their representatives responsible for such outbreaks as that at Waterbury, but it is high time that something was done to change this, and the sooner some provision, such as that recently proposed in the Connecticut Legislature, is enacted, the better it will be for the entire community. The labor leaders have opposed the idea of having their organizations incorporated, as this would fix responsibility upon the officers and members for lawlessness committed at their instigation, even though it might not be done by them personally. It would certainly have a restraining influence upon them, and enable employers to enforce agreements when they have "recognized the union."

Country Platforms on Interurbans

The country platform on an interurban line may not be a great revenue producer, and the amount of income from a platform in a year may be very small, but it would seem that if it is worth maintaining at all it should be made comfortable enough so that it will attract what possible patronage there is, and it should be provided with signal devices which will prevent annoying delays because of running by passengers at night, and the possible missing of passengers entirely, through inability of the motorman to see occupants of the platform. The present arc headlights used on interurban roads leave much to be desired. The wandering of the arc around the carbon tips so changes the focus that at times a dense black shadow will obscure the motorman's vision of a platform or stopping place which he may be approaching. If he misses the prospective passenger entirely, as he may if going at high speed, it takes that passenger a long time to forget the experience. If the motorman does see the prospective passenger it may only be when so near the platform that he cannot stop in time, and must run by and back up, all of which means a loss of time and expense to the company in other ways. On the other hand, if cars are compelled to run so slowly when approaching a platform which is in a shadow that they can stop in time it seriously cuts down the schedule.

On some of the higher speed interurban roads it is sometimes not easy even in the daytime to see a passenger on a country platform in time to make a comfortable stop. A car running 60 miles an hour covers so much ground in a second

that the motorman must see far ahead in order to make stops at country platforms.

The simple solution of the matter is to have some kind of a recognized signal provided at the platform. A small semaphore blade is cheaply put up and can be seen from a distance. This semaphore blade can be weighted so that it will ordinarily stand in clear position, and will be in stop position only when held so by the prospective passenger when he sees the car approaching. In connection with this semaphore a night signal, consisting of incandescent lamps, can be used. When such a signal is provided the passenger is assured that he will be picked up, and that there will be no danger of the motorman not seeing him, and the motorman will have the assurance that he is not in danger of running by passengers at every country platform he passes. The common practice to depend upon the headlight on the motor car to reveal passengers on platforms is not by any means a satisfactory one, especially with the high speeds that are now common on interurban roads. In fact, it is a relic of street railway practice, carried into interurban work, which should be abandoned, along with some other street railway customs, when the conditions cease to be those of a street railway.

There is also an increasing sentiment among interurban operators that more comforts and conveniences should be provided at country platforms. It is, of course, not feasible to maintain a warmed and lighted station at all times, but a shelter from the coldest winds can be erected at slight expense, and in connection with the signal lights a light can be provided in this shelter so that a passenger, when holding the signal to stop position and waiting for a car, can have light to read by. Some interurban roads have some or all of the improvements outlined on their country platforms, but many do not; and it is a matter worth considering whether such details as these would not pay when catering to rural traffic.

Safety Precautions in Power Houses

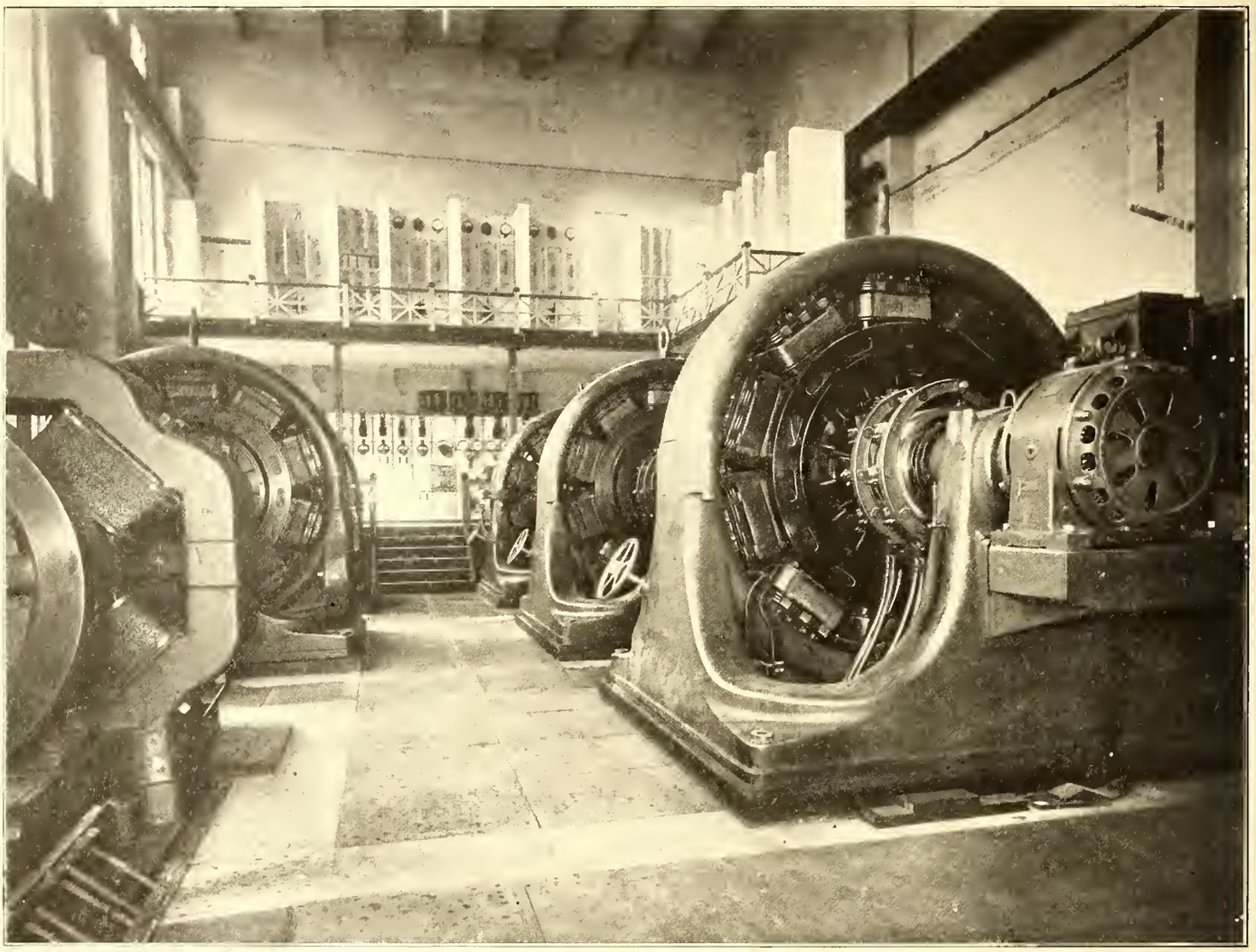
The recent curious accident at Niagara Falls in which fire robbed the plant temporarily of much of its output and caused no small inconvenience to consumers ought to be taken as a lesson in cautious construction. It is always the unexpected that happens, and in high-tension stations the results of accidents in themselves by no means of great gravity are often surprisingly serious. Witness the famous deflagrated cat in one of our metropolitan power plants and many another equally curious instance. A couple of years ago a tame crow flew into a rope drive in a lighting station, and half a city was in darkness for the rest of the evening. Only a few days since a broken steam pipe shut down a large proportion of the Boston street lights, and we might go on for a column or two citing similar instances. The power stations affected are generally well planned and provided with all the ordinary safeguards against accident, but the attack comes from some totally unexpected quarter; and the station is suddenly put out of service, to the great annoyance of everybody concerned. The moral is that, in large stations particularly it is sometimes wise to take precautions which seem abnormal and needless under ordinary conditions. As experience accumulates new and hitherto unrecognized sources of danger appear, and they should be heeded, particularly when so many eggs are put in one basket as the present fashion dictates.

The bursting steam pipe or breaking flange has now been in evidence a sufficient number of times to warrant and demand a special reckoning. The modern power house, with its stately row of colossal direct-coupled units, is peculiarly liable to suffer from this cause. The piping is generally of the best, but at some unexpected time and from some unforeseen cause a break occurs, and a shut down follows. A 2000-hp unit requires piping considerably larger than a goose quill, and when it gives way there is no time to stroll leisurely around and repair damages. Very likely the piping may be in duplicate, but there is confusion for a while in spite of the best efforts of everybody to right matters. It is one of the characteristic dangers of large stations. We have often intimated that power stations of more moderate size are sometimes desirable, and it is certainly true that in the matter of immunity from accident two or three good sized stations are better than one enormous one. However this may be, big power stations require special precautions to prevent just such accidents as have occurred. Electrically the case is much the same. Granted that the units are so connected that an accident to one will not shut down the others the distribution lines in the station and the switchboard connections should be planned with similar caution. It is absurd so to arrange a switchboard, for sake of symmetry or compactness, that a blunder at that one point may put all the generators out of service. There has been of late a wise tendency to put big high-tension switches and the like in special fireproof compartments, but there are few stations in which one cannot find more than one point at which a slight accident would involve the whole output of the plant. Sometimes the designer of the station gets the concealed wiring bee in his bonnet, and puts most or all of the cables into a single compact subway, where, if one goes, it takes all the others with it.

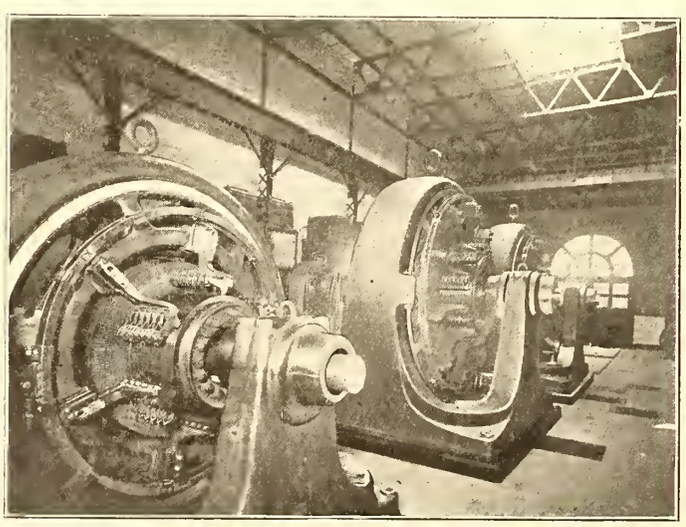
Of course cables are generally safe, but in these days of high voltage alternating-work insulation may break down in spite of the best construction, and if it does the doctrine of general cussedness assures us that it will do so at the precise point where it can involve the maximum number of cables. It is a good, safe rule to keep high-tension cables well apart and in plain sight until they get out of the station. Another weak point in many stations is the absence of safety devices near the generators, giving every opportunity for a short circuit inside all the switches. In these days of automatically operated switches the switch itself can be put anywhere without disarranging the operating switchboard, and it seems to us like taking long chances to leave a long stretch of connections between the machine and the nearest means of cutting it out. And, incidentally, we would like to see a list of the stations burned or seriously damaged through the failure of lightning arresters or their improper location. We have seen stations built within a few years in which the arresters and their lines all centered in a wooden wire tower not big enough to swing a Manx cat in. The lightning arrester at best is a thing of uncertain character, that works about as often as a walking delegate. It should be put, like him, in a secure and isolated spot, where it can be watched. Incendiary in its tendencies, it should be kept away from inflammable material of every kind. Particularly, station designers should realize the extreme difficulty of securing really fireproof construction. Given such heat as is furnished by a big arc and few materials can be trusted. The walls of a station are safe enough, but the floor and interior fittings are easily attacked. The bigger the station the greater care is necessary in all sorts of safety precautions, and while we do not wish to be alarmists it is a fact that many stations supposed to be planned with special regard to security have weak points at which a small cause would produce disastrous results.

IMPROVED POWER FACILITIES FOR THE BROOKLYN RAPID TRANSIT COMPANY

A year ago last October there appeared in the Street Railway Journal an extended article by C. E. Roehl, engineer of power and electrical transmission, on the proposed power distribution scheme of the Brooklyn Rapid Transit Company. In this article the direct-current power stations which are now in use were described and illustrated and the plans for the new Third Avenue power station, now rapidly nearing completion, were given. Since the writing of this article the sub-stations which are to be used in connection with the high-tension transmission from the new power station have been practically completed, and the railway now is awaiting the installation of the generators in the power station when the system of high-tension mains, rotary converters, sub-stations, etc., can be put into operation immediately. In the meantime the supply of direct current taken from the present generating stations distributed throughout the city is being supplemented by direct current from the sub-stations. The Brooklyn Edison Company is sup-



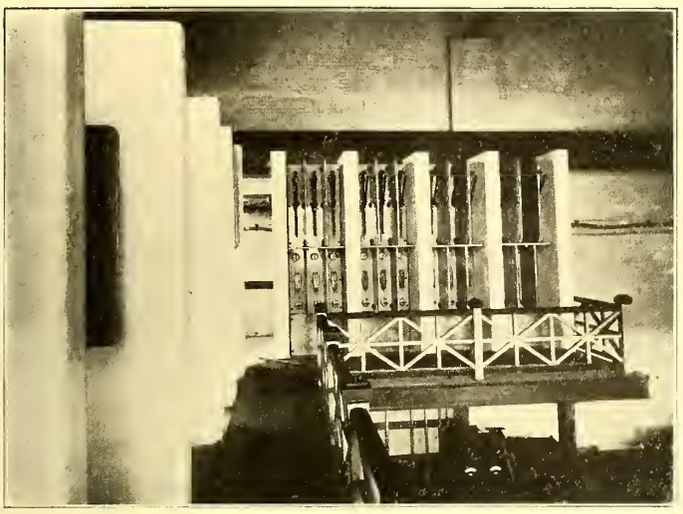
INTERIOR OF THE HALSEY SUB-STATION



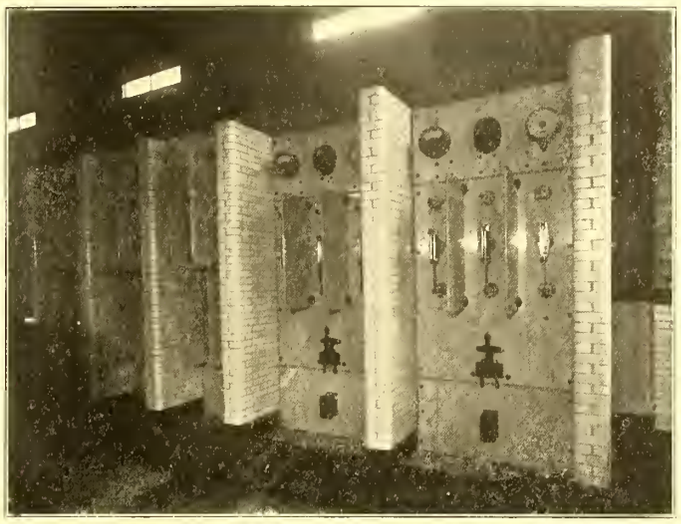
INTERIOR OF TOMPKINS SUB-STATION

INTERIOR OF CONEY ISLAND SUB-STATION

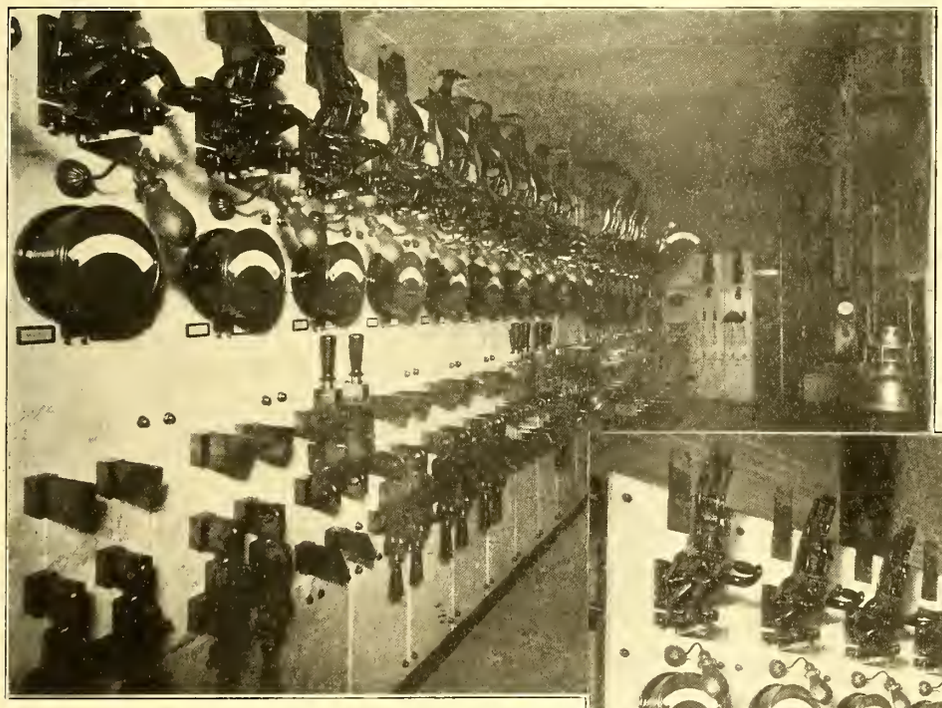
plying to the railway company all the high-tension alternating current that it can spare. The voltage in the high-tension mains of both railway and lighting companies is 6600 volts, so that an interchange of power will always be easy of accomplishment.

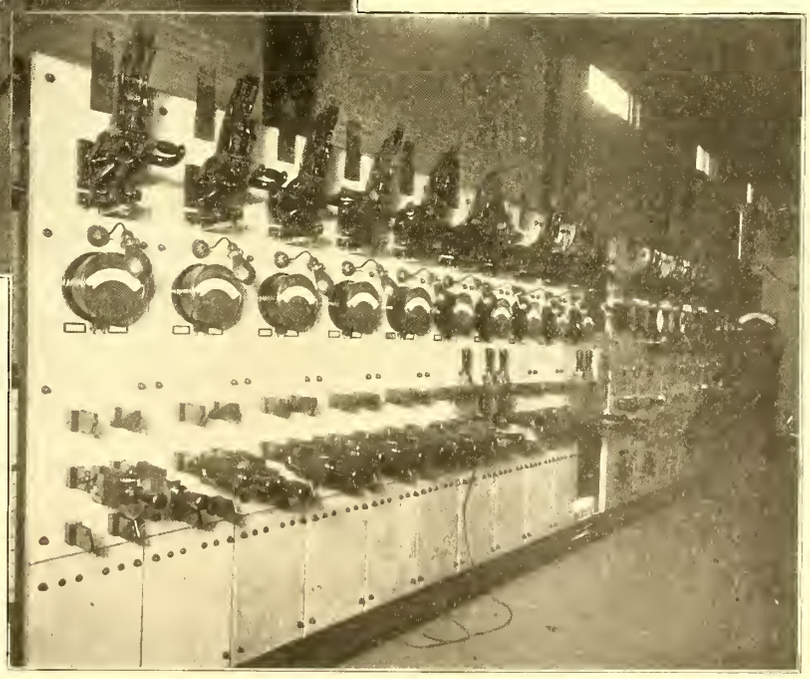


HIGH-TENSION BOARD OF HALSEY SUB-STATION



HIGH-TENSION BOARD, TOMPKINS STATION

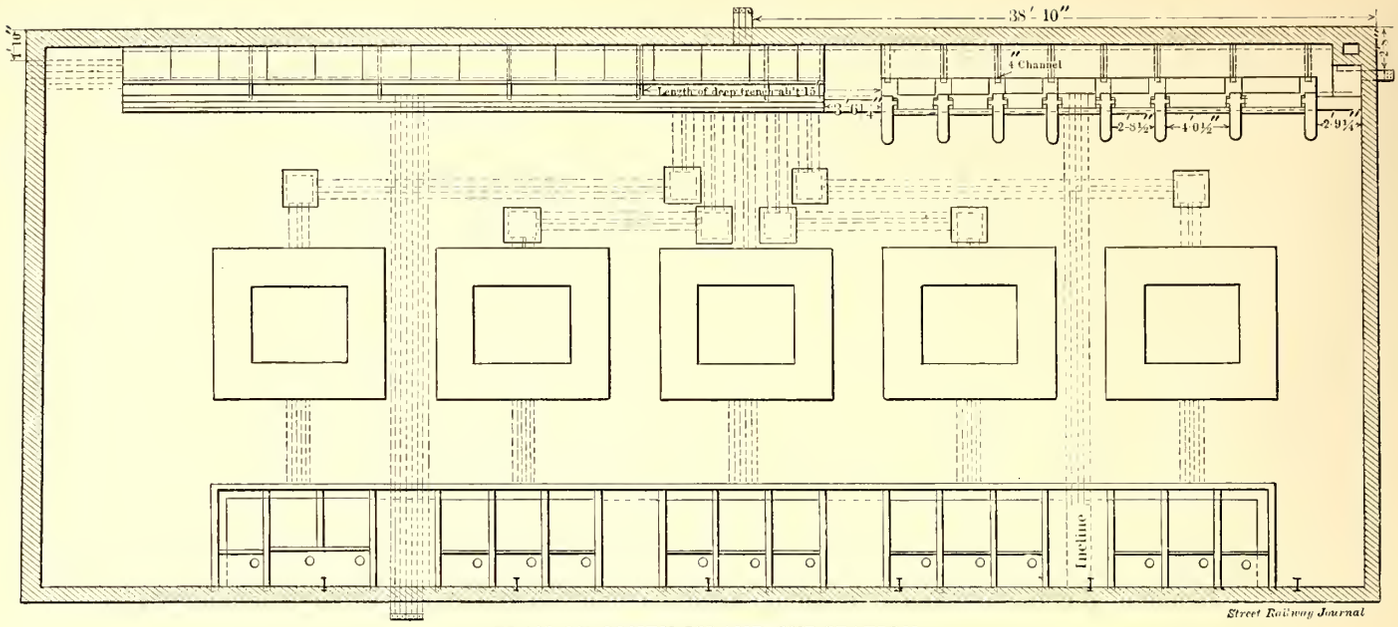




DIRECT-CURRENT SWITCHBOARDS, HALSEY AND CONEY ISLAND SUB-STATIONS

The accompanying illustrations show plans and interior views of four of the principal sub-stations, namely, the Tompkins sub-station, located at Tompkins Avenue and Fulton Street, which serves the central portion of the system; the Halsey sub-station, which serves the eastern district; the Essex sub-station, which furnishes power to the East New York district, and the Coney Island sub-station, which takes care of the large summer excursion business in that direction. There will be a fifth sub-station in Flatbush, which has not yet been commenced. This station will be near the Brighton Beach line and will supply power to the district now supplied by the Thirty-Ninth Street power station. The total proposed rotary capacity of the sub-stations is as follows: Essex sub-station, 2000 kw; Tompkins sub-station, 3500 kw; Halsey sub-station, 7000 kw; Coney Island sub-station, 3000 kw. Mention should also be made in this connection of two 1000-kw rotaries which are to be installed at the Fifty-Second Street power station in Bay Ridge. The foundations for these machines are already built and the switchboard apparatus has been installed. By using these rotaries at night it will be possible to shut down the entire steam plant of the station at that time, while during the day the excess direct-current power from the generators there can be transformed and distributed to other sections of the city on the high-tension mains. The introduction of only 2000 kw in rotaries at this point will, therefore, greatly increase the flexibility of the system.

The erection and equipping of the sub-stations and power station have been in charge of Mr. Roehl, and have been under the personal supervision of his assistant, C. B. Martin. In the construction a number of interesting engineering details have been introduced, of which a brief



PLAN OF CONEY ISLAND SUB-STATION

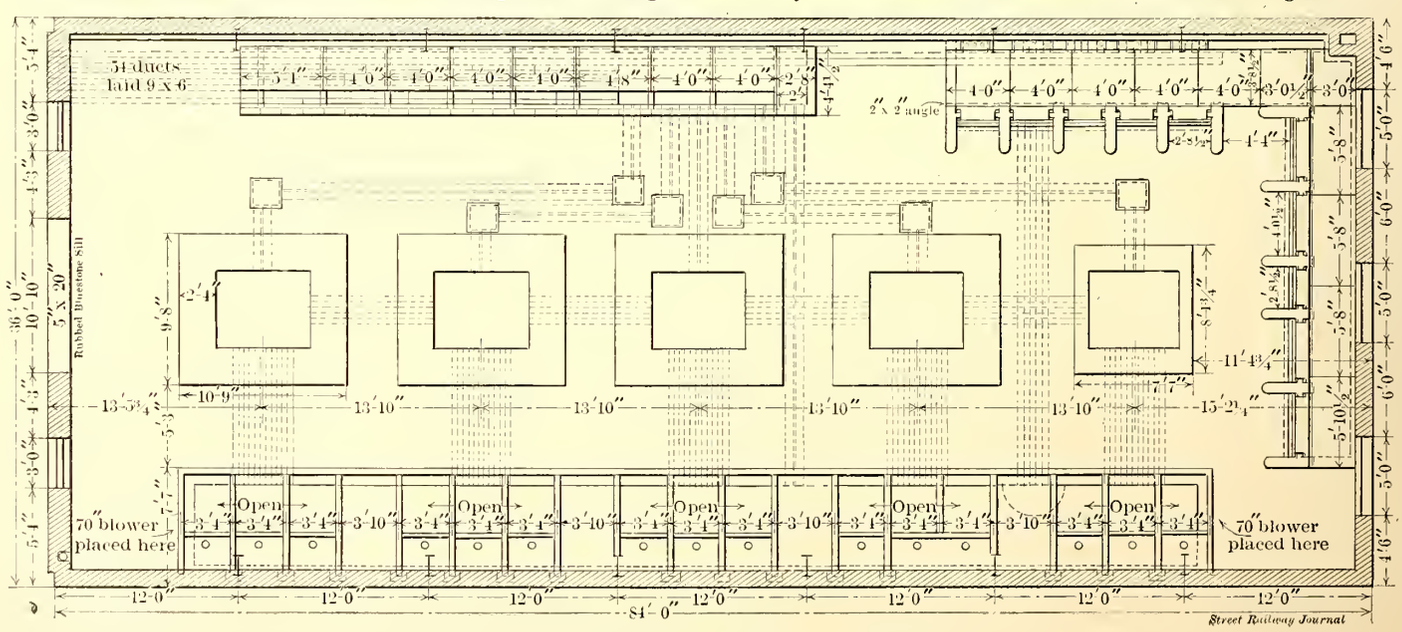
description should be given. Plans are shown of the Tompkins, Coney Island and Essex sub-stations, from

TOMPKINS SUB-STATION

which it will be seen that a general scheme of arrangement has been carried out in all. The wiring from the high-tension switchboard to the transformers, from the transformers to the rotaries, and from the rotaries to the direct-current switchboard, is all done by conduits placed in the floor. These conduits are made of ordinary 6-in. drain pipe in a number of

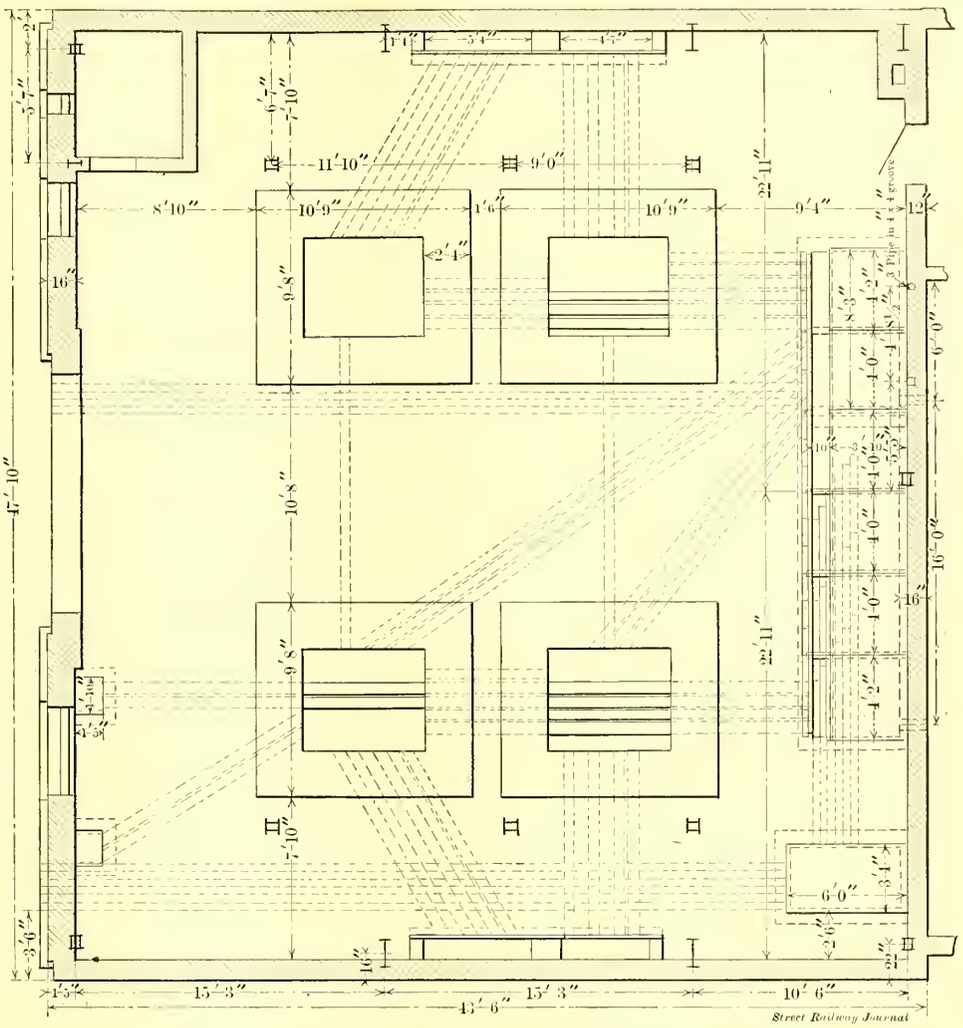
HALSEY SUB-STATION

cases, though some of the work has been done with the standard clay sectional conduit. The switchboard arrangement on



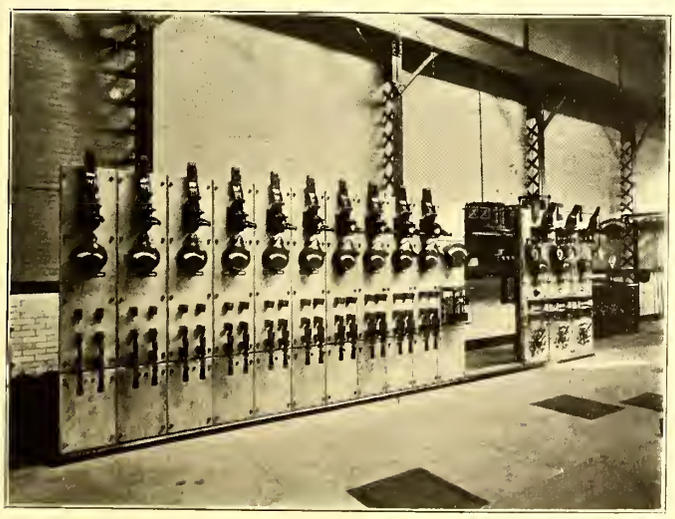
PLAN OF TOMPKINS SUB-STATION

the direct-current side is all of Westinghouse standard switchboard practice, with the circuit breaker at the top of the panels, the ammeter just below, with electric illuminating lamp above it, and the switches at a convenient level for the operator. On the feeder switchboards a "hospital" bus is connected to the lower switch contact, those of the main bus being on the upper contacts. The circuit breaker at the top of panel is placed in the circuit between the upper switch contacts and the main bus, and as there are generally two feeders to each panel protects two feeder circuits in parallel. In case of trouble on either feeder, therefore, the circuit breaker comes out. Should the trouble continue the feeder switch on that circuit is thrown down to the "hospital" bus, which is connected to the main bus by an auxiliary circuit breaker, and which, thus, localizes the trouble in the station to a single feeder. Any imperfect action of the circuit breakers on the main bus may, of course, be readily investigated and repaired by throwing down the switches on that panel to the "hospital" bus. The circuit breakers are of the carbon-break type, and have given so little trouble that this last use of the "hospital" bus is seldom found necessary. The high-tension boards are formed of stalls containing three-phase operating apparatus. It will be seen from the photographs reproduced herewith that the one at Tompkins sub-station is made of glazed brick. The high-tension switchboard at the Halsey sub-station, which is placed upon a gallery over the direct-current board, is made of hollow firebrick covered with plaster having a Winsor finish, which, while not giving as handsome an effect as the glazed brick, is decidedly lighter.

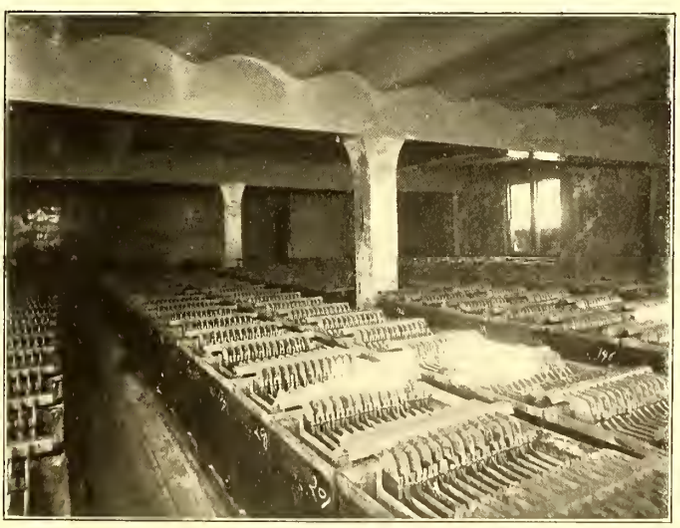


PLAN OF ESSEX SUB-STATION

All the transformers and rotary converters in the sub-stations as well as the switchboard apparatus was furnished by the Westinghouse Electric & Manufacturing Company, of Pittsburg, Pa. The Halsey sub-station equipment consists of five 1000-kw rotaries. This station also contains a booster made from two direct-current generators that were saved from a fire in one of the company's power stations a year or two ago, and which have been rewound for this service. In the view of the interior given on the first page of this article, this booster can be seen on the left, while on the right is shown the method of starting the rotaries by means of an induction motor. Throughout the entire system the rotaries are started in this manner. The Essex sub-station consists of a combined storage battery and rotary converter station. In the plans shown only the rotary room is given, the storage battery rooms being immediately behind, the rear part of the building consisting of two stories, both being occupied by the batteries. These are Chloride Accumulators, supplied by the Electric Storage Bat-



DIRECT-CURRENT BOARD, TOMPKINS SUB-STATION

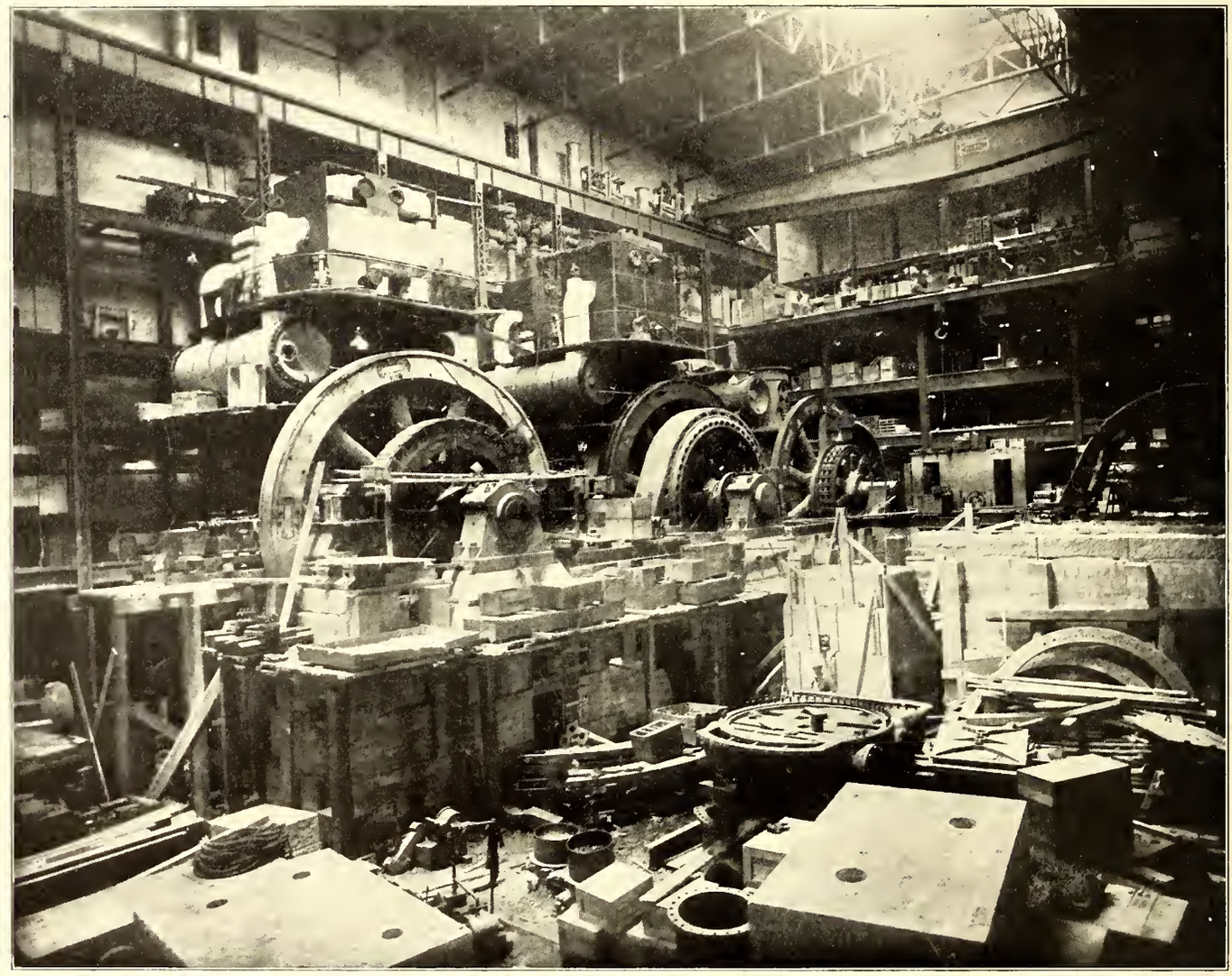


STORAGE BATTERY, ESSEX SUB-STATION

tery Company, of Philadelphia, and a view of one of the battery rooms is shown. The present capacity of the Essex battery is 2000-amp. hours. There has been installed one rotary converter of 1000-kw capacity, and there is accommodation for three other rotaries. The Tompkins sub-station contains two 1000-kw rotaries and one 500-kw rotary. The Coney Island sub-station is already equipped with its full complement of 3000 kw, containing one 1000-kw rotary and four 500-kw rotaries. This station is a very important one, although it serves a territory upon which only the summer traffic is heavy. It has been the custom to help out this part of the road by means of a portable storage battery, contained on old elevated cars, which could be moved from one part of the system to another, being used at East New York during the winter and at Coney Island during the summer. These cells have now been permanently placed at the Essex sub-station, as the completion of the Coney Island rotary sub-station has given sufficient current supply to this section of the system. It is the intention of the company to move a part of these rotaries to other sub-stations during the winter months to take care of the car-heater load. This will keep the equipment in use throughout the year and relieve the road from paying fixed charges on idle machines.

Nothing has been said in the above of the 6000-kw sub-station to be erected near the Brooklyn terminal of the Brooklyn Bridge, and to be known as the Bridge sub-station. The conduits for the high-tension feeders leading to the station have already been laid, four 1000-kw rotaries, the initial equipment, have been ordered, and the station is expected to be running before next winter.

A temporary sub-station has recently been constructed near the site of the permanent Bridge sub-station. It consists of a wooden building about 30 ft. x 50 ft. The walls are covered on the inside with asbestos board and the roof is of tin. This sub-station has been built during the last few weeks, and will receive high-tension current from the Edison Illuminating Company, which until recently was not available. The railway has been buying all the power it could get from the lighting company for many months, and this temporary sub-station will be used to handle any that may be set at liberty by the operation of the new power station, or such additional as can now be spared from the lighting circuits. The Manhattan and Brooklyn illuminating companies are connected by three-phase cables laid across the Brooklyn Bridge. One of these cables has been cut, and both ends are connected to the switchboard of the temporary sub-station. The controlling switches are so arranged that current can be obtained directly from Manhattan, directly from the Brooklyn power station or the two ends can be joined, and the illuminating companies work without connection with the railway circuits. The present installation of the sub-station consists of one 1000-kw Westinghouse rotary and three 400-kw transformers, but this is expected to be duplicated in the near future.

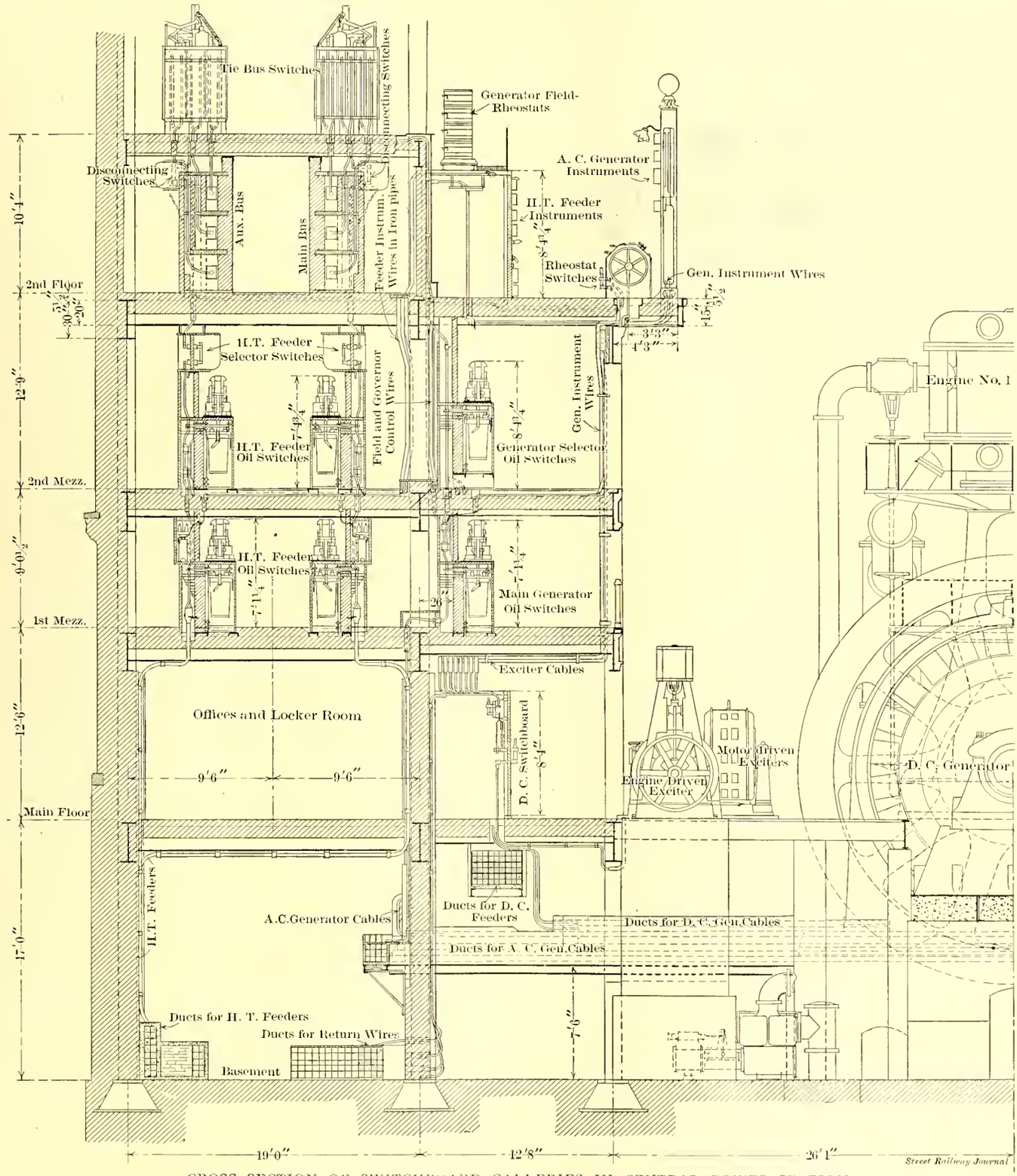


INTERIOR OF NEW STATION. THREE MACHINES NEARLY COMPLETED

The new Third Avenue power station, the plans of which were given in detail in Mr. Roehl's artcile, above referred to, is rapidly approaching completion, and it is expected

that within a week or two the first one of the alternating-current machines will be running. This station will be known as the "Central" station, to distinguish it from the "Southern" and "Eastern" stations on other parts of the system. The present condition of the interior is well shown by the illustrations, from which it will be seen that the two generators

There are several features of special interest in the design of the interior. The switching apparatus is all placed at the east end on a series of galleries, the operating board for the alternating current being on the second floor near the top of the station, and that for the direct current on the main floor. Down each side of the room run tiers of galleries about 6 ft.



CROSS SECTION OF SWITCHBOARD GALLERIES IN CENTRAL POWER STATION

adjoining the first one erected will also soon be finished. It is hoped that the entire station with its full complement of six alternating-current generators and two direct-current machines will be running by Nov. 1, in time to take care of the winter load next season. This station is one of the handsomest examples of central station design in the Metropolitan district. Ground was broken for the foundation in May 21, 1901, and the engineers of the road are to be congratulated at the rapid progress that has been made in its construction.

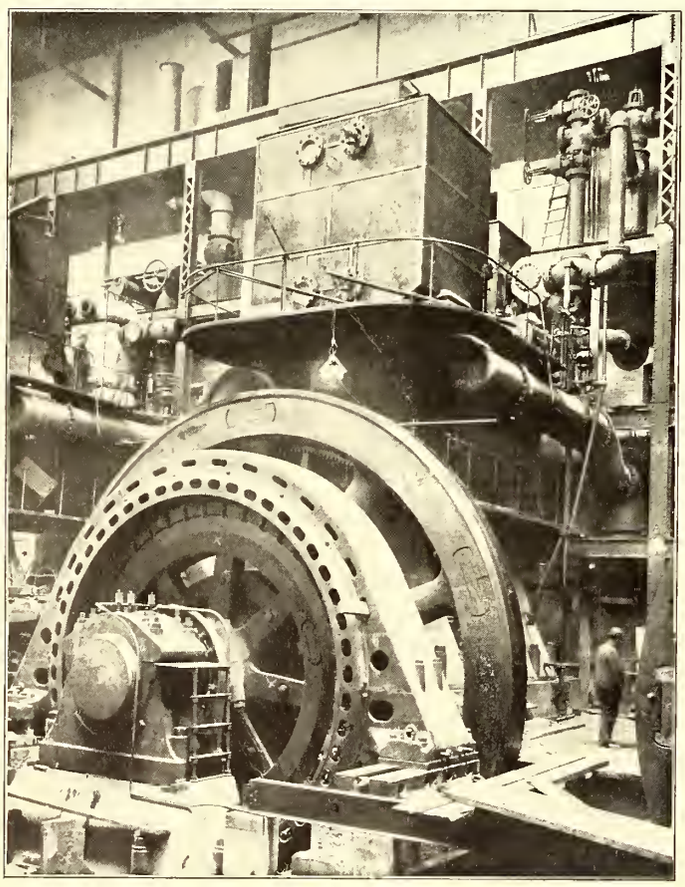
wide, which give access to the various stagings around the engines, and from one engine to another, as well as enabling workmen to get at any part of the steam piping and the large barometric condensers which are part of the engine equipment. About half way to the roof these longitudinal galleries are connected at the west end so that the workmen can readily move from one part of the station to another at the upper levels. The boiler room is in practically the same relative condition as the engine room, two batteries of boilers, four units in

all and sufficient to operate the first generator, being ready to start up.

A cross section is given of the east end of the station, showing the layout of the switching apparatus. Two 2700-kw

THE NEW CENTRAL STATION

direct-current machines are placed nearest this end, and their leads are brought directly to the direct-current switchboard on the first floor through a series of vitrified clay ducts. The high-



THE FIRST UNIT COMPLETED

tension leads from the alternating-current machines are carried in similar conduits to the center of the galleries, from which they are taken vertically to the switches above. In all there are twenty-eight ducts on each side of the station. This line of ducts is placed between the generators and the out-board bearings. The direct-current switchboard will contain the usual direct-current measuring instruments, generator panels and feeder panels. There are forty-four feeders running from this station, which supply current for the surface lines in the vicinity and for the Fifth Avenue Elevated, two blocks away. Separate panels and recording instruments are used for the two classes of service, so that the relative current consumption of each can be determined. The high-tension cables, after leaving the ducts, are carried vertically to the first mezzanine floor, where are placed three-phase high-tension oil switches, having circuit-breaker attachments. Above each of these main generator switches on the second mezzanine floor are two selector switches which connect with two sets of bus-bars on the second floor. Each pair of selector switches is connected by two sets of cables with the generator switch below, but interlocking devices on the switchboard operating switches prevent a generator from being thrown onto both sets of bus-bars at the same time. Between the selector switches and the bus-bar are placed air-break, hook-type switches, operated by long wooden handles, so that in case of emergency, such as the sticking of the oil switches, a positive break between the bus-bars and the generators can be made and the buses positively killed. The system of connection to the feeders is similar to that described for the generators. Two selector switches connected to the bus-bars by means of the auxiliary air-break hook-type switches connect each feeder switch with the two sets of bus-bars. Interlocking devices at the switchboard prevent the throwing of a feeder onto both buses at the same time. The main feeder switches, like the main generator switches, will act as automatic circuit breakers on an overload of current. From the feeder switches the cables run down vertically to below the main floor level, entering vitrified clay ducts and being carried to the conduits in the street. There will be fifteen high-tension three-phase feeders in the initial installation.

The oil switches are enclosed in brick casings with Alberene partitions and a removable Alberene slab in front. This material is very similar to soapstone. These switches are all motor-operated, 500-volt, current being taken from the trolley circuits or direct-current generators for this purpose. The bus-bars consist of heavy copper strips, supported on porcelain insulators having mica linings, and suspended in an enclosed gallery made of brick with brick columns in front of the bars. This gives complete access to the buses without danger of accidental contact being made. The bus-bars are in four sections, that is, the two sides of the station are separated. Three-phase oil-break switches, placed on the third mezzanine floor, above both the main and auxiliary buses, enable the operator to separate the two halves if occasion requires it, but ordinarily both sides of the station will be run together, the bus-bar tie switches being normally kept closed.

The exciter current for the alternating-current generators will be supplied at 150 volts by a direct-connected generating unit of 150 kw and two motor-driven generators of 150 kw each. These latter generators are driven by induction motors operated on the 6600-volt circuit, and it is expected to start them from the direct-current side in order to avoid the disturbance that might otherwise result in the lines by throwing on the high-tension current while the motors were at rest. The motor-driven sets are from the Westinghouse Electric & Manufacturing Company, and the engine-driven exciter consist of a 250-hp vertical engine, made by James Beggs & Company, of New York, direct coupled to a Westinghouse generator. This engine set is to be held as a reserve, the 300 kw from the motor sets being sufficient to furnish exciting current to the six alternators, which take 350 amps. each at 125 volts. It is expected to install a storage battery later, which will be kept floating on the exciter circuits and serve as a further reserve. The direct-current controlling apparatus on the switchboards is being

furnished by the Albert & J. M. Anderson Manufacturing Company, of Boston.

The following is a short summary of the apparatus to be installed in this station: The boilers are arranged on two floors, there being thirty-two 650-hp boilers in all with coal storage above. The boilers were furnished by the Aultman-Taylor Company, and are of the water-tube type, 6500 sq. ft. of heating surface each. Feed-water is supplied by pumps made by the George F. Blake Manufacturing Company, and will be heated to a temperature of about 212 degs. F., by Wainwright feed-water heaters, placed near the base of the barometric condensers in the engine room. The condensers are furnished by the Worthington Company, as are also the air pumps and other auxiliary apparatus relating thereto. The engines were built by the Allis-Chalmers Company, and are of the vertical marine type of 4000-hp rated capacity each, directly connected to Westinghouse 2700-kw generators. Although the most economical cut-off for the engines is at 4000 hp the guarantee calls for efficient working at 6000 hp, and the generators are also guaranteed to operate successfully under 50 per cent over load. Six of these generators are of the three-phase alternating-current, revolving-field type, generating current at 6600 volts and 25 cycles, and the other two are Westinghouse railway generators, delivering current at 575 volts. The steam pressure is to be 175 lbs. The 50-ton traveling crane with a 10-ton auxiliary hoist, which traverses the entire length of the engine room, was supplied by Alfred Box, of Philadelphia. Coal conveying apparatus is to be installed in duplicate, and will have a capacity of moving 125 tons of coal per hour. This limit being made by the capacity of the coal tower on the receiving dock. Ashes will be handled by means of an electric locomotive and hopper cars.

FREIGHT AND EXPRESS ON ELECTRIC RAILWAYS—II.

BY H. S. COOPER

As stated in a previous article there is now no doubt that the general "short-haul" carriage of freight and express by the electric roads, in any territory they may enter, will come as surely—and much more quickly—as did the short-haul carriage of passengers. The latter has not only paved the way for the former by educating the public in the possibilities and permanency of electric transit, but it has been the means of building many electric lines which will pay as freight roads but which could not have been built as such. Of the many strictly interurban electric roads in the United States over 50 per cent do a regular express and freight business, while over 25 per cent of the remainder carry packages, express or freight to a greater or lesser extent.

Almost without exception this business is not only a very remunerative part of their operating, but it grows in volume and scope in a way that leaves the purely passenger business far behind. This business and this growth has been not only in the face of bitter opposition from without but it has had to contend with ignorance from within. Those who operate this department have been, as a whole, much at sea as to the best classification, rates, service and handling, especially the first two. This does not mean that there is a universal doubt in the minds of individual managers or freight agents as to the correctness of their own particular practice, for of such doubt there appears to be too little, but it means that, back of all this individual certainty, there is a general feeling that the "other fellows" are not quite correct in their policy or practice, and where there is such a feeling it is a pretty sure sign that matters, as a whole, are not satisfactory—either at home or abroad.

This is especially true as to business beginning and ending locally—meaning by this term all business not taken from or delivered to another road, steam or electric. This local business is, at this time, an extremely short-haul affair, and as such is very much subject to local conditions, but, as the electric roads extend and join and cross, this business will be much extended and increased and will soon need a standard classification and rates of its own or at least it will need a standard "basis" for the same. While it is true that there are many cases where such local business is absolutely peculiar to a particular line or community it is, nevertheless, always reducible to terms of operating cost, and consequently to comparison with carriage costs of other—even if dissimilar—matter. Consequently, extraordinary charges in one locality while tolerated now, in the early stages of electric haulage, because of the absence of any present standard of comparison, or because local conditions permit them, will not be tolerated as soon as the business grows and outside practice and conditions become known. If the electric road haulage of express and freight were only a passing incident, or even if it were a fixed, but limited condition, the irregular and arbitrary rates and methods might continue without harm, but such is not the case. It must be remembered that this business is in its very swaddling clothes, a lusty infant with promise of a vigorous manhood, and consequently that its future must be specially looked to and it must not be allowed to contract habits or get into permanent ways that will injure or retard its growth. It is all very well to say, as has been frequently said of late in regard to this business, "What is the good of worrying over such future matters, they will take care of themselves when they arrive, just as they did in the passenger business. Don't cross a bridge until you come to it!" And yet, on many of these same roads, they are suffering under a heritage of irregular and arbitrary passenger fares, transfers, etc., that were allowed to drift along with the same idea that they were "to take care of themselves when the time arrived," and, like all procrastinated matters, they not only failed to do so but from their very continuance have accumulated a weight of precedent that makes it very difficult to change them. There is no time like the present to plan for the future.

With a view to obtaining information on the subject of local classification and traffic, correspondence was opened by the writer recently with a few of the leading interurban electric roads doing a regular express and freight business. The answers received were so diverse on all points and showed such lack of standard with "hit or miss" results that it was felt that it would be better to devote a little more time and trouble to the matter and find out fully what was actually being done in this field. To this end a personal letter was written to an official of every interurban electric railway in the United States and also to all suburban electric roads which served territory far outlying the corporate limits of their town or city. In connection with each letter was also sent an "inquiry sheet," containing questions applicable to the road to which they were sent. Owing to the "syndicating" of many roads into groups under one management, the number of letters sent out does not represent the actual number of electric roads in the United States that are doing an express and freight business, but the proportion of answers received do represent very closely the practice of a very large majority of all the roads. In addition to this correspondence an extended trip in the Middle West was made, and the express and freight operation of a large number of roads personally examined and the following facts and data are the result of the correspondence and visits.

Letters and inquiry sheets were sent to 147 separate, or separately operated, electric roads, and to the credit of the electric railway fraternity be it recorded, answers were received from 129 of them, which, allowing for some letters having gone astray, gotten into wrong hands or having been mislaid or forgotten, is a very creditable showing, considering that, in many cases, it took some time and trouble to answer them.

The answers were seldom perfunctory, and generally evinced a lively interest in the subject; they not only gave the information asked, where it was possible to give it, but the writers in many instances volunteered suggestions and ideas that had not been touched on in the questions sent them. The same may be said of those personally interviewed; full information was cheerfully given in regard to rates, classification, methods, etc.; forms, blanks and methods of accounting were freely exhibited, and while figures of costs and profit were not asked they were often voluntarily given, and in all cases full opinions were expressed as to the past, present and future of the business, and the concensus of the facts so gathered and the opinions so expressed are given in this and the preceding article.

Of the 129 companies which replied:

Forty-one do no express, package or freight business and do not expect to do any. Various reasons are assigned for this, the majority, however, being prevented from doing so by legislative or municipal enactments or by charter or franchise limitations.

Ten do no express or freight business but expect to do so as soon as possible. Most of these are new roads which are developing their passenger business primarily, and the others are urban or suburban roads who are just adding an interurban extension.

Sixteen do only a small package and express business on their regular passenger cars, using the conductor to attend to it, all the goods being brought to or taken from the car or waiting stations by the shipper and consignee. The rates charged by these roads are absolutely irregular, inconsistent and arbitrary; varying from 1-100 of a cent per pound-mile to 3 cents per pound-mile. All these charges appear to be (as one manager states) "regulated from time to time as emergencies arise." Another states that he considers the business "a necessary evil," and charges accordingly. Another "does it simply for the convenience of the passengers," and proceeds to charge them at a rate of about $60 per ton-mile, with a maximum allowed weight of 100 lbs. Others go to the other extreme and carry packages up to 50 lbs. in weight, 10 miles for 5 cents. Nearly all of these roads ring up their charges on the fare register, one or two of them having a special register for that purpose. In nearly all of these cases the charges are 5 cents or multiples of it.

Twelve do no "express" business themselves, but have made arrangements with outside public or private companies to take care of this business. These arrangements being private, no details were obtainable in regard to them other than the fact that in six cases the operating companies paid the railway companies a percentage on the gross receipts, the railway companies furnishing cars, power and motormen; in another case the operating company pays the railway company a per diem charge per car run over the whole line of road; in four other cases the operating company pays the railway company a fixed amount per 100 lbs. on all matter carried, regardless of distance. As stated, no details were given as to amounts, percentage or rates received by the railway companies, but all seemed to feel that it was in each case a remunerative arrangement for both parties and, on the part of the railways, that it relieved them of worry, risk and probable loss and damages, that it enabled them better to concentrate their efforts on their passenger business, and that it relieved and greatly simplified their accounting. In two of these cases there is reason to believe that the railway company or some of its stockholders are interested in the operating company, but this belief could not be verified.

Four roads do only a "special freight" business. One of them carries ore in its own cars at 20 cents per ton for a 2½-mile haul, the cars being loaded and unloaded by shipper and consignee. Another does a grain (corn, oats and wheat) business from and to elevators, store business and mills along its line, the rate on grain averaging about ¼ of a cent per bushel per mile, no loading or unloading being done by the road.

Another hauls logs to and lumber away from the saw-mills on its route, doing neither loading nor unloading, and averaging about 6 cents per ton-mile. Another hauls slate and building stone from quarries on a spur to its line, and averages 4¼ cents per ton-mile, neither loading nor unloading. The hauling in all these cases is done by an ordinary motor car, in two by a regular passenger motor car, running in between the regular passenger cars when travel is light.

Seven others, in addition to their regular business, mention that they have "special freight contracts" for hauling materials on their lines. These materials consist of lumber, wood pulp, pulp-wood, slate, building stone, lime, sugar beets, coal, fertilizers, etc. The rates range from 1½ cents per ton-mile, where the loading and unloading is not done by the road, to 15 cents per ton-mile where it is, the average being a little over 4½ cents per ton-mile.

Of the nearly fifty remaining roads, thirty-four do a regular express business, running cars for that purpose, and the rates as given by them are as follows:

	Minimum charge.	Minimum charge per mile.	Average rate per 100 lbs. per mile.	Collection and delivery.
No. 1	.10	.02	.02	Neither
" 5	Rates about 25 per cent lower than "old line express companies."			"
" 14	.10	.02	.01	"
" 19	.10	.01 4/10	.01 4/10	Delivery
" 22	Use official l cal classification and tariff of competing express companies.			Delivery
" 25	Use official local classification and tariff of competing express companies.			Neither
" 26	.15	.00½	.01	"
" 29	Use official local classification and tariff of competing express companies.			"
" 30	Based on official local classification and tariff of competing express companies; rates about 10 per cent to 15 per cent lower			"
" 39	.25	.05	.05	"
" 41	.10	.01½	.02½	"
" 44	.10	.03	.02	Delivery 2c. per 100 lbs.
" 51	Rates not given, "made low enough to get the business from the steam roads."			
" 53	.20	.05	.05	Neither
" 52	.10	.01	.02½	"
" 62	.05	01	.00 5/10	"
" 67	10	.02	.02	"
" 69	Use official local classification and tariff of competing express companies			"
" 70	.10	.01	.02	"
" 71	.10	.00⅓	charges based on official classification.	"
" 76	.05	.00⅓	.02	"
" 77	.10	.02	.02	"
" 78	.20	.01	not given	"
" 83	.15	.01	.02	"
" 84	.15	.01	Use official classification and add 10 per cent. to official tariff.	"
" 89	.10	.01	.01¼	"
" 99	.10	.01	.02	"
" 107	.15	.00½	.00½	"
" 113	.10	.01	.01	"
" 114	.05	.00½	.01	"
" 118	.10	.01	.01	"
" 120	Use official local classification and tariff.			"
" 121	.10	.00⅔	.01	"
" 123	.10	.00⅞	.01	"
" 126	"Based on official local classification and tariff."			"
" 128	"Based on official local classification and tariff."			"
" 135	15	.01	.01	"
" 136	.10	.02	.02	"

Note.—The "minimum charge" is the smallest amount for which any single package is carried any distance, and the "minimum charge per mile" is obtained by dividing the minimum charge by the longest distance for which it is carried. The "average rate per 100 lbs. per mile" is, on some roads, without regard to classification, such roads not using any; where

roads use a classification an average of the rates used have been given.

Any analysis of the above table is somewhat difficult, as outside of the fact that four use "the official local classification and tariff," that three "base their rates" on the same, and that very few give "doorstep" collection or delivery, there appears to be a delightful independence in regard to rates. The "minimum charge per mile" varies from one-third of a cent to 5 cents per mile, with an average, in twenty-eight roads, of 1.34 cents per mile. The "average rates per 100 lbs. per mile" are also very irregular, running from one-half cent to 5 cents, the average of twenty-five roads being 1 8-10 cents per 100 lbs. per mile, or 36 cents per 2000-lb. ton-mile.

Nine of the above roads, Nos. 1, 39, 41, 59, 62, 67, 83, 113 and 118, do an express business only, and their charges average a little above the general average, but their rates still include almost the lowest (8-10 cent) and highest (5 cents) among all. With one or two exceptions though, those roads which also do a freight business seem to have lower rates in proportion to service given, and from some of the "notices" and advertisements sent out to the public it would seem, as stated in the previous article on this subject, that where both an express and freight business is done by an electric road, and especially where the freight service almost equals that given by the express, any very large proportional difference between the two sets of charges on similar classes of goods would probably be resented by the customers. In confirmation of this belief several of the roads advertise "express at freight rates," and limit the difference between the two classes entirely by a maximum of "package weight" (varying from 15 lbs. to 50 lbs. per package), any excess over these weights placing the package in "special rate classes" or in the "freight."

In many cases local industries of large magnitude seem to necessitate "special rate" classes, which, when compared, give equally as irregular results as do the regular charges. In dairy, fruit or vegetable sections, such articles as butter, milk, small fruits in crates, apples and potatoes in barrels, peaches, onions and celery in crates, etc., are given special rates, which vary from 5 cents to $1.50 per ton-mile. In one or two cases the rates are made in the nature of a "fixed" or "general" charge, a certain amount being charged per unit package without regard to distance. This seems to be generally applicable, however, to only four classes—personal baggage, bicycles, baby-carriages and milk in cans—although it is applied in other cases to such farm products as are universal or general along the line of the road. In the carriage of milk in cans this seems almost universal, only two exceptions being noted in nearly twenty cases, and the custom of returning the empty cans free of charge is also general. The rate per gallon, however, follows the other "express" rates given, in being very irregular, running from ½ cent per gallon to 4 cents per gallon, the average of twenty-seven roads, which furnished milk rates, being a little less than 1½ cents per gallon. Of course, no figures could be obtained as to the average haul per gallon, but from a comparison of the location and lengths of the roads giving these rates there seemed to be no good reason for the variation shown in rates.

It would seem then, that so far as the practice of electric road express business is concerned, the only fact to be deduced is that it is utterly without any standard of either classification, rates, service or methods—a regular chaos—whose disorder has had some excuse in the past, as its growth has necessarily been on very irregular lines, but whose present extent and prospects not only warrants, but absolutely necessitates, that something be done at once to unify and standardize it.

Of the nearly fifty roads spoken of, which regularly do either an express, a freight or a combined express and freight business, there are four that do a freight business only and thirty-three that do both. Of this thirty-seven eighteen use absolutely the standard classification and local distance tariff of their competing or connecting steam road or roads.

Eight use absolutely the standard classification of the local steam roads, but vary on the tariff as follows:

One includes delivery at standard tariff rates.

One is "a little higher" (amount not given) than standard tariff rates.

One "averages lower" than standard tariff rates.

One adds for delivery 2 cents per 100 lbs. standard tariff rates.

One adds 10 per cent to standard tariff rates.

One "averages 25 per cent higher" than standard tariff rates.

One "averages higher" (amount not given) than standard tariff rates.

One "considerably lower" (amount not given) than standard tariff rates.

Three "base" their classification and rates on local steam-road practice with following variations:

One averages a little higher (amount not given).

Two "average lower."

Thus it will be seen that out of thirty-seven of the largest freight-carrying electric roads in the country eighteen, or 46 per cent, use the standard classification and local distance tariff absolutely, while eleven, or 28 per cent, "base" their rates on the same, thus recognizing it as a standard. This difference from the express part of the business appears to be mainly due to the fact that much more intertraffic is done by the electric roads with steam roads on freight than is done with the "old line" express companies on express and, as previously stated, in such intertraffic with the steam roads; these latter would of necessity insist that the classification used be identical with their own, and that in all "prorating" done between them their own tariff should be the basis. Another reason for this is that, at competing points between the electric and steam roads, the freight (as classified by the steam roads) is a much greater proportion of the business than is the express. This is probably due to the fact that very few of the electric roads have, as yet, more than one preponderatingly large town or city on their lines, and as the bulk of express is between large cities while the bulk of freight is between the country and large cities. The electric roads, therefore, do not come so seriously into competition with the large express companies as they will when they (the electric roads) or their extensions or electric connections are able to carry express directly between the larger cities.

The remaining eight freight-carrying roads, which do not use steam road classification or rates either as a standard or a basis, have rates which are as irregular and arbitrary as the average of the express rates. This is probably due to the fact that, as yet, none of them directly compete or connect with any steam road, and their rates have, therefore, been made either in competition with wagon-hauling or they have had local conditions which forced or enabled them to make either very low or very high rates. In some cases they seem to have followed the steam road maxim of "putting on all that the traffic will bear," while in others they seem to have "taken off all that the directors would bear." For instance, one road hauls brick at a rate of a little over 2 cents per ton-mile, while another charges 12 cents per ton-mile on lumber—both in car load lots. Another road says that its L. C. L. rate averages 2½ cents per ton-mile, while another states that it gets an average of 30 cents per ton-mile for L. C. L. lots.

Still, the fact that such a large proportion do have any standard is a hopeful sign, and, as a rule, the local standard steam road rates seem to be fairly remunerative when any fair amount of business is done. In most cases where traffic is interchanged with steam roads the electric roads prorate with them, and in several cases they have insisted on—and obtained—a "minimum" charge for their part of the service, independent of the classification or rate. This is an important point

and one that should always be insisted on in any traffic agreement with a steam road, as it gives a fixed amount instead of a contingent amount on which to base estimates of income, etc.

In the hauling of steam railroad cars over electric roads there are not as yet many electric roads so favorably situated either physically as to grades, curves and sub-structures on their lines, or by reason of steam road connections that they can do such hauling. These, however, are features which will be improved in the future. The increasing weight and speed of electric cars on interurban lines in necessitating the construction of the track, roadbed and sub-structures and the elimination of steep grades and sharp curves, all in accordance with strict steam railroad practice will, in the future, allow the hauling of steam road cars to a much greater extent than is now done. Also, the increasing number of electric roads which tap steam roads will greatly increase the opportunities for this branch of the business. This will be the case in electric roads, especially which connect or cross different steam roads and which thus will act as "junction" roads.

Eleven roads report the hauling of steam road cars upon their lines, and the following is the individual report of the charges in each case:

No.

22. So much per 100 lbs. or net ton, according to commodity or distance.
44. Charges are on ton-mile of contents. No rate given.
51. .02 cents to .04 cents per ton-mile, excluding weight of car (17 miles operated).
69. "Use regular Western classification."
70. 30 cents per ton of contents, minimum of 20 tons, any distance (9-mile road) if less than C. L.; class rates averaging 8 cents per ton-mile are charged.
87. Arbitrary switching charge.
89. Charges are largely "joint through tariffs;" a local tariff is in force and S. R. O's are used when required.
99. Haul steam-road cars on a 2-mile branch, charges are $3.00 per car.
114. Have switching charge of $3.00 for car and return to a certain point on line; arbitrary rate of about $1.33 per car-mile for further haul.
126. Charges are based on mileage hauled, and average about 75 cents per car-mile, return free.
128. Use "through joint tariff" of local steam roads.

It will be seen from the foregoing that there is quite a lack of uniformity in either the method or rate of charging for so simple a service. As this is peculiarly an interchange of traffic with the steam roads it would seem that their practice would have prevailed in this instance, but local conditions seem to have overruled them.

The question of forms and accounts was not gone into very thoroughly, nor was it intended to be, but a great many forms were sent on request, and an examination was made of both forms and methods of accounting on such roads as were personally visited. As might be expected from the other parts of the service, both the forms and methods of accounting were—to say the least—various. This is a matter, though, that can be safely left in the hands of the Accountants' Association, although it will be but justice to say that until the classification, rates and general practice of the express and freight operating departments of a large majority of the roads are unified and standardized, the work of the Accountants' Association will be somewhat that of making bricks without straw.

As previously explained, very few actual figures of the costs or profits of the freight and express departments were obtained even among those personally visited and none among those written to, but many expressions of opinion were given, both personally and by letter, as to the present condition and future prospects of these branches of the business, and they were, almost without exception, favorable; showing incontestably that, as a whole, the business was considered not only a presently remunerative one but that it promised even better results in the future. It would, undoubtedly be difficult at this time to obtain from the electric railways who are doing an express or freight business sufficient data of costs and income to show really how profitable a business it is, or, perhaps, whether it is profitable at all. One reason for this is that there are only a comparatively few of the larger roads which have sufficiently departmentized this section of their business to be able to state at all definitely as to their operating cost, and even with these there are quite a number of items of actual operating, such as power, track, roadway and overhead repairs, general car house expense, etc., that have to be arbitrarily proportioned between the passenger and freight departments, while very many of the "general" expenses have to be divided in like manner. The operating results could, of course, be obtained much closer if a recording wattmeter and a cyclometer were in use on all cars, and certain expenses proportioned according to mileage and kilowatt use.

Another difficulty in the way of obtaining such figures would be the reluctance of the roads themselves to give any publicity to them. With the present outcry against the "unrighteous" and "exorbitant" profits of corporations, especially of public service corporations such as electric railways, it behooves these latter to keep the details of their business as much to themselves as prying Legislatures, investigating committees and yellow journals will allow them to. In the special cases of express and freight this is all the more a necessity, as in addition to the previous triumvirate the steam roads and the old line express companies would be only too glad to have actual figures as ammunition in the war they are ceaselessly waging against the electric roads, a war which has taken on a more bitter phase since their freight and express profits have been trenched on.

So that it will probably be some time before the exact general status of the electric freight and express business will be publicly known, but still, to those who have watched the course of the business closely from the start there is no doubt that—judiciously managed and operated—these branches of electric railroading are profitable to a very fair degree. As to their enormous increase in the past that is patent to all, and a single visit to a dozen or so freight and express-carrying electric roads will prove that the future increase in both scope and amount will be much greater than in the past.

The crying needs at the present time are a practical and experienced knowledge of the subject by those managing it and a standardization of classification, tariffs, forms and methods. The former is being obtained by the employment of able men who have had full experience in the freight departments of steam roads and with the larger express companies. The latter can only be obtained by a direct organization of those having charge of these departments, a subsidiary organization to the American Street Railway Association, and formed on the lines of the Accountants' Association. There is even a greater need for such an organization of freight and express departments at the present time than there is of the master mechanics'. The standardization of the mechanical and electrical part of the business is a well-recognized necessity, but its deferring for a short time would work but little harm as long as that necessity is recognized, for that very recognition makes each individual master mechanic work separately, if slowly, towards the common end desired. But with the freight and express business such a necessity does not seem to be generally recognized by those engaged in it nor will it be until grave injury has been done to the business, unless such an organization, as is suggested, is soon formed and meets and acts. The writer ventures to say that the first general meeting of such an organization would do more to open the eyes of all concerned to its necessity than would any other one thing, for they would then realize the present chaotic condition of the business, the need of unification and standardization as well as a helpful unity among themselves.

STREET RAILWAY STRIKE AT WATERBURY

The disorderly element which gained the ascendency among the striking employees of the Connecticut Railway & Lighting Company, at Waterbury, on Jan. 30, is still in evidence in spite of the efforts of the local authorities and the State militia to suppress rioting. On Sunday, Feb. 1, the city was placed under martial law, and 1200 men of the Connecticut National Guard were assembled from other points to assist the local companies. Fourteen companies of the First and Second Regiments, at Hartford and New Haven, were pressed into service to relieve the local companies of the State militia. Disorder and rioting had been very frequent up to this time, and the company had been unable to operate its cars because of the attacks that had been made upon them by the strikers and their sympathizers. As soon as the troops arrived, however, they began patrolling the streets upon which the car lines operate, and order was restored in a measure at least, but for several days there were incipient outbreaks whenever a car appeared at an unprotected point that was accessible to the union men. It became so dangerous for persons to ride in the cars that the authorities were forced to adopt very severe measures, and consequently martial law was practically in force from the time of the arrival of the troops. Even with this protection it was found that the operation of the lines outside of the business district, especially after dark, was attended with great danger, as logs and other obstacles were thrown across the track and torpedoes were placed all along the line. Trolley wires were cut and cars ditched at several points. Many serious outbreaks were reported in the first two or three days after the arrivel of the troops, and even the cars guarded by militia were frequently attacked.

Early in the proceedings it became apparent that some of the militia were in sympathy with the strikers, and even wore pins bearing the inscription, "We Walk," which had been adopted by the union for distribution among the people of the town who desired to show their sympathy with the movement. As soon as this became known the management requested the withdrawal of the troops from the power house, as it was thought unsafe to leave them in command of such an important point when it was evident that they were in sympathy with the strikers. This action on the part of the company seemed to awaken among the self-respecting members of the militia a realization of the position in which they were placed, and it soon became apparent that only a comparatively small portion of the troops had become affected by the lawless sentiment that seemed to prevail throughout the town. A large majority of the visiting militia men discharged their duties in a prompt and satisfactory manner, and were highly commended by their officers and by the railway officials.

For more than a week this condition of affairs prevailed and then there was a lull which led the State officials to withdraw the troops from the city.

TROLLEY CAR AND UNION 'BUS

At the end of a week the last scene in the first military occupation of Waterbury was enacted when several companies of the Second Regiment of the Connecticut National Guard withdrew from the city, leaving only the two Waterbury companies of this regiment, which it was thought would be sufficient in case of an emergency. The First Regiment had already been withdrawn. Immediately upon the departure of the troops, however, rioting was resumed, and a great deal of damage has been done since then.

The company has found no difficulty in securing motormen and conductors to operate its cars, but owing to the disturbances the people are afraid to patronize them. Several efforts have been made to effect a compromise and secure an adjustment of the difficulties, but a final settlement seems as far distant as ever. The strikers have refused positively to agree to any settlement which does not include the reinstatement of the entire force with the exception of two men, accused of

intoxication, whose discharge led to the present trouble. The strikers now say that they will not demand the reinstatement of these two men, although the union ordered the strike because of their discharge, but they will insist upon the return of all other workmen who left their places at the behest of the union. The company, on the other hand, declines to discharge the men whom it secured to take the places of the strikers. The management is willing to give employment to as many union men as it will require to fill the places that are now vacant, but

DAMAGED TROLLEY CAR EMERGING FROM A STRIKERS' SALUTE

it cannot consistently turn out the men who have loyally stood by the company through the present difficulties.

The damages to the property of the company have been very heavy and will entail a general overhauling of the rolling stock. The cars that have been operated during the strike have been riddled with stones, and in some instances not only have the windows been broken but the sides of the cars have been very seriously damaged. Some of these cars look as if they had

CAR HOUSES GUARDED BY TROOPS

served as a target for a battering ram; others have been completely wrecked, and all bear evidence of the severe usage to which they have been subjected.

The strikers established a bus line with the intention of competing with the railway company and securing revenue for the union, but the people did not take kindly to the project, and the movement proved a failure. One of the pictures which is presented herewith shows one of these union 'buses in the heart of the city and also a trolley car, both being empty. Another picture shows a damaged car after a salute by the non-union men.

As usual the executive committee of the striking trolley men's union issued a statement disclaiming all connection with the riot, yet they denounced the authorities for taking steps to suppress disorder.

An attempt was made in the Board of Aldermen to pass a resolution appointing an arbitration committee, to consist of General Manager Sewell, Colonel Burpee, attorney for the railroad company; the Mayor, two Aldermen and two members of the Amalgamated Association of Street Railway Employees. It was voted down.

THIRD RAIL OPERATION ON THE AURORA, ELGIN AND CHICAGO RAILWAY

The Aurora, Elgin & Chicago Railway, representing, as it does, the highest development in electric interurban railway construction, is naturally the center of much interest, and problems coming up in its operation are many of them new. A description of the road appeared in the Street Railway Journal souvenir number for 1902.

Being a third-rail road of course it has had its troubles with sleet along with the rest. This is the first winter this road has been in operation, and the first two sleet storms caught the road unprepared. Since the first two, however, the sleet has been successfully battled with. The use of a solution of brine seems to be the most efficient way of fighting sleet that has yet been used by this company. The brine is put in a tank on the front platform, and fed through a ¼-in. rubber tube onto the third rail. The brine acts so quickly that even the first contact-shoe on the car will get current. The brine is applied from 5 ft. to 10 ft. in front of the first contact-shoe, and seems

MILITIAMEN AT MESS

to be a good enough conductor, so that the ice is at once rendered a sufficiently good conductor to allow some current to pass. The amount of brine required per mile is surprisingly small, a run of 24 miles having been made with 8 gals. of brine. A solution of calcium chloride is to be tried instead of brine.

There has been some criticism of the third rail for use on

high-speed interurban roads by some railway men who have ridden over this road at night, because there has been some flashing at the contact-shoes. Part of this flashing has been due to inequalities in the road bed, as the road is new, and the ballast not all settled yet. Running at high speed it takes but slight inequalities to make some flashing at the contact-shoes. It was found by the management that part of the flashing at the contact-shoes has been due to the fact that some of the track men, not being familiar with third-rail work, had put shims under the track rails, in order to bring them up to surface at some places where settling had taken place. This would be done at times when the ground would be so frozen that the ties themselves could not be raised. The effect of this was, of course, to raise the track rails without raising the third rail, because the third rail rests on every fifth tie. The variation in the relative height of track and third rails, of course, did not improve the contact, when running at very high speed. Indeed, in some places the track was so high with reference to the third rail that the shoes are almost lifted off the third rail.

One or two cars are equipped with the spring contact-shoe, devised by W. B. Potter, of the General Electric Company, and previously described in these columns. This shoe seems to be doing very good service. The majority of the cars are equipped with the usual type of third-rail shoe, weighing from 20 lbs. to 28 lbs., and depending upon its weight for contact, being hung loosely on links. Cast-iron links have been used for shoe suspension in the past, and these links were intentionally made the weakest part of the shoe, in order that they might be the first to break in case unusual strains or shocks were put upon the shoe. That is, it was more desirable to have the links break than to tear away the whole contact mechanism. Experience has seemed to indicate the desirability of having these links somewhat stronger, however, and cast-steel links are to be tried. A large number of contact-shoes have been lost off the cars since the operation of the road began by the breaking of the links at high speed when taking the crossings.

As mentioned in the description of this road experiments are to be tried with a short length of overhead trolley at the highway crossings. One crossing has been so equipped, but no trial has been made at present writing. The bow form of trolley on the car will necessarily have to be used, as it will have to take care of itself, with the car running at a very high speed. It is not anticipated by Secretary Bicknell that this will be a very satisfactory device, as even with a carefully arranged angle of approach on the trolley wire there will be considerable shock to the bow trolley and to the overhead work when a car runs under the trolley wire at 70 miles an hour. The cost of putting these overhead trolley wires at all the highway crossings on a system will be considerable, and it is feared that the maintenance will be large, because of the shocks which the overhead work will necessarily receive. Of course, such an overhead trolley would be used only for the purpose of keeping the lights burning at all times at night. The capacity of the bow trolley would not be sufficient to supply the current for the motors, which is from 400 amps. to 1200 amps. Then again, the use of a small storage battery on each car, to supply the lights during the interruption of the third rail at highway crossings, has been considered. Aside from the undesirability of maintaining a storage battery there is little room on one of these cars to place a storage battery, as the type M train-control apparatus and the air brake apparatus take up most of the room under the car. It is not unlikely that acetyline or Pintsch gas lighting will prove to be the best for this purpose. The amount that can be stored in a small tank of acetylene, according to some of the modern methods where a liquid absorbent is used for the gas, would supply a car with light for several days. The car could, of course, be lighted entirely by gas or with gas supplemented by electricity.

Shortly after this road went into operation it became apparent that in order to make the fast schedules which will ultimately be required, and, in fact, to maintain the present schedules on days of extra heavy traffic in the summer, it would be necessary to get the maximum efficiency out of the brakes. In other words, the rate of braking must be more rapid than has heretofore been common in the service stops on interurban roads. If brakes were applied with a constant pressure from the beginning to the end of a stop, much time would be lost, because of the slow rate of retarding the car at the higher speeds. Furthermore, the wheels are likely to be skidded at the lowest speeds. Of course, this is in accordance with the well-known principle of railway car braking, that the coefficient of friction between brake-shoes and wheels is much less at high speed than at low.

To obtain the maximum braking effect with the least danger of flat wheels the motormen have been instructed by a special air-brake instructor in the art of applying the brakes with a very high pressure at first, and gradually reducing this pressure as the car falls off in speed.

There is a rumor that some of the steam roads paralleling the tracks of the Aurora, Elgin & Chicago Railway have issued orders to the locomotive engineers not to race with the electric cars. Racing between the steam trains and electric cars has been very common. On an ordinary straight run, where the electric cars do not have to stop, they never fail to leave their steam competitors, and racing would, therefore, be somewhat uninteresting after the novelty wore off, were it not that the electric cars have to stop occasionally while the steam trains make very few stops. This gives the electric cars a handicap which frequently makes the race exciting to passengers of both lines.

THE COMING MASTER MECHANICS COMMITTEE MEETING

A committee of the master mechanics and electrical men of the electric railways of the country is to meet at the Hollenden Hotel, Cleveland, Ohio, Monday, Feb. 16, 1903, for the purpose of forming an organization. During the convention of the American Street Railway Association, held in Detroit last October, a meeting of the mechanics and electricians in attendance was called for the purpose of discussing the advisability of organizing an association for master mechanics, engineers and electricians connected with electric railways. In response to this call, which was possibly not as generally advertised as it might have been, an enthusiastic meeting was held, everyone present being very favorably impressed with the idea, and a committee was appointed to get the organization started.

At a subsequent meeting of the committee it was decided to interest the most influential street railway men throughout the country and solicit their aid in the movement. A letter has, therefore, been recently addressed to the master mechanics or chief electricians representing the largest street railway companies in the United States and Canada, to get their ideas on the subject, and to ask that it be brought before the management of the various companies to get their consent to become members of such an association, and to have them appoint representatives to meet with the new association at the next annual meeting of the American Street Railway Association.

The principal idea in forming this society is to bring master mechanics and electricians of the electric railway companies together for the purpose of improving and standardizing mechanical and electrical equipment. While the electrical and mechanical men have always had papers and discussions on topics which interested them at the meetings of the Street Railway Association, yet they are obliged to listen to so much that does not concern them that they feel that better results can be obtained by devoting all their time when in session to the dis-

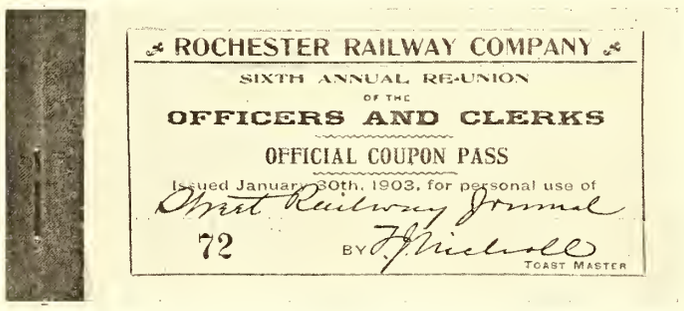
cussion of subjects in which they are directly interested. This would be of benefit, not only to the mechanical and electrical men, but to the American Street Railway Association, which would have that much more time to devote to other and broader questions.

The idea of the committee is to organize along the same lines as the Accountants' Association. The companies which are members of this association are paying dues of $20 a year, and appointing delegates to represent them at the annual meeting, which is held in conjunction with the American Street Railway Association convention. The committee asks the views of the electric railway men over the country for consideration at its meeting in Cleveland, and would also be glad to have any of the master mechanics or electricians outside of the committee present at its sessions to assist in forming the organization.

The committee consists of Thomas Farmer, superintendent of motive power, Detroit United Railway Company; E. W. Olds, superintendent of rolling stock, the Milwaukee Electric Railway & Light Company; William Pestel, superintendent of motive power, Worcester Consolidated Street Railway Company; G. W. Palmer, Jr., electrical engineer, Old Colony Street Railway, Fall River, Mass.; C. A. Brown, master mechanic, Toledo Railway & Light Company, Toledo, Ohio; W. O. Mundy, master mechanic, St. Louis Transit Company; Walter Mower, of the Detroit United Railway, is secretary for the committee.

UNIQUE ENTERTAINMENT AT ROCHESTER

The officers and clerks of the Rochester Railway Company held their sixth annual reunion on Jan. 30, and celebrated the completion of the sixth year of T. J. Nicholl's administration as vice-president and general manager of the system. Dinner was served at the Livingston Hotel, and an entertainment fol-


ROCHESTER RAILWAY COMPANY
SIXTH ANNUAL RE-UNION
OF THE
OFFICERS AND CLERKS
OFFICIAL COUPON PASS
Issued January 30th, 1903, for personal use of
Street Railway Journal
72 BY T. J. Nicholl
TOAST MASTER

CHARACTERISTIC PROGRAMME COVER

lowed, in which several of the officials participated. The arrangements for the affair had been made by a committee representing the officers and clerks, which was composed of Miss Lillian M. Taft, A. Green, G. G. Morehouse and F. M. Nicholl. A unique feature of the entertainment was the programme prepared by Miss Taft, which was printed in the form of an official coupon book, the outside front cover of which is represented in the accompanying cut.

Each coupon in the book was devoted to some particular feature of the entertainment, and the collection forms a very attractive souvenir of the occasion. Vice-President Nicholl was the guest of honor, and he was also called upon to preside at the entertainment that followed the dinner. Speeches were made by several officers of the company, and the event proved a most enjoyable one in every respect.

The annual meeting of the New York & New Jersey Railroad Company, which is to run trolley cars through the tunnel now being constructed under the Hudson River, was held recently. The following directors were elected: David Young, G. Tracy Rogers and Charles W. King.

NEW YORK CENTRAL'S APPOINTMENTS

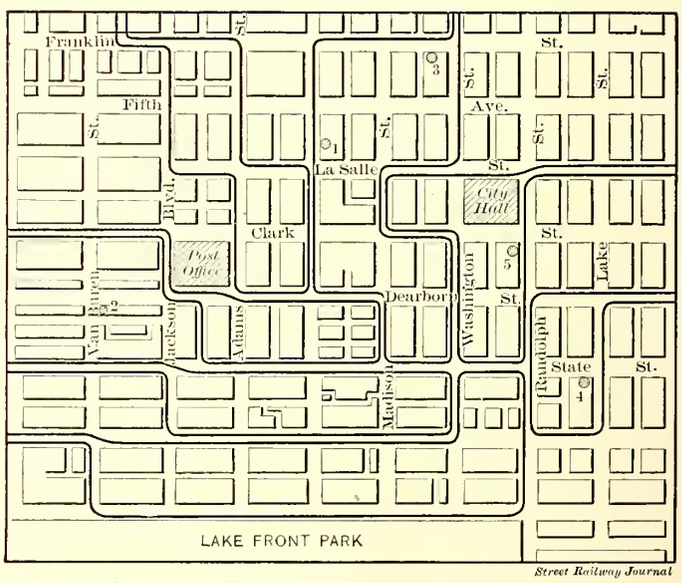
Official announcement has been made by W. J. Wilgus, fifth vice-president of the New York Central & Hudson River Railroad Company, that the electrification of certain portions of the various routes of the company in New York city and vicinity is in charge of a commission, consisting of himself and Messrs. Arnold, Sprague, Gibbs and Waitt. The plan of the organization of this commission and the work upon which it is to be engaged were explained in the Street Railway Journal of Jan. 17. It is now announced that the electrical and mechanical corps reporting to the commission is under the general charge of Edwin B. Katte, electrical engineer. John D. Keily has been selected as Mr. Katte's assistant, with the title of assistant electrical engineer.

Arthur J. Slade has been appointed mechanical engineer in charge of the designing and construction of heat, light and power plants, water and fuel supply stations, to succeed Mr. Katte, who has just been appointed electrical engineer. E. L. Brown has been appointed assistant steam engineer under Mr. Slade. All of these officers will be engaged upon the new work which the electrification of the Central's lines in and about New York will entail.

H. Fernstrom has been appointed chief engineer of the New York Central & Hudson River Railroad, with headquarters at Grand Central Station, New York, to succeed W. J. Wilgus, who has assumed the office of fifth vice-president.

ANOTHER SUBWAY PLAN FOR CHICAGO

The Illinois Telephone & Telegraph Company has already constructed several miles of low-level tunnels under the downtown streets of Chicago, and it is believed this system of tun-



ANOTHER TUNNEL PLAN PROPOSED FOR CHICAGO

nels would be interfered with somewhat by the low-level subways proposed in the report of B. J. Arnold to the local transportation committee. The company has submitted to the city plans for a system of high-level subways. The Arnold report, however, includes a system of high-level subways, which, in many respects, is superior to the one proposed by the telephone company. The scheme proposed by the telephone company is shown herewith. There is naturally some question as to what will be done with this telephone company's tunnels in Chicago in case it is decided to build a high and low-level or double-deck system of subways.

IMPROVEMENTS ON THE CHICAGO & MILWAUKEE ELECTRIC RAILWAY

The Chicago & Milwaukee Electric Railway Company, operating between Evanston, north of Chicago, and Waukegan, serving the suburban towns near the shore of Lake Michigan, is making extensive improvements looking toward heavier traffic and a faster service. The present service is a car every twenty minutes.

It will be remembered that this was among the first electric roads to employ polyphase transmission in connection with rotary converter sub-stations and storage batteries; heretofore the storage batteries at the sub-stations have been connected directly across the terminals of the rotary converters, which are shunt wound. There has, therefore, been no voltage compensation at the sub-stations for losses in the direct-current feeders. The present improvements will add differential boosters for the storage batteries to the sub-station equipment, so that the storage batteries will more effectively take their share of the fluctuation, and will also maintain a voltage which will compensate for the loss in the direct-current feeders just as a compound-wound generator would. The plans call for the use of longer and heavier cars, enabling the road to carry more people per car during the heavy summer traffic, which is more than double the winter traffic.

The new double-track line from Lake Forest to Libertyville will be in operation in the spring. This branch will be extended from Libertyville to some point in the inland lake district. The Arnold Electric Power Station Company is the consulting engineer for this road.

CHICAGO TRACTION CONFERENCES

Three lengthy conferences were held last week between the local transportation committee of the Chicago City Council and representatives of the Chicago Union Traction Company and the Chicago City Railway. Attorney J. S. Auerbach represented the Union Traction Company, and Attorney E. R. Bliss the Chicago City Railway Company. Other company representatives were present but took little part in the discussion.

At the first session it was agreed by both companies to proceed at once to a discussion of the terms of franchise renewals. Mr. Auerbach at the beginning of the first session read a statement, in which he expressed a desire on the part of the interests he represented to go to the State Legislature, hand in hand with the city of Chicago, to secure State legislation which would make some definite provisions as to what should be done at the expiration of franchises, making municipal ownership and purchase possible at the end of a twenty-year franchise grant, in order that there might be no uncertainty as to the position of the companies and the disposition to be made of the property at the end of the grant. Such legislation would provide that if the city did not take over the lines at the end of the franchise the franchises would either be extended or provision would be made by the city so that the existing lines would be purchased at their physical value. Mr. Bliss, for the Chicago City Railway Company, expressed willingness on the part of his company, to have such legislation enacted as was outlined by Mr. Auerbach. There was an attempt on the part of some members of the Council committee to get the traction representatives to say that they would at once waive all possible rights under the ninety-nine-year act; but this the traction men consistently refused to do until the terms of the proposed franchises were outlined. With satisfactory terms of extension they expressed willingness to waive these claims.

At later sessions these points were taken up more in detail, but no different conclusions arrived at. The committee proposed a franchise by which the city should have the option to purchase the companies' property at its physical value any time after the end of ten years, after giving six months' notice, or, in other words, a ten and one-half-year franchise. Both traction representatives objected to this as being too short a period, because of the difficulty of raising money for improvements to go into a property which would be sold at a second-hand value at the end of ten and one-half years. Further conferences will be held this week.

OPENING OF THE FOND DU LAC OSHKOSH INTERBURBAN

The new interurban line between Fond Du Lac and Oshkosh, Wis., was formally opened with appropriate ceremonies, Jan. 28, 1903. This road was built by the Columbia Construction Company, of Milwaukee, for the Fond Du Lac & Oshkosh Electric Railway Company. The road is 19 miles long, from the center of one city to the center of the other. T. F. Grover, president and manager of the Fond Du Lac Street Railway & Light Company, is also general manager of the interurban. The cost of this line, complete, including roadbed, rolling stock and improvements made in the power plant of the Fond Du Lac Street Railway & Light Company, amounts to $300,000. The rails are in 62-ft. lengths, weighing 70 lbs. to the yard. The standard overhead construction consists of two No. 0000 trolley wires. The rolling stock consists of four passenger cars and one McGuire rotary snow-sweeper.

A large party of prominent local Oshkosh and Fond Du Lac people celebrated the opening. A special car brought the Oshkosh visitors to Fond Du Lac for lunch at the Palmer Hotel. Over eighty persons sat down to the tables. After the lunch a number of toasts were given, in which a great deal of friendly feeling between the newly-joined cities was manifested. Clement C. Smith, president of the Columbia Construction Company, represented his company at the opening.

This road is but one in a long chain of interurbans which are being constructed and promoted in that part of Wisconsin. The grouping of a number of fair-sized towns in the neighborhood of Green Bay and Lake Winnebago makes that country especially tempting for the construction of interurbans.

The operating officers of the company are as follows: Manager, T. F. Grover; superintendent of transportation, Ralph Colman; superintendent of rolling stock, G. W. Porter; superintendent of roadway and overhead lines, H. S. Hayes.

STORAGE BATTERIES AND CARE FOR PEAK OF THE LOAD

Philadelphia, Feb. 9, 1903.

Editors Street Railway Journal:

The editorial in the issue of the Street Railway Journal of the 7th inst., under the caption, "Caring for the Peak of the Load" on a railway or lighting plant, does an injustice to storage batteries. It states that the cost of a storage battery to take a peak is about the same as that of extra engines, generators and boilers, but that the advantage of the latter is the lower cost of maintenance and operating expense and a higher efficiency. As your article states, "the most usual method of caring for a peak is by an installation of storage batteries," and experience has shown that in cases where the base line of the peak is not too great, a storage battery will meet the conditions more satisfactorily, both from an operating and financial standpoint, than extra generating capacity.

Under normal conditions the extra units would be used, but for a very short time during each twenty-four hours, whereas a storage battery, in addition to discharging on the peak, is always on the system; it acts as a regulator of potential and also as a reserve which can be instantly drawn upon in case of emergency. A battery has been aptly described as "the watch-

dog of the system," and has been compared to "a bank reserve." In railway plants the battery relieves the generating apparatus of the fluctuations of load throughout the day, reducing the number of units in service, and hence the cost of maintenance on the entire plant.

The efficiency of a storage battery, charged at times of light load, and therefore receiving energy produced at minimum cost, is fully as high as generating apparatus of the class described by you, which, being operated for but a very few hours a day, would show a much higher cost per unit of output than that of the machines from which the storage battery receives its power. The engines would not offer the same class of reserve as a battery, as a very appreciable length of time would be required in which to get them into operation after an emergency arose, during which time either the service must be impaired or the rest of the units be seriously overloaded or both.

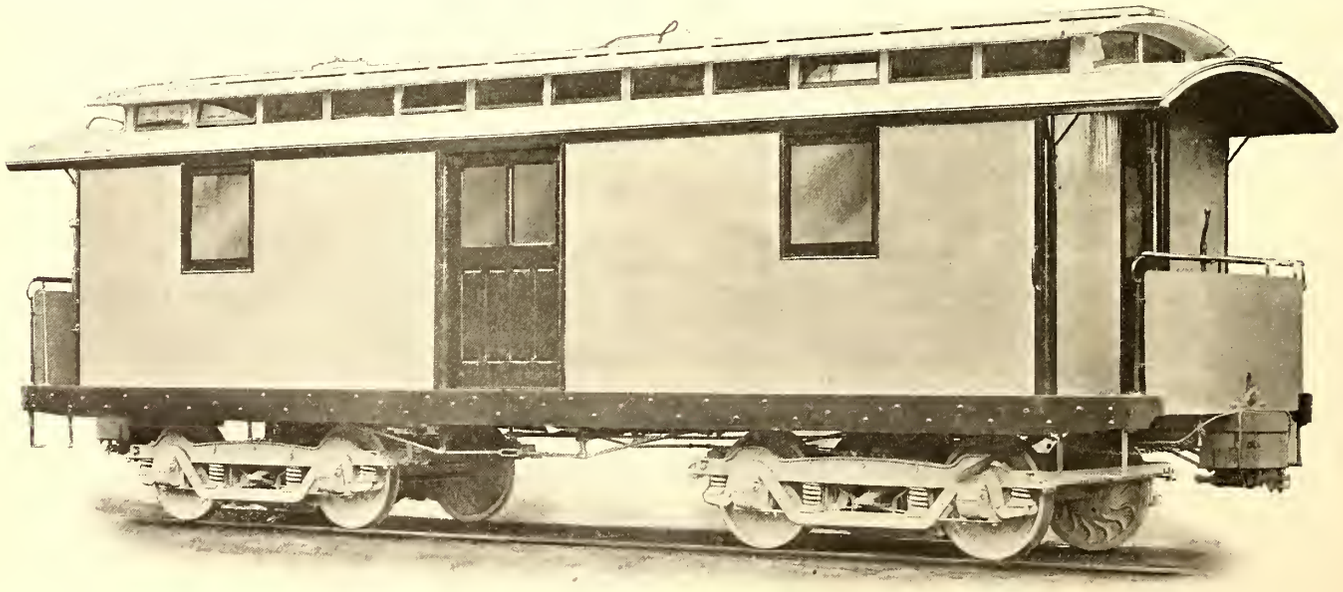
The labor required by the extra units would undoubtedly be greater than that required by the battery.

A comparison between the costs of maintenance of a battery and of maintenance and depreciation of the extra units would certainly not be to the disadvantage of the storage battery, especially if the reduction in maintenance on the entire generating plant affected by the storage battery be taken into consideration. The cost of maintenance of a battery includes its depreciation, inasmuch as the renewal of plates from time to time will keep it always up to date, whereas the repairs to a generating unit merely keep it in operation, and eventually the entire unit must be discarded. Moreover, a battery has the unique advantage of a flexibility which permits it to be adapted to changes in conditions over a very wide range. Its capacity and voltage can be increased or decreased by changing the number of plates per cell or the number of cells in series without destroying the value of the original investment.

Charles Blizard.

HEAVY SERVICE EXPRESS OR FREIGHT CAR

This car is one of several built by the John Stephenson Company, of Elizabeth, N. J. The construction is particularly strong and substantial, so that it can be used for hauling freight cars if necessary. There are four heavy longitudinal sills along the bottom, the outer ones being plated with deep steel plates. The sills are placed at a height similar to steam railway freight cars, but the buffers are built down so as to range with the buffers of the passenger cars, to prevent telescoping in case of a collision.

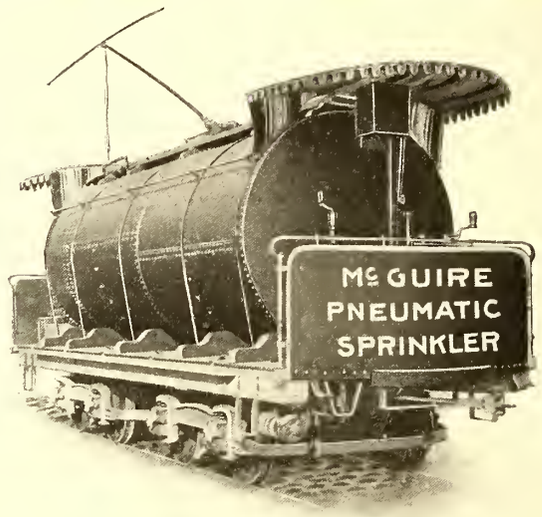


HEAVY CAR FOR FREIGHT AND EXPRESS SERVICE

This car is mounted on Stephenson No. 16 extra heavy trucks, having solid steel frames and double equalizing bars, which are looped over the boxes and terminate wide. Coil springs, placed at the ends of the frames, to prevent canting of truck when starting and stopping. The axles are 5 ins. in diameter, and wheels double plate. As in all types of Stephenson trucks the bolsters and boxes are M. C. B. standard pattern. Four heavy motors furnish the power. This car has all the usual appliances necessary for the operation of electric cars as well as a small writing desk at one end.

LARGE PNEUMATIC SPRINKLING CAR

Large sprinkling cars in which constant pressure is maintained by compressed air, and the water is put in a closed steel tank to permit this to be done, are now made by the McGuire Manufacturing Company. A 4000-gal. double-truck pneumatic sprinkling car is shown in the accompanying engraving. The tank is made of steel, 6 ft. 6 ins. x 18 ft. 6 ins., provided with an inside head, 30 ft. from one end, making an air chamber or air reservoir, 30 ins. x 78 ins., for storage of compressed air. The remainder of the tank is the water compartment.



LARGE SPRINKLING CAR

The width of the street it will sprinkle is governed by the air pressure supplied to the water compartment. This pressure is controlled by a reducing, regulating valve. Variation in the

distance the water is sprayed is governed by a lever operated by the foot, readily controlled from maximum discharge to quick shut-off by spring action when meeting carriage or vehicle.

The car is provided with an annular sprinkling head at each end, which discharges the water in sheets, maintaining its unity 12 ins. to 18 ins. from the head. Either or both sides of the street may be sprinkled. The cars are designed to spread water very rapidly when desired, and hence will allow running them at a rapid rate of speed. The sprinkling heads are adjustable for either small or large discharge.

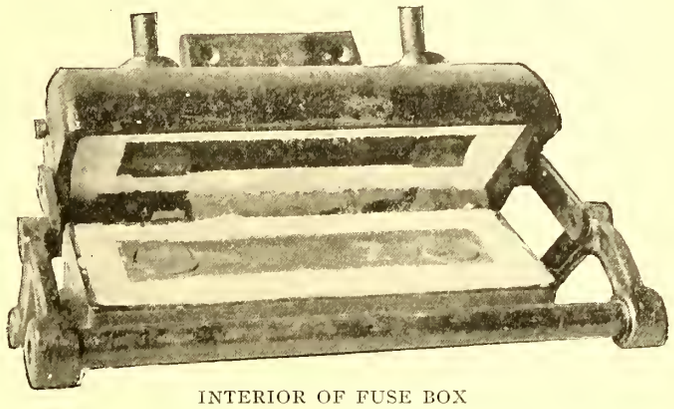
The plan embodies a well tried air compressing system similar to that used for air-brake service, consisting of an independent electric motor-driven air compressor of ample capacity, and a high-pressure air reservoir, into which the air is compressed to 75 lbs. or 80 lbs. The air reservoir has a large capacity, nearly sufficient to empty a tank of water with 10 lbs. pressure. This avoids the necessity of operating the air compressor constantly. A six to ten-minute run of the compressor will fill the air reservoir to 75 lbs. pressure, avoiding the complications and troubles inherent to axle-driven compressors or motor pumps pumping water from tank directly to the sprinkling head. These sprinklers are made with tanks of 3000 gal. to 5000 gal. capacity.

CHICAGO CITY RAILWAY BROOMS

The Chicago City Railway puts up its own brooms for sweepers. A separate department is maintained for this purpose. The rattan, as purchased in the market, is split. This gives the broom greater flexibility and consequently longer life, as it has been found that the ordinary rattan, which has not been split, is so stiff that it is more likely to break in service. The split rattan pieces of the proper length are tied together in bunches of the right size to fit into the holes in the hub of the sweeper. These bunches are stuck into the hub after having the ends dipped into a compound of hot tar and rosin.

PROTECTION OF STREET CAR MOTORS

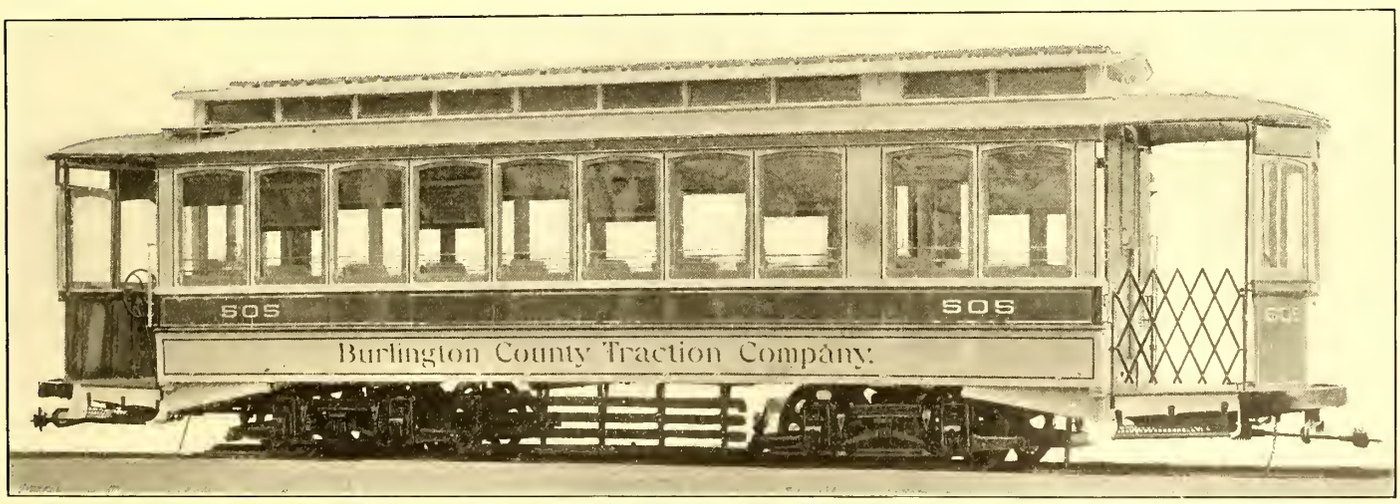
Where it is not thought advisable to incur the expense of equipping all the cars of a line with automatic circuit breakers a fuse block is substituted, possessing the same qualities of easy accessibility, renewal and freedom from danger, such as is shown in the accompanying illustration. When open the contacts on which the fuse is cut out of the circuit, making it safe to replace the fuse while the line is alive. A straight piece of copper wire is used as a fuse and is secured in place and clamped in the contacts by the act of closing the block. When a fuse blows all that is necessary is to open the block, drop a piece of straight copper wire in place and then close it again. The form shown herewith is made by the Westinghouse Electric & Manufacturing Company, and is completely enclosed in an iron casing, excepting where the vent for the arc extends through the bottom.



INTERIOR OF FUSE BOX

NEW CARS FOR THE BURLINGTON COUNTY TRACTION COMPANY

The J. G. Brill Company, of Philadelphia, has recently completed five semi-convertible cars for the Burlington County Traction Company, of Burlington, N. J., of a type similar to those furnished by the Brill Company to the Philadelphia Traction Company. The window sashes are removable, and when in position are held securely by locks which are operated by a key. The curtains are of waterproof material and the edges extend into the grooves, so that there is protection from rain and wind when the windows are removed. This method does away with wall window pockets, and by placing the ends of the seats close to the side lining between the posts, affords more aisle space. The cars have smoking compartments, which will seat eight passengers; the length of the compartment is 6 ft. 6 ins. The partition between the compartments is of glass, with single sliding door. Spring cane walk-over seats have 33 ins. of seating space, and the total seating capacity of the cars is forty.



NEW BURLINGTON CARS

The cars are very stanchly built, having 4-in. x 7¾-in. white oak side sills, plated with ⅜-in. x 12-in. steel. These wide steel plates extend up the base of the posts, and aid materially in strengthening them. The end sills are also of white oak, 5¼ ins. x 6¾ ins., and the cross joists 3½ ins. x 7⅝ ins. The thickness of the corner posts is 3¾ ins., and that of the side posts 3¼ ins. The sweep of the posts is 1¾ ins. The outside

knees of the platforms are plated the full width with ½-in. steel. The platforms are fitted with Brill portable vestibules. When the vestibules are removed and the windows taken out the car is practically as open as a regular summer car. The interior finish of the cars is white ash with ceilings of decorated three-ply birch veneer.

The general dimensions of the cars are as follows: Length over end panels, 29 ft.; length over crown pieces, 39 ft.; width over sills, 7 ft 11½ ins.; width over posts at belt rail, 8 ft. 2 ins., and height over trolley board, 12 ft. The cars are equipped with sand boxes, "Dedenda" gongs, radial draw bars, folding gates, angle-iron bumpers and other specialties, all of which are made by the builders. The trucks are Brill 27-G type.

EXTENSIONS AT ST. LOUIS

In continuing the work of improving the system of the St. Louis & Suburban Railroad, of St. Louis, began last year, the expenditure of $1,500,000 during the coming year is proposed by the company.

All that portion of the company's tracks between Sarah Street and the Suburban Garden has been torn up and new T-rails of the heaviest pattern have been laid. From Vanderventer Avenue east to Sixth and Locust Streets the old tracks have also been torn up, and new girder rail of the heaviest pattern have been laid. A loop has been placed in service at Union Avenue, and a new service is to be placed in operation at once. The Union Avenue cars will run from Sixth and Locust Streets to the loop and return. The power stations are to be reconstructed. In the boiler room the old tubular boilers are to be replaced by safety water tube boilers, eight in number. This work is now well under way and will increase the capacity of the steam plant 75 per cent. In the engine room it is proposed to install a 1600-hp engine with a 1200-kw alternator direct connected. This engine will be a duplicate of one erected last summer. The present Hamilton-Corliss engines, operating 800-kw machines, direct connected, will be reconstructed with new cylinders, valve settings, gearings, etc., to run at an initial pressure of 165 lbs. of steam; the steam pipings, separators and piping in general are to be reconstructed.

The car houses are to be improved and rebuilt, with pits for suitable repairs to the cars. Separate tracks are to enter the car house, with the switches outside of the buildings.

The intention is to change the color of all the cars to an olive green, which has been adopted by the company as the standard color. All cars are to be equipped with new trucks of the M. C. B. type, specially designed by the St. Louis Car Company for the Suburban Company. The cars will be equipped with four motors and air brakes. In addition to reconstructing and remodeling the new cars now in use on the system, fifty cars will be added to the service. They are being constructed by the St. Louis Car Company.

These new cars will be 9 ft. longer than the present cars, and will be vestibuled at both ends. They are also to be provided with the Smith arc electric headlight.

Plans are also under way for the construction of buildings and grounds for a car house, general market stores, flats, large hall and club house for the employees.

NEW YORK'S TRAFFIC OBSTRUCTION

State Railroad Commissioner Baker had a conference last Monday with Police Commissioner Greene on the subject of controlling vehicular traffic on New York's crowded streets. General Greene has already expressed a desire to aid the Commissioners along this line. He estimates that 10 per cent of the surface trouble will be obviated by proper and legitimate traffic regulations. A report has been submitted by the Interurban Street Railway Company, giving in detail for the first fifteen days in January the cause and time limit of each delay on the road. Each page of it shows for each day cases where the service has been held up for periods varying from forty-five minutes to one hour and forty-five minutes by trucks. This, happening at strategic points, means that the entire main thoroughfare is temporarily disabled. Similar statistics, accompanied by maps and diagrams, were submitted by the company during the recent hearing, and were produced in the Street Railway Journal of Jan. 17.

POWER PROBLEMS AT DENVER

The Denver City Tramway Company during the past two years has built a large direct-current power house on the Platte River, between Fourteenth Street and Fifteenth Street, adjacent to condensing water and to railroad sidings. This station is well situated for a direct-current power house, being near to the heaviest grades on the north side of the city, and also near to the downtown center of load.

The company, however, has a number of long suburban lines, and as the growth of the population has been considerable in the past few years along these longest lines the importance of better voltage on these lines is becoming more and more a matter for consideration. Three of these longest surburban lines are in a southeasterly direction. Another line, which partakes of many of the characteristics of an interurban road, has just been finished northwest a distance of 18 miles, to some coal mines which the company controls. It is also probable that this latter line will be extended into the mountains, to secure tourist passenger traffic, as there is at present no trolley line and only infrequent steam service from Denver to the mountains, although Denver is near the foot hills. This line is in the direction of Boulder.

The rapid increase in traffic of the past two years has made necessary an addition to the new power house, which is now being planned, and will consist of both alternating and direct-current units. The alternating-current units will feed sub-stations supplying the more distant portions of the line. The 18-mile line toward Boulder, which is now finished as far as the coal mines, will be supplied at 26,000 volts.

One somewhat trying condition to be met in Denver is that heavy loads sometimes occur on the very long lines. A freight car containing a small sub-station will probably be used to take care of these temporary loads.

MULTIPLE UNIT COAL TRAINS

The company, will of course, haul its own coal the 18 miles from its mines to Denver, and will also supply some other large consumers in Denver. Coal motor cars, equipped with four motors each, will furnish the motive power on these coal trains. Each motor car will usually take care of about three trailers. When additional cars are to be run in one train, another motor car will be put on, and the length of the train will then be increased to eight cars. The train-control system will be used, so that one man will control all the motor cars in the train.

The grades, after leaving Denver, are but slightly over 1 per cent, the slope being toward Denver, so that the grades will aid the motor cars hauling the coal.

COAL CAR VS. POLE-LINE TRANSMISSION

At the time this power house was first started, L. L. Summers, of Chicago, the consulting engineer, gave careful consideration to the possibility of locating a power house directly at the coal mines, and transmitting electrical energy at high voltage into Denver to several sub-stations there, instead of locating the power house at Denver, and hauling coal from the mines to the power house. In other words, estimates were made on the efficiency of electrical transmission vs. transmission of the coal in coal cars. It was found that the cost of hauling and switching for the 18 miles would probably be less than the interest on the investment, which would be required for high voltage transmission.

FINANCIAL INTELLIGENCE

The Money Market

WALL STREET, FEB. 11, 1903.

The money market, confirming expectations, continues to work toward a lower level. Business has been active during the past fortnight, but the activity reflects rather the pressure of lenders to place their funds than the desire of their customers to borrow. The whole situation is best depicted by the quotations for money themselves. For all periods from sixty days to six months 4½ per cent is the ruling figure, while many of the sixty to ninety-day contracts are being written as low as 4 per cent. Call money, meanwhile, brings at the outside 3 per cent, and the bulk of the transactions occur at 2¾. It is a fact of curious significance that the competition to lend is keener in the time money than in the call money branch. This shows, of course, the confidence felt in the indefinite continuance of the present conditions. Two striking developments seem to have followed very naturally from this state of affairs. One is renewed liquidation of last year's advances of foreign capital, the other a rapid expansion of the domestic loan account. According to the highest authorities, our indebtedness abroad is comparatively small, and at the rate it is now being canceled it will soon have been entirely extinguished. This is a most reassuring fact, of course, for the future. Outstanding loans of the New York banks have reached a total which, with one exception—last August—is the largest ever recorded in the history of the local Clearing House. The reason for the recent heavy increases—$34,000,000 within the last two weeks—is that the great syndicate transactions of one sort or another which were held up during the autumn stringency are seizing the present favorable opportunity to push on to completion. It will probably be made clear, however, that both the enormous loan expansion and the heavy losses in cash, which combined to produce last Saturday's decrease of $9,000,000 in surplus reserve, were abnormal. This week so far the banks are again creditors in their operations with the Treasury, while they continue to gain, although in greatly reduced quantity, through the interior exchanges. With the past ten days foreign exchange has risen steadily, so that once more it approximates the gold export point. Yet even the most sensitive critics have to admit that, whether we do or do not send gold to Europe, is, in view of the easy money conditions at home and abroad, a matter of little concern.

The Stock Market

The stock market has at length awakened from the lethargy which characterized it for a month or more. For a time after the culmination of the January rise speculative opinion was divided, and one contingent numbering a great many experienced traders were inclined to think that lower prices would result from the existing financial conditions. They based their belief on the fact that an immense supply of new securities having no fixed market value, were being carried by the banking syndicate, and this, together with the absence of the speculative public, they urged, would deprive the regular market of the buying power necessary to any important advance. It is now recognized that whatever force this argument may have for the future it is outweighed for the present by other facts in the situation which are favorable to a higher market. Chief among these, of course, are the excellent position of trade and railway earnings, the easy money market, the growing foreign trade and the concentration of stocks in the hands of a comparatively few powerful speculative interests. Attempts to force a decline during the latter part of last month having failed, speculative attention has turned with considerable unanimity to the possibilities of a movement in the opposite direction. The ease with which prices have risen during the last few days indicates that this campaign is likely to be a success. A certain latent uneasiness is visible, especially in the foreign markets, over the gathering war clouds in the Balkan Peninsula, and ultra-cautious people are not wholly satisfied that the Venezuela controversy has finally lost its serious aspects. But as yet neither of these factors appear to be of sufficient consequence to check the upward tendency of the market. There have been few times in fact during the last year or two when the financial horizon has seemed more clear.

The local traction stocks have not borne as conspicuous a part in the recent trading as they have at various former times in the season. Still they have shared in the general speculative revival of the last few days, and have all risen rather sharply. The liquidation recently noted in Metropolitan and Metropolitan Securities seems to be over, and the shares have risen partly on investment purchases, attracted by their comparatively low quotations and partly on the covering of a scattered short interest. The general opinion that Manhattan would gradually work away from the field of active speculation and become a more strictly investment issue appears being borne out by current developments. The change in the Brooklyn Rapid Transit directorate has suggested the probability that the representatives of new financial interests in the management may have been adding to their holdings. Some outside buying has been based on this theory and on the further idea that the new capitalists on the board will not be averse to seeing the stock assume a more prominent place in the speculation.

Philadelphia

The last two weeks in Philadelphia, so far as the street railway specialties are concerned, have been singularly unimportant. Business has been exceedingly dull and price changes small and inconsequential. Union Traction, for instance, has not moved outside the range of 46¾-47 during the entire period. Rapid Transit, which has been until lately an active leader, has done scarcely anything, a few trifling purchases carrying the price up from 15 to 16. All the Philadelphia Traction that has changed hands has brought either 98½ or 98⅜. American Railways has varied between 51⅞ and 52¼. Consolidated Traction of New Jersey has been weak at a decline from 66 to 65. Several hundred Reading Traction sold at 30, and there were odd-lot sales of Indianapolis Street Railway at 84½, Union Traction of Indiana at 50 and United Traction of Pittsburg preferred at 51¾. This completes the business record of the past two weeks.

Chicago

Nothing that is at all authoritative has been announced during the fortnight in connection with the readjustment of the Chicago surface properties. Union Traction common sold as low as 8¾ a week ago, but has since rallied to 11. This recovery is due probably to assurances from semi-official sources that in no event will there be any assessment on the stock. Otherwise the outcome of the plans now in progress is a mere matter of guesswork. City Railway shares, after reaching 235, dropped suddenly to 230. West Chicago was very weak in sympathy with the decline in Union Traction, falling from 88½ to 85. North Chicago also broke to 165. The action of the Metropolitan Elevated directors in voting a semi-annual dividend of only 1½ per cent on the preferred stock is regarded as eminently conservative in view of the fact that 2 per cent might easily have been paid. The inference is that in view of its many ventures along lines of expansion the company deems it prudent to add liberally to its surplus. Metropolitan preferred has weakened under selling by disappointed speculative holders to 88, the common remaining, however, at 36. Sales are reported in Northwestern common at 32½ and 31, the preferred at 70, and in South Side at 109 As a preliminary to the reorganization of the Lake Street company, the committee has asked for deposits of the various classes of bonds, together with the stock, and has asked the holders to sign an agreement which they believe will insure the success of the undertaking. Lake Street shares made a new low record a week ago, getting down to 6¼, but they have since rallied to 7½.

Other Traction Securities

The revival of speculation in the copper shares has so monopolized interest in Boston that the traction stocks have been left pretty much to themselves. Such fluctuations as have occurred were meaningless, and trading was in all cases very light. Massachusetts Electric common sold up at one time to 37, but fell back quickly to 35¾. The preferred rose from 92½ to 93, then lost its gain. Boston Elevated, selling ex-dividend, wandered aimlessly about between 150 and 152. West End issues were the strongest features of the market, the common rising from 95 to 97 and the preferred from 112½ to 115⅛. Baltimore securities have enjoyed a fair degree of activity during the last two weeks, with advance in prices the rule. United Railways income bonds, which were quoted a fortnight ago around 67, were bid up to 68¾ and held the advance, while the general mortgage 4's were remarkably strong and active at an advance from 95 to 96⅝. The stock of the company went as high as 14, then reacted on scattering sales to

13¾. Charleston Consolidated Electric 5's, which were an active favorite some time ago, jumped on the execution of a single buying order from 92¼ to 95. Nashville Railway shares went at 4½ and the 5 per cent certificates at 106½. Other sales included City and Suburban (Washington) 5's at 99, City Passenger 5's at 107½, Baltimore Traction 5's at 116¾, Lexington Street Railway 5's at 103½ and Anacostia and Potomac 5's at 100. On the New York curb some sharp fluctuations in San Francisco 4 per cent bonds have been the main incident recently. These securities beginning at 80½ dipped suddenly to 78⅞ and then rushed back to 82 as quickly as they had come down. There was no news to explain this curious movement. Brooklyn Rapid Transit new 4's, reflecting the prevailing satisfaction over the changes in the management of the company, have been very strong, advancing from 83½ to 86½. Other curb transactions of less note include San Francisco subscription privileges at 49½, Washington Traction 4's between 80¼ and 80¾, Interborough Rapid Transit (60 per cent paid) at 114¼ to 112¼, St. Louis Transit 5's from 94⅜ up to 96, United Railways of St. Louis 4's at 84⅜, New Orleans common stock at 14, the 4½ per cent bonds at 80, Brooklyn City Railroad at 245½, and Nassau Electric 4's at 93.

Tractions were remarkably inactive on the Cleveland 'Change last week. Northern Ohio Traction & Light common sold to the extent of 430 shares, all of which brought 19¼, a slight advance over previous figures. A small lot of Cleveland Electric sold at 88, the same as last. There was some activity in Cleveland City, and a small lot sold at 105. Monday of this week three 100-share lots came out at the same figure, the lowest price at which the stock has been sold in many months. For the past year it has been held at 115, but when the recent issue of $1,000,000 worth came out the price dropped to 110, and since has shown gradual decline. It is thought forced liquidation caused the selling, particularly since consolidation rumors are again in the air and the consummation of the deal would send the stock soaring. Lake Shore Electric is selling at 14 for the common, the lowest in many weeks. Syracuse Rapid Transit gained a point on a sale of fifty shares at 77. Ten thousand dollars' worth of N. O. T. & L. 4 per cent bonds sold at 61 and 62. On the Cincinnati Exchange, about 700 shares of Cincinnati Street Railway stock changed hands at between 140 and 140½ and 300 Cincinnati, Newport & Covington common at from 39½ to 40⅞, the latter the closing figure.

Security Quotations

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

	Closing Bid Jan. 27	Feb. 10
American Railways Company	51½	51½
Aurora, Elgin & Chicago	32	a38
Boston Elevated	153½	150½
Brooklyn R. T.	68	69¼
Chicago City	228	225
Chicago Union Tr. (common)	12	10¾
Chicago Union Tr. (preferred)	45	45
Cleveland Electric	86½	85
Columbus (common)	63	70
Columbus (preferred)	—	104
Consolidated Traction of N. J.	66	65
Consolidated Traction of N. J. 5s	107	107½
Detroit United	87	89¼
Electric People's Traction (Philadelphia) 4s	98	98
Elgin, Aurora & Southern	a54	a52¼
Lake Shore Electric	14	14
Lake Street Elevated	7¾	7⅛
Manhattan Railway	†144⅝	144⅞
Massachusetts Electric Cos. (common)	35¼	35¾
Massachusetts Electric Cos. (preferred)	93½	92½
Metropolitan Elevated, Chicago (common)	36	35
Metropolitan Elevated, Chicago (preferred)	87	87½
Metropolitan Street	138½	137¾
New Orleans Railways (common)	15⅛	14⅛
New Orleans Railways (preferred)	—	43
North American	112	116
Northern Ohio Traction & Light	16	19⅛
Northwestern Elevated, Chicago (common)	33	31½
Philadelphia Rapid Transit	16	16
Philadelphia Traction	98¼	98⅜
St. Louis Transit (common)	28	28½
South Side Elevated (Chicago)	107	109
Syracuse Rapid Transit	28¾	—
Syracuse Rapid Transit (preferred)	75½	—
Third Ave.	123	125
Toledo Railway & Light	a36	35⅞
Twin City, Minneapolis (common)	a122	120¾
United Railways, St. Louis (preferred)	80	80
United Railways, St. Louis, 4s	84¼	84⅜
Union Traction (Philadelphia)	46⅝	46⅞
Western Ohio Receipts	28	—

a Asked. † Ex-"rights." The rights closed on Tuesday at 6⅝.

Iorn and Steel

The general situation in the iron trade continues favorable, with increasing activity in all lines. As the best testimony to these facts the report of the constituent companies of the United States Steel Corporation shows aggregate orders on hand of 5,509,000 tons, the largest in the history of the concern. Higher prices are being talked of in iron ores, and prices are strengthening elsewhere, but so far this has had no effect in curtailing consumption. The greater activity in the domestic iron trade has further reflected itself in larger purchases of foreign articles, especially steel and steel rails. It is to be noted, however, that prices are rising steadily abroad, and this movement will, if continued, put a check upon imports into this country. Quotations are as follows: Bessemer pig iron, $22; Bessemer steel, $30; steel rails, $28.

Metals

Quotations for the leading metals are as follows: Copper, lake, 12¾@12⅞ cents; tin, 29 cents; lead, 4⅛ cents, and spelter, 5 cents.

NEW ENGINEERING FIRM

Dugald C. Jackson, professor of electrical engineering at the University of Wisconsin, and William B. Jackson, until recently traveling engineer with the Stanley Electric Manufacturing Company, have opened an office at Madison, Wis., as consulting engineers and experts. The new firm is prepared to do engineering work of all classes, especially that relating to applied electricity embracing the design and construction of complete steam or hydraulic plants, central stations, isolated installations, long distance transmission, electric railway systems, etc. It is also fully equipped to make examinations and professional reports on proposed and existing properties and to undertake the duties of experts in patent litigation and of referees and arbitrators in matters relating to industrial enterprises.

THE HISTORY OF THE BERLIN STREET RAILWAY COMPANY

The Grossen Berliner Strassenbahn, which is the largest street railway in Germany, if not in all Europe, has recently published a very handsome book descriptive of the organization and equipment of the company's lines in Berlin. The volume consists of over 270 pages, printed on heavy paper and interleaved with fine full-page illustrations of Berlin views. The company has recently completed the transformation of its line from horse to electric power, and now has 481.76 km (300 miles) of track and is capitalized at 85,780,000 marks ($21,445,000.) The electrical equipment, power station and other features of the engineering side of the railway are thoroughly described and illustrated. Chapters are also given on the traffic of the line, the track construction, employees, etc., and much of the information of a statistical character is illustrated by graphical diagrams printed in colors, by which the data are rendered more clear. Altogether the book is the finest and most complete, so far as is known, which has ever been published by a street railway company.

It is not a case of a duplicate register at Montreal, but a case of a duplicate fare-box. The conductor under arrest for stealing had a duplicate fare-box which he used, turning into the company's box at the end of the day only such portion of the receipts as he thought the company entitled to receive.

In the *Street Railway News*, published in the interest of street railway employees in and near Cleveland, is recorded the death of a woman who was the mother of a motorman, oldest sister of a motorman, mother-in-law of an employee of one of the street railway shops, grandmother of a power-station employee of a road in Virginia, and grandmother of an ex-employee in a street railway shop in Cleveland.

SOUTH SIDE ELEVATED REPORT—CHICAGO

The stockholders of the South Side Elevated Railroad Company, of Chicago, held their annual meeting Jan. 29, at which time the following statement of earnings for 1902 was submitted:

RECEIPTS

	1902	1901
Passenger	$ 1,433,828	$ 1,316,009
Other earnings	48,476	45,646
Miscellaneous	1,537	576
Total gross	$ 1,483,841	$ 1,362,231
EXPENSES		
Maintenance way and structure	$ 57,442	$ 74,498
Maintenance equipment	107,145	105,280
Conducting transportation	364,736	361,620
General expenses	149,956	*141,202
Loop rental and expenses	183,057	162,360
Total	$ 862,338	844,960
Net earnings	621,505	517,271
Bond interest	33,750	33,750
Balance	$ 587,755	$ 483,521
Dividends	409,125	357,955
Surplus for year	$ 178,631	$ 125,566

* Includes taxes for 1899, 1900 and 1901.

BALANCE SHEET—ASSETS

	1902	1901
Cost of property	$12,006,657	$11,787,044
Capital stock in treasury	92,390	92,390
Material and supplies	24,930	23,613
Bills receivable	5,141	.....
Current assets	16,621	6,650
Due from agents	4,966	.....
Other assets	.....	9,181
Cash on hand	8,814	62,721
Totals	$12,158,522	$11,981,599
LIABILITIES		
Capital stock	$10,323,800	$10,323,800
Funded debt	750,000	750,000
Current liabilities	*183,814	134,846
Profit and loss	850,907	722,953
Depreciation	50,000	50,000
Totals	$12,158,522	$11,981,599

* Includes taxes payable in April, December pay rolls and supplies.

Month	Daily average passengers	Pct increase	Earnings	Expenses	Pct. expenses
January	79,154	11.27	$ 126,209	$ 74,354	58.9
February	79,386	6.52	115,462	70,234	60.8
March	80,313	5.30	129,358	73,737	57.0
April	81,009	4.16	125,930	69,038	54.8
May	76,063	2.50	122,767	68,129	55.5
June	76,449	9.77	119,745	67,632	56.5
July	70,767	10.98	113,241	68,925	60.9
August	68,334	11.76	109,320	71,864	65.7
September	76,572	13.23	118,784	69,662	58.6
October	83,112	13.76	133,091	75,989	57.1
November	83,299	8.50	129,062	74,071	57.4
December	88,513	11.00	140,869	78,697	55.9
Totals	78,566	8.95	$1,483,843	$862,338	58.1

PRESIDENT CARTER'S TALK

President Leslie Carter, in his annual statement, noted the increase of 8.95 per cent in the number of passengers carried and said the corresponding gain in revenue had enabled the company to meet the increased expenses of operating and at the same time continue to maintain the property. He recounted the improvements to equipment and structure, the addition of cars costing $160,000 and mentioned other expenditures, adding:

"I mention these items to show what has been done with earnings over dividends, adhering to the policy of providing additions to equipment out of earnings, instead of increasing the bonded debt.

"The pay of every employee of the company, except the general officers, has been raised during the last fifteen months, making an increase for the year of $20,552 in the pay-roll, which increase will be heavier during 1903, as some of the increases were made during the year 1902."

Joseph Leiter and Byron L. Smith, retiring directors, were re-elected.

"We have made application to the council for the right to build a third track to Forty-Second Street. Should the ordinance pass we will also operate a line to Lake Avenue. It is believed that these lines will be popular and will add needed facilities to the south division; but we must not expect a large increase in net revenue from them, as the cost of construction is at this time high and materials and labor are also much advanced, while we are restricted to a fixed and extremely moderate price for the transportation furnished."

LINE TO ENGLEWOOD

A branch line has been projected to a thickly settled district of Englewood under the name of the Englewood Elevated Railroad Company. Residents of Englewood are anxious for the line and have held mass meetings favoring it. Plans have been submitted to the council track elevation committee.

QUARTERLY AND HALF-YEARLY REPORT OF THE MANHATTAN ELEVATED RAILROAD

The report of the Manhattan Elevated Railway Company, of New York, as filed with the Railroad Commissioners, for the quarter ending Dec. 31 and the six months ending December, shows that material increases have been made in the earnings of the company. There was an increase of $374,225 in gross earnings for the December quarter, while net earnings increased $423,560. The surplus for the December quarter shows an increase of $52,741. The gross earnings for the six months ending December 30 increased $775,061, while the net earnings increased $797,585. The increase in surplus for this period was $304,348. The statements of the company, together with the balance sheet as of December 31, follows:

Quarter ending Dec. 31—	1902	1901
Gross earnings	$3,211,373	$2,837,148
Operating expenses	1,355,636	1,404,971
Net earnings	$1,855,737	$1,432,171
Other income	65,287	201,287
Total income	$1,921,025	$1,633,465
Interest and taxes	747,954	753,135
Balance	$1,173,071	$880,330
Balance	$1,173,071	$880,330
Dividend	720,000	480,000
Surplus	$453,071	$400,330
Passengers carried	64,822,675	57,225,850
From July 1 to Dec. 31—	1902	1901
Gross earnings	$5,706,485	$4,931,424
Operating expenses	2,694,577	2,717,101
Net earnings	$3,011,908	$2,214,323
Other income	146,575	392,575
Total income	$3,158,483	$2,606,898
Fixed charges	1,392,723	1,385,486
Balance	$1,765,760	$1,221,412
Dividends	1,200,000	960,000
Surplus	$565,760	$261,412

Assets—	1902	1901
Cost of road and equipment	$82,299,262	$70,932,738
Cost of leases	14,014,000	14,014,000
Real estate	3,254,465	3,148,472
Cash on hand	210,693	191,139
Central Trust Co., N. Y., trus., etc	1,511	4,593
Supplies on hand	410,438	348,583
Estate Jay Gould	.....	300,000
Due by agents	112	437
Due by others	9,968	9,697
Open accounts	49,400	222,460
Loaned on collateral	104,355	7,641,479
Prepaid insurance	13,007	15,793
Sundries	16,173	335,367
Total	$100,383,386	$97,164,758

Liabilities—		
Consolidated capital stock	$47,999,700	$47,999,700
Subscriptions to increased capital	300	300
Funded debt, including $1,000 New York Elevated first mortgage 7s, called for redemption	39,558,000	39,545,000
Interest due and accrued	368,952	317,553
Sundries	199,034	36,995
Dividends unpaid	127,358	17,358
Coupons due, not presented	60	60
Manhattan 4 per cent bonds, special	.....	300,000
Due for supplies, etc	1,586,429	417,620
Open accounts	111,319	62,649
Profit and loss surplus	6.825,489	5,366,686
Convertible bond certificates	26,000	42,035
Taxes on litigation	3,580,743	3,058,802
Total	$100,383,386	$97,164,758

WHAT HAS BEEN DONE AT DES MOINES

The Des Moines City Railway Company, on Dec. 31, 1902, had been in existence just forty-nine years. It was first organized on Dec. 31, 1853, with a capital stock of $100,000, for the purpose of constructing and operating a street railway system within the city of Des Moines, under the name of the Des Moines Street Railroad Company. The incorporators were M. P. Turner, U. B. White, F. M. Hubbell and Jeff S. Polk. The company constructed and operated the old horse car railway system of the city, and in the year 1889 had from sixteen to twenty miles of track in operation. In 1889 the capital stock was increased to $1,000,000, a large power plant was constructed, and electricity was substituted for horses as the motive power. In 1891 the capital stock was still further increased to $2,000,000, the increase being used in extending the lines, and in securing better equipment. In 1892 the capital stock was increased to $3,000,000. In 1893 the new articles of incorporation were adopted and filed, and the name of the company was changed to the Des Moines City Railway Company.

Since 1892 the company has been extending its lines to all parts of the city, improving its power plant, and bettering its service in every way, until at the present time the system is one of the best in the United States for a city the size of Des Moines. The company has over sixty miles of track in operation within the city limits, a large portion of which is laid with 70-lb. rails. During the past three years the company has made at its own shops several large double-truck cars, besides purchasing a large number of double-truck cars. The power plant has been greatly enlarged, several new engines have been installed, and the capacity of the plant increased more than sufficient to operate the present street railway system and furnish power for the operation of the interurban lines from Des Moines to Valley Junction and from Des Moines to Colfax.

During the year 1902 the efforts of the company were devoted to the work of improving the power plant, painting, refitting and improving the cars and relaying heavier rails. A new addition to the power plant was started, in which was erected an Allis cross-compound 2500-hp engine direct connected to a General Electric generator. A duplicate of this unit is now being installed in the new section of the power plant, and the company expects to have the new unit in operation early in the coming year. The company purchased and put in service fifteen new cars during the year, and is now manufacturing and purchasing that many more cars to be ready for service by spring. During the coming year the company will relay considerable track with heavier rails, and will extend its lines from 5 to 10 miles.

The Interurban Railway Company, which is operated in connection with the Des Moines City Railway Company, has been in existence almost five years. The company was incorporated April 22, 1898, with a capital stock of $50,000, by H. H. Polk, J. B. Jones and Simon Casady. In March, 1902, the capital stock of the company was increased to $250,000. The company has in operation at the present time about 32 miles of track. The first line constructed was from the terminus of the Ingersoll line of the Des Moines City Railway Company to Valley Junction. This line was constructed in 1898. In 1901 the army post site line was commenced and was completed last year. During the year 1902, the company has constructed about 29 miles of track. The line from Grandview Park, Des Moines, to Colfax was completed the latter part of December, and the freight line north of the city, from the end of the Flint Valley line of the street railway system to a connection with the Colfax line north of Grandview Park, is almost completed. The company constructed waiting-rooms and freight warerooms at Altoona, Mitchellville and Colfax. Four cars are in operation on the Colfax line, two passenger cars and two combination passenger and baggage cars. These cars were built by the St. Louis Car Company, of St. Louis, Mo., and are 46 ft. over all. They are finished in mahogany, have plush seats and are heated by the hot-water system. Each car is equipped with four G. E.-67 motors. The line has been in operation as far as Mitchellville for several weeks. The company announces that it will extend the line from Colfax to Newton, the county seat of Jasper County, during 1903, a distance of 14 miles. Also that it may extend the army post line to Indianola, the county seat of Warren County, and also to Winterset, the county seat of Madison County.

IMPROVEMENTS AT DES MOINES

The Des Moines City Railway Company, of Des Moines, Ia., has decided to expend $500,000 in betterments and extensions during the coming year. The plans include the erection of an addition to the power plant, the construction of new car-building shops, the building of a large number of new double-truck cars, the construction of new car houses, the construction of 10 miles of new track within the city limits, the building of a large auditorium at Ingersoll Park and the building of a big pavilion at the State Fair Grounds. These improvements will be sufficient to put the system in condition to handle the rapidly increasing business and to anticipate a rapid growth of the city.

The most important improvement will be at the power plant. Last year the capacity of the plant was doubled, and in doing this work an extension of the buildings was made sufficient to accommodate the installation of machinery that would triple the output of the plant. A third generator, an exact duplicate of the machine installed last year, and a battery of new boilers will be provided. Mechanical stokers will also be provided, and a new steel smokestack 200 ft. high will be constructed.

The car-building plant will be erected on property adjoining the power plant and will be 250 ft. long by 150 ft. wide, of vitrified brick, with a steel arch and slate shingle roof, cement floors and pits. It will be absolutely fireproof and is to be heated by steam. The greater portion of the building will be used for a carpenter shop, but there will be in it also a blacksmith shop, painting and varnishing rooms, etc., and inside trackage. The company expects to construct all its cars in this shop. The capacity of the plant will be fifty double-truck cars a year. The armature and electrical working rooms will be continued in the present quarters, the space now given over in these quarters to assembling cars being added to this department.

The new car house will be constructed at Twenty-Fourth Street and Ingersoll Avenue. It will be 80 ft. x 250 ft. and will be separated from the present house by a fire wall. Constructed of vitrified brick, with a steel arch roof, it will be entirely fireproof as regards construction. The two houses will have a capacity of storing seventy double-truck cars.

The auditorium that is to be built at Ingersoll Park will be in the form of an amphitheater, to conform to the slope of the ground, and will have a seating capacity of 4000 people. The most up-to-date facilities will be provided for putting on summer attractions. In addition to building the auditorium a number of improvements will be made to the grounds.

The large pavilion surrounding and enclosing the company's big loop at the State Fair Grounds will be located just across the street from the racetrack amphitheater and will extend to the stock pavilion. It will be provided with ticket-selling booths for the State Fair ticket department and with compartment loaders, so that when enough people to load a car have been admitted to the compartment it can be closed and the crowding and the crush attending the fairs done away with.

The twenty large double-truck cars that the company is to put into service are being built in Ohio and are to be ready for delivery April 1. These cars, with those already in the service, will be sufficient to do away with all single-truck cars except during big rushes. The company now has 110 cars, which, with the cars contracted for and those to be constructed as soon as the car shops are completed, will make the total 170 by the close of the year.

The 10 miles of new track that are to be built within the city limits during the year include the extension of some of the present lines and the building of new lines touching portions of the city not now reached by the system.

PLANS FOR BUILDING INTERURBAN LINES AT DES MOINES

The Interurban Railway Company, of Des Moines, has recently announced plans for building extensions during 1903. In all, about 80 miles of new road will be constructed. The company is now engaged on a survey from Colfax to Newton, and will in all probability build on what is called the north line, a survey that has been made to the north of the Rock Island tracks. Work on

this line will be commenced as soon as the frost is out of the ground. The line will be about 10 miles long. From a point just beyond Colfax a spur will be built 7 miles south to Prairie City, passing through the coal fields of Jasper County. These two sections will be constructed at the same time, and a supplementary power station will be constructed at Colfax to furnish power for both extensions. The company will also build into Indianola and Winterset by way of Norwalk. The expiration of franchises in those towns will not interfere with the company's plans, for, if necessary, new grants will be secured under the law giving electric railways the same rights in securing right of way enjoyed by steam roads. The survey that has been made to Indianola and Winterset will be abandoned. The Indianola line runs about 3 miles east of Norwalk, and the survey to Winterset started from Valley Junction and passed through the towns of Commerce and McIntire. The route over which the company will build will start from the end of the army post line and extend in a southwesterly direction to Norwalk. From there the company will construct two branches, one to Indianola and one to Winterset. The line from Des Moines to Winterset will be operated as a through service, and the line from Norwalk to Indianola will be operated as a branch. With a supplemental power station at Norwalk, the company will be able to operate these lines with but one additional plant. Had the Indianola and Winterset lines been built as originally proposed, it would have been necessary to erect plants at Indianola and Winterset.

Y. M. C. A. RAILROAD WORK

Upon invitation of the Young Men's Christian Association of Topeka the eleventh international convention of the railroad department of Young Men's Christian Associations will be held in the Auditorium at Topeka, Kan., April 30-May 1 and 2. Representatives of all railroad associations and departments, railroad men from unorganized points, railroad presidents, secretaries and general secretaries of city associations at railroad centers will be present. For the benefit of delegates, special rates will be secured at hotels and boarding houses. Applications for hotel accommodations should be addressed to Richard C. Wilson, chairman committee on entertainment, railroad department Young Men's Christian Association, Topeka, Kan., at the earliest date possible, and not later than April 20.

The formation of branches among the street railway employees on the same lines as the steam roads will form the subject of a special report. Marked progress has been made in this department during the last year, and it is hoped that a more general knowledge of the movement will be appreciated by street railway managers where co-operation is necessary for the success of the undertaking.

VENTILATING STREET CARS

Tests of a new system of car ventilation were made on Tuesday afternoon in the presence of F. M. Baker, of the State Railroad Commission, and C. R. Barnes, the electrical expert of the board, a representative of the Board of Health, Oren Root, Jr., of the Metropolitan Street Railway Company, and others interested in street railway equipment and operation.

A car had been equipped by the Interurban Street Railway Company for the purpose of making a practical demonstration under ordinary operating conditions. The device employed consists of a small steel box set just below the roof of the car, in the space usually occupied by the ordinary ventilating windows and protruding out and inside. There are ten of these ventilators to a car, five on each side, and they are made in several sizes to meet the requirements of the different sizes of cars. It is the purpose to change the air of the car three times an hour, and it is claimed that this can be effectually done without creating drafts or introducing dust or other extraneous matter into the car. Air is admitted through a small aperture, an automatic valve regulating the force and volume and at the same time excluding snow, sleet, rain or foreign substances of any kind. The air then passes upward through a perforated metal strip and is deflected upward so that no draft is created. The principle upon which the device is based has been found practical in the ventilation of offices, hospitals and in steam railroad cars, and the form exhibited on Tuesday afternoon is a modification devised especially for street railway cars. It is pointed out in this connection that it is not necessary or desirable to use one of the many artificial methods of forcing in fresh air and drawing out foul air, because of the fact that where the air is thus driven out of its natural channels drafts are necessarily created. It is contended, too, that a considerable saving can be effected in the cost of heating the cars and a much more uniform temperature maintained throughout.

In the tests on Tuesday a quantity of oakum was burned in the car while the ventilators were closed, so that the car could be filled with smoke. The ventilators were then opened and the car was cleared of smoke in nine minutes. This, of course, is a condition that would not arise in ordinary operation, but was created expressly for the purpose of illustrating how the change of air was effected without opening doors and windows or otherwise creating draft.

The system is being placed on the market by the National Ventilating Company, of New York.

EXCURSION TO HISTORIC POINTS

The Richmond, Fredericksburg & Potomac Railroad Company is making preparations to handle a much larger business this year than formerly, as the growing popularity of the points reached by this system demands additional facilities. The district penetrated by this road is one of great historic interest, and is so closely associated with events that are still fresh in the minds of the people that the opportunity afforded by the Richmond, Fredericksburg & Potomac Railroad Company to visit these scenes will be generally welcomed. The company operates fast and frequent train service between Washington, Fredericksburg and Richmond, enabling all who desire to visit the historic battlefields nearby and return to Washington the same day, if desired. Points of interest include Arlington, Alexandria, Aquia Creek, Rappahannock River, Fredericksburg, Marye's Heights. The battlefields of the Wilderness, Chancellorsville and Spotsylvania Courthouse are a few miles from Fredericksburg. At Hamilton's Crossing, 3 miles south of Fredericksburg, a monument of unhewn granite marks the famous battlefield. The Chandler House, near Guinea, in which "Stonewall" Jackson died, can be seen from the car windows. The principal battlefields near Richmond are Yellow Tavern, Ellerson's Mill, Harrison's Landing, Mechanicsville, Cold Harbor, Malvern Hill and Seven Pines.

FIFTY-YEAR FRANCHISE FOR BRONX RAILWAYS

The fifty-year franchise to the New York City Interborough Railway Company in The Bronx, subject to the approval of the Board of Aldermen, has been granted by the Board of Estimate and Apportionment. It was first proposed that the city should purchase the plant and cars and rails of the Interborough Company at the termination of the franchise. An amendment was offered leaving it optional for the city to do this, but the Mayor produced a statement giving his reasons for believing that it would be wise for the city to commit itself to the purchase of the plant of the road at the termination of the franchise. The view of the Mayor was adopted by vote, and the franchise was approved. It will now go to the Board of Aldermen. The statement of the Mayor, which he read himself, concludes as follows:

"I think that the city, in granting a terminable franchise, should agree to buy at a fair rate at the expiration of the franchise all the plant that is necessary at that time for its actual operation. If the city pursues a different policy it will pay many times over, in my judgment, in bad service, for what it will save in money by reserving an option to buy or not, as it pleases."

THREE-CENT FARE LAUGHED DOWN IN CHICAGO COUNCIL

An ordinance providing for 3-cent fare was introduced in the Chicago City Council at its meeting Monday night. It met with all manner of good-natured ridicule during its reading by its author and was referred to the local transportation committee for burial. The city fathers of Chicago are evidently not inclined to disturb the local transportation committee of that city in its present commendable efforts to settle the franchise question on a satisfactory, business-like basis.

Supreme Court Justice Marean, in New York city, spoiled a $10,000 suit for damages brought last week against the Brooklyn Heights Railroad Company. The plaintiff claimed that his hand had been injured and that his thumb was bent over the palm and could not be moved. Judge Marean asked to see the hand, and with a quick motion straightened out the "poor, maimed thumb," and it was all over with the $10,000.

ANNUAL DINNER OF THE AMERICAN INSTITUTE OF ELECTRICAL ENGINEERS

The American Institute of Electrical Engineers held its annual dinner at "Sherry's," in New York City, on the evening of Feb. 9. The dinner this year was designated as a "Library Dinner," and the guests of honor and speakers were prominent donors to the Institute's library fund and men interested in library work. Andrew Carnegie, whose gift of $7,000 supplemented the similar gift of Dr. S. S. Wheeler that purchased the famous Latimer Clark collection and gave a working capital to the library committee, was the principal speaker. Mr. Carnegie received a most enthusiastic reception, and probably never made a more eloquent and characteristic speech on the subject of libraries. Earning some of his earliest wages as a telegraph operator, he claimed the privilege of talking to the representatives of the electrical profession present in a fraternal spirit, and interspersed his remarks with many quaint reminiscences of the old days. President C. F. Scott made the opening address of the evening, calling attention to the fact that during the last year the Institute had entertained Mr. Marconi and Lord Kelvin. Mr. Scott advanced the idea that electricity was a foe to narrowness and that it increased human and individual efficiency. He made a strong plea for co-operation among the members for bettering the facilities of the Institute and pointed out the rapid growth which has recently taken place. The toastmaster was T. C. Martin, editor of The Electrical World and Engineer, and the speakers were introduced in turn by a series of characteristically humorous remarks and graceful recognition of their labors and achievements in their chosen fields. Dr. Wheeler, the founder of the Institute Library, gave a modest account of the manner in which he secured his gift of the Latimer Clark collection, and praised his fellow-members for the material support which they had given in carrying on the work. The other speakers were R. R. Bowker, editor of The Publisher's Weekly; Dr. J. S. Billings, director of the New York Public Library; Theodore L. De Vinne, the celebrated American printer and bibliophile, and Dr. J. C. Bayles, M. E., technical editor of The New York Times.

Thomas A. Edison and Mrs. Edison were among the diners, and Mrs. Carnegie accompanied her celebrated husband. W. D. Weaver, chairman of the library committee, was, unfortunately, unable to be present on account of illness. Many graceful references were made in the speeches to his unselfish labors in placing the library on a practical, working basis. Among those who attended were Dr. F. B. Crocker, Louis A. Ferguson, H. L. Doherty, F. W. Jones, J. C. Barclay, B. J. Arnold, Elihu Thomson, L. B. Stilwell, Frank J. Sprague, J. F. Calderwood, J. W. Lieb, Jr., T. E. Murray, G. A. Hamilton, Dr. Samuel Sheldon, H. G. Stott, W. N. Ryerson, W. J. Hammer, A. A. Knudson, Dr L. Waldo, Prof. W. L. Robb, Edward Katte, F. H. Taylor, J. D. Keiley, C. A. Terry, H. V. Henshaw, P. A. Bates, A. L. Doremus, W. C. Andrews, Kern Dodge, Charles Day, P. B. Delany, C. O. Mailloux, W. S. Barstow, Leo Daft, Oberlin Smith, W. C. Gotshall, H. G. Reist, H. A. Lardner, J. J. Mahony, E. H. Mullin, R. A. Fliess, H. Wray Weller, F. A. Scheffler, R. W. Pope, C. Blizard, C. E. Knox, H. R. Leyden, Joseph Bijur, C. A. Bragg, George F. Sever, Dr. Max von Rocklinghausen, F. H. Shepard A. K. Warren, T. C. Wood, D. B. Rushmore, Prof. W. E. Goldsborough and F. Darlington.

THIRD-RAIL OPERATION

At the next meeting of the Chicago Electrical Association, to be held at room 1736 in the Monadnock building, Chicago, on Friday evening, Feb. 20, H. M. Brinckerhoff, general manager of the Metropolitan West Side Elevated Railway Company, of Chicago, will present an illustrated paper on "The Third-Rail System for Electric Railways," which will be followed by the usual discussion.

THE STRIKE AT MONTREAL

After a brief but riotous history the strike of the employees of the Montreal Street Railway Company, of Montreal, Que., declared Feb. 5, was settled Feb. 8 through a series of conferences between the committee representing the City Council, officials of the company and the representatives of the strikers. The main objection of the company was to a formal recognition of the union, the representatives of the company stoutly maintaining that no settlement could be effected while the clause for formal recognition of the union remained in the articles submitted for signature. After considerable dickering on all sides this clause was modified and the articles signed. The agreement, as signed, follows:

1. None shall be dismissed without full and equitable reason.
2. The company will give an equitable hearing to any employee against whom a complaint has been made. An appeal may be made to the highest officer, be it the superintendent, the manager or even the president.
3. The company will maintain the same scale of wages to sweepers as they had in force on Feb. 3.
4. The company will, on demand, show to a deputation of its employees the reports that shall have been made against recently dismissed employees.
5. The company will grant a general increase of salary equivalent to 10 per cent on the scale of wages in force on Feb. 3.
6. The company shall recognize the right of their men to belong to any union or benefit association of their own that they may see fit. In case of any difference arising between the company and its employees the management will, at all times, be ready to discuss such grievance with the men in its employ and attendance upon any deputation to lay views of the men before the management will, in no wise, be prejudicial to the employees composing the same. The company cannot undertake to discuss among its employees nor to grant any difference of treatment to those who are members of such union and those who are not.
7. All men discharged since Jan. 1, 1903, may have their cases considered by the directors, and, in case there is dissatisfaction with the verdict, their case may be, on the demand of either party, submitted to a board of arbitration, composed of one representative named by the men and one person by the company and a third by the agreement between the two thus named, each party agreeing to be bound by the final verdict.
8. If there are any other matters at issue, the company is prepared to discuss the same with its employes as soon as the service is resumed.

TOPICS OF THE WEEK

The Columbus, Delaware & Marion Railway, of Delaware, Ohio, is picking up considerable extra business by providing skating at Stratford Park. The lake at the park is kept cleared of snow, and lights have been stretched across, making night skating perfectly safe. The pavilion is heated and lunch is served. A special round-trip rate is made to people who desire to skate.

It is understood that the Rapid Transit Subway Company, of New York, is considering the advisability of establishing a private hospital for the employees of the system, to be in readiness when the tunnel system is placed in operation. General Manager E. P. Bryan, of the company, says that the Terminal Company in St. Louis, with which he was connected before coming to New York, has a hospital for employees, and that it works most satisfactorily.

"In St. Louis," said Mr. Bryan, "when an employee needed medicine he got it from the hospital, and when he was too ill to be around he went to the hospital. All the expense of conducting the hospital was covered by the monthly dues of 50 cents from each member. We have not fully decided to establish the hospital as yet, but the idea seems to have been favorably received by the directors, and at the next meeting of the board doubtless the subject will come up for final disposition."

It would seem that the recent remarks of President Vreeland, of the Metropolitan Street Railway Company of New York, about the interruption of street railway traffic through the blocking of cars by trucks and other vehicles, are to receive the serious attention of the lawmakers at Albany. Already plans are making for serious changes to the section of the city charter governing the street cleaning department. The first change proposed is to take the Bureau of Incumbrances from the control of the borough president and lodge the powers in the street cleaning commissioner, who will be given absolute jurisdiction over all incumbrances, with power to declare an express wagon or a truck or any vehicle which blocks the street car tracks an incumbrance. Further than this the Street Commissioner is to have police powers, He is to apply to the Police Commissioner for a detail of police not exceeding seventy in number, who are to act under his sole jurisdiction. These policemen are to see that no incumbranees or obstructions are permitted to remain in the street. If a truck is left standing on the tracks a policeman can remove it and arrest the driver.

In his report for the two years ending Dec. 1, 1902, Secretary of the Commonwealth Griest, of Pennsylvania, gives the number of street railway charters issued at 362, and of elevated and underground railways twenty-eight. During these two years 258 street

railways extended their lines, and 180 increased their capital stock. Attention is called to the fact that when street railway companies are incorporated it is the practice to make the capital stock the minimum amount allowed by the act of May 14, 1901, which same law permits companies to extend their lines without limit. The result is that a company may have a charter route of 10 miles with a capital stock of $60,000, and the lines may be extended 20 miles without an increase of capital stock. The Secretary recommends legislation compelling the companies to have a capital stock of at least $6,000 for every mile of its charter and extension routes, as provided in the present law governing steam railroads. He also recommends that corporations pay a bonus upon the creation for increase of their indebtedness, and that foreign corporations be required to pay a bonus upon the amount of their bonded or other indebtedness in the hands of residents of this State. He also recommends the passage of a general act relating to the manner in which all corporations may be permitted to change their corporate title, requiring such proceeding to be approved by the Governor.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED JAN. 27, 1903

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

718,993.. Car-Switching Mechanism; T. A. Ennis, Albread, Ark. App. filed Oct. 23, 1902. A grooved block located in the middle of the track and curved toward the side track is engaged by a tongue suspended from the car.

719,003. Surface-Contact Structure; E. M. Hewlett, Schenectady, N. Y. App. filed Oct. 20, 1897. A bolt placed in an axial cavity in a wooden block has a contact button threaded to its end, the cavity being filled with insulating material surrounding the bolt.

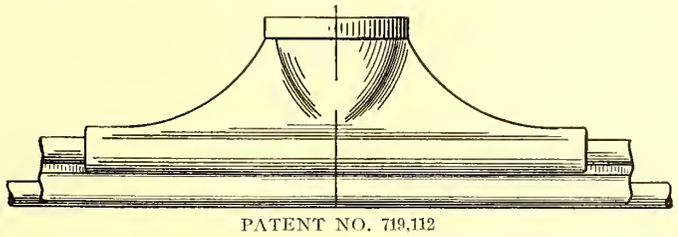
719,006. Trolley; A. J. Johnson, Cleveland, O. App. filed April 14, 1902. Automatic means controlling the spring action of the pole whereby the same upward force is exerted at any angle of the pole.

719,010. Rail-Joint for Street Car Tracks; J. Jones, Denver, Col. App. filed May 27, 1902. Consists of rail sections having abutted inclined ends overlapping each other.

719,020. Railway Electric Motor Cooling System; C. O. Mailloux and W. C. Gotshall, New York, N. Y. App. filed Oct. 6, 1902. A controller acts periodically upon a valve which admits compressed air from any suitable source into a piping system which conveys the air to the motors for cooling purposes.

719,029. Fender; J. McGuire, St. Louis, Mo. App. filed March 31, 1902. Relates to a fender which will be lowered into operative position, close to the surface, automatically, upon contact with an obstruction or at will.

719,055. Switch-Controlling Apparatus; C. W. Squires & J. B. Squires, Springfield, Mass. App. filed July 2, 1902. Relates to improvements in electro-magnetic apparatus for throwing a railway switch. The magnet is operated on a circuit independent of the motor and so arranged that the switch tongue is held immovable during the passage of a car.



PATENT NO. 719,112

719,112. Trolley Support; E. Hill, South Norwalk, Conn. App. filed May 7, 1902. The support is of uniform cross-section and has a longitudinal enlargement. The hanger has a continuous longitudinal recess adapted to receive said enlargement, said support being continuous to extend between a plurality of such hangers.

719,180. Electric Car Sign; I. B. Brower, Philadelphia, Pa. App. filed April 4, 1902. A sign box containing lights is mounted upon a peculiarly constructed pivot through which the circuit leads.

719,256. Car Fender; J. Quern, Brooklyn, N. Y. App. filed Oct. 28, 1902. Details.

719,339. Car Wheel and Track Therefor; T. W. Koster, Treichlers, Pa. App. filed April 3, 1902. Teeth or serrations cut in the periphery of the wheel at the side opposite the flange engage teeth or serrations in the rail.

719,412. Railway Crossing; Z. Frei, St. Louis, Mo. App. filed Nov. 7, 1902. Relates to the construction of a noiseless crossing block.

UNITED STATES PATENTS ISSUED FEB. 3, 1903

719,452. Trolley System for Electric Railways; J. S. Fox, Jackson, Mich. App. filed June 28, 1902. A third rail having a movable cap adapted to be forced inward by the trolley wheel to make contact with a conductor located inside of the rail.

719,453. Railway Rail; J. S. Fox, Jackson, Mich. App. filed June 28, 1902. Embodies a channeled base, a recessed cap vertically perforated at the lower portion thereof and a movable post extending through said perforation.

719,496. Interlocking Center Bearing for Cars; J. E. Norwood, Baltimore, Md. App. filed June 4, 1902. An interlocking center bearing designed to prevent the pulling of the truck from beneath the car when starting under a heavy load.

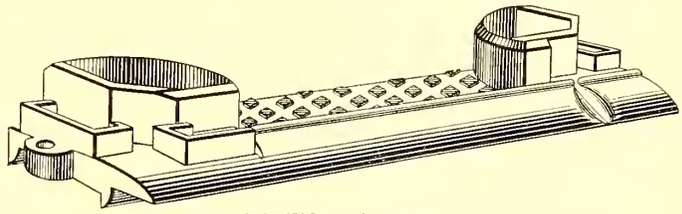
719,512. Street Railway Track; J. Scanlan, Chicago, Ill. App. filed Nov. 21, 1902. The flanges of the two rails extend laterally in the same direction, so that traffic wagons may readily turn out of the track.

719,557. Railway Switch; H. Blanchard, Boston, Mass. App. filed Nov. 13, 1902. Two detents in the bed-plate engage the switch point to prevent accidental movement of the switch.

719,566. Electric Brake; F. E. Case, Schenectady, N. Y. App. filed July 31, 1899. A brake electrically or mechanically operated which will permit independent control of the movements of a car by either system of operation.

719,672. Door Sill; W. O. Jewell & F. H. Jewell, Marion, Ind. App. filed Aug. 5, 1902. A metallic door sill for cars forming a cap for a wooden sill and provided at its ends with upwardly extending pockets arranged to receive and support the corner posts.

719,699. Safety Emergency Brake; W. T. Sears, Boston, Mass. App. filed Sept. 6, 1902. The brake-shoe is pivoted to the axle and is adapted to be thrown under the wheel, said shoe being provided with a straight edge adapted to fit the tread of the rail, and a series of friction rollers adjacent to the periphery of the wheel.



PATENT NO. 719,672

719,763. Construction of Underground Conduits; T. E. Devonshire, Chislehurst, England. App. filed Nov. 3, 1902. The conduit is formed in lengths, each consisting of a concrete body part provided with flanges at the ends and with metal network embedded in the said body part.

719,952. Side-Bearing for Cars; J. E. Norwood, Baltimore, Md. App. filed April 14, 1902. Roller bearings so constructed that an effective number of bearing balls will at all times lie between the bearing plates or races to sustain the body of the car and in which the balls will have free bodily movement and will automatically return to their normal positions when pressure is removed from them.

12,079. Electrical Switch Operating Mechanism; C. B. Russell, Marlboro, Mass. App. filed Aug. 13, 1901. Details of the circuits controlling the switch.

PERSONAL MENTION

MR. F. J. GUERNSEY has been appointed superintendent of the Union Elevated Railroad, of Chicago, to succeed E. W. Richey, resigned.

MR. JOHN D. CAUGHELL, secretary of the Waupaca Electric Light & Railway Company, of Waupaca, Wis., was married to Miss Maud Eleanor Rowe, of Waupaca, Jan. 29.

MR. W. S. WATERBURY has been elected secretary and treasurer of the Ballston Terminal Railroad, of Ballston, N. Y., to succeed Mr. J. M. Cronly, of New York, resigned.

MR. C. F. DARRACH, formerly superintendent of the Commercial Dispatch, of Chicago, has been appointed freight agent of the St. Louis & Suburban Railway, of St. Louis, Mo.

MR. H. I. MANVILLE, of Milwaukee, Wis., of the H. W. Johns-Manville Company, was married Jan. 28 in New York to Miss Romaine, daughter of Mr. Frank Hall Romaine.

MR. E. J. W. DIETZ was appointed, on January 15, traffic manager of the Aurora, Elgin & Chicago Railway Company. Mr. Dietz will have his headquarters at 1409-100 Washington Street, Chicago.

MR. H. FERNSTROM has been appointed chief engineer of the New York Central & Hudson River Railroad, with headquarters at Grand Central Station, New York, to succeed Mr. W. J. Wilgus, who has been elected fifth vice-president.

MR. CLINTON R. ROSSITER has been appointed by Mayor Low a commissioner of the Atlantic Avenue improvement in Brooklyn to succeed the late Commissioner Steele. Mr. Rossiter's familiarity with the needs of Brooklyn admirably fit him for this office.

MR. FRANK GINN, superintendent of the Lancaster Traction Company, of Lancaster, O., has resigned to become connected with the American Shipbuilding Company. Mr. Ginn went with the Lancaster Company in 1896, and had entire charge of the work of installing the system. His successor has not yet been appointed.

MR. HARRY HARTWELL, associate member of the American Society of Civil Engineering, formerly construction engineer of the San Paulo Tramway, Light & Power Company, Ltd., San Paulo, Brazil, has accepted the position of assistant superintendent of construction with the London office of J. G. White & Co., Ltd., and will sail for England on Feb. 14.

MR. M. E. STARK, superintendent of the Albany & Hudson Railway & Tower Company, of Hudson, N. Y., has resigned from that company to become assistant superintendent of the local properties of the Connecticut Railway & Lighting Company at Waterbury, Conn. Mr. Stark will be succeeded at Hudson by Mr. George Stock, treasurer of the Utica Gas Company.

MR. ARTHUR A. ANDERSON, who resigned Dec. 1, 1902, as general manager of the Pennsylvania & Mahoning Valley Railway, of Youngstown, O., has accepted the position of general manager of the Union Traction Company of Indiana, with headquarters at Anderson. Mr. Anderson was at one time connected with the traction interests of Indianapolis. He accepted the position of general manager of the Youngstown system about nine years ago.

MR. O. W. BRAIN, electrical engineer for the New South Wales government railways, who has been making a tour of inspection of the railways and manufacturing establishments of this country, has sailed for home via the Hawaii Islands. Mr. Brain was much gratified by the uniform courtesy with which he was treated, and he carries away with him considerable important data regarding American methods and apparatus which he collected during his visit.

MR. B. S. JOSSLYN, general manager of the Hudson Valley road, with headquarters at Glens Falls, N. Y., has resigned to accept another position. He was previously general manager of the Kentucky and Indiana Bridge & Railroad Company. He held this position for three years prior to his appointment with the Hudson Valley Road, in September, 1902. Mr. Josslyn had a long experience in steam railroad operation before attaching himself to the electric railway field.

MR. W. H. TUCKER has been appointed superintendent of the Houston Electric Company, of Houston, Tex., with entire charge of transportation, and Mr. C. H. Byrne is appointed assistant secretary and treasurer of the company, succeeding Mr. Tucker. Mr. Tucker has during the past eighteen months occupied the position of assistant secretary and treasurer. He came to Houston from Columbus, Ga. Mr. Byrne comes more recently from Dallas, but originally from the general offices of Stone & Webster, of Boston, Mass., who control the Dallas and Houston systems.

MR. LUKE ROBINSON, who was formerly superintendent of the Montreal Park & Island Railway, of Montreal, Que., has been appointed assistant superintendent of the Montreal Street Railway and Montreal Park & Island Railway. Mr. Robinson was with the Park & Island Railway up to the time that he went to Paris with Mr. Duncan McDonald. He returned from Paris a few weeks ago. Mr. Robinson's appointment makes necessary a number of changes in the personnel of the company. The positions of the assistant superintendents, who have heretofore had charge of the eastern and western divisions, are to be abolished, and the officers in charge of these divisions will in future be known as division superintendents, and will report to the assistant superintendent, who has jurisdiction over the entire system.

MR. CHARLES O. KRUGER, who has recently been appointed general manager of the Philadelphia Rapid Transit Company, was formerly second vice-president and assistant general manager of the Union Traction Company. From the organization of this company until 1895 Mr. Kruger served as its secretary and treasurer. He was also the secretary and treasurer of the People's Traction Company, which was one of the constituent companies of the Union Traction Company. Mr. Parsons was officially the president and general manager of the Union Traction Company, but in the new organization of the Philadelphia Rapid Transit Company he holds the position of president, while Mr. Kruger is general manager. Mr. Kruger was born in Philadelphia on Dec. 14, 1864, and has always lived there. His advancement to his present position has been steady and has been based upon merit. He is able, energetic, and is a thorough master of all the details of the great organization of which he is the responsible head.

MR. R. C. TAYLOR, formerly master mechanic of the Twin City Rapid Transit Company, Minneapolis, Minn., has been appointed assistant to the general superintendent of the Brooklyn Heights Railroad Company, Brooklyn, N. Y. The duties of the engineer of power and electrical transmission, which heretofore covered maintenance and operation of power houses and substations, as well as the construction, maintenance and operation of line and management of transmission, have been divided, and the power and sub-station maintenance and operation have been placed in Mr. Taylor's hands. He has been in Brooklyn about a month, during which time he has been enabled to make a thorough inspection of the property, and at the very commencement of his new work is perfectly familiar with its details. As master mechanic of the Twin City Railway, Mr. Taylor had charge of both power stations and rolling stock equipment, and he will probably devote much of his time to the latter subject in his new position. A Scot by birth, he has been in this country since he was twenty years of age. He was master mechanic for four years of the West Superior Iron & Steel Company, West Superior, Wis., and afterwards spent six years as mechanical engineer in the St. Paul office of the Buckeye Engine Company. He has had four years' experience in railway work with the Twin City Rapid Transit Company.

COLONEL H. G. PROUT, whose retirement from the editorship of The Railroad Gazette has just been announced, has been appointed vice-president and general manager of the Union Switch & Signal Company. Colonel Prout has been engaged in editorial work for the last sixteen years, and his work has commanded the respectful consideration of the engineering fraternity. In addition to his regular editorial work, Colonel Prout has given lectures before many prominent engineering organizations, and he is now departmental editor for the railroad division of the Encyclopedia Brittanica. He has also contributed largely to the current technical literature on railroad engineering. He is a member of the American Society of Civil Engineers, vice-president of the Engineers' Club, of New York, a member of the American Railway Engineering and Maintenance of Way Association, of the Master Car Builders' Association, the New York Railroad Club, corresponding member of the American Geographical Society and a member of the Century Club, of New York. The current issue of The Railroad Gazette, in announcing the retirement of Colonel Prout, publishes an appreciative sketch of his interesting career by W. H. Boardman, who has been associated with him in this work.

MR. JOHN D. KEILEY, assistant master mechanic of the Brooklyn Rapid Transit Company, recently resigned that position in order to join the engineering staff of the New York Central & Hudson River Railroad. Although a young man, Mr. Keiley has had exceptional opportunities for following the improvements in electric car equipment during the last few years, especially with regard to multiple-unit control systems, and he has obtained a number of valuable patents on devices of his own invention. He left Johns Hopkins University in 1893, after taking the four years' scientific course, with special attention to electrical engineering, but instead of immediately taking up electricity he spent a number of years in the South engaged in civil engineering work. In the spring of 1899 he came to the Brooklyn road to take a position in the track department, where, after a few months, he was made assistant engineer and assigned to the larger of the two divisions of the Brooklyn Rapid Transit Company's lines. Later he was transferred to the electrical engineering department, then under the late R. P. Brown, and since then has been prominently connected with the electrical engineering work of the road, particularly the installation of heavy elevated equipment and extensive tests and consequent improvements which have been made in connection with the equipment of both elevated and surface lines. Mr. Keiley commenced his new work on Feb. 1 with the title of assistant electrical engineer.

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The New Association

At last the electric railways of this country have an organization which appeals directly to the electrical and mechanical men. This is naturally one result of the evolution in the transportation field. The higher the development of a business the more it is necessary to specialize. It has been evident for some time that the electric railway business has developed to a point where the convention proceedings of the American Street Railway Association are too general in character to get the best results in the discussion of mechanical and electrical matters. The men of intimate practical knowledge of mechanical and electrical details have heretofore taken little advantage of the opportunity to make themselves heard at the national conventions, and this is not altogether strange, for presidents and general managers have always been the active spirits in these meetings, and the master mechanics have, in the main, attended as spectators, and devoted their time principally to the inspection of exhibits or an exchange of views with those engaged in similar pursuits.

The time is certainly ripe for the new American Railway Mechanical and Electrical Association. The meeting at Cleveland this week was a most enthusiastic gathering; the attendance was large, and the results entirely satisfactory. The addition of this allied organization to the next national meeting will mark a new era in electric railway conventions. The organization scheme has been conservatively worked out, vesting the voting power in companies, but giving an opportunity to master mechanics and engineers personally to become associate members, with all privileges save voting. That the authority of a company should be behind each vote seems advisable, since in future action is likely to be necessary on standards, which will permit interchange of rolling stock on interurban roads and other matters involving large expenditures by companies themselves. Now that the new association is ready to go ahead on definite lines, and already has an influential membership, there should be no hesitation on the part of any company about joining the movement and getting the many benefits that will result from membership. That all the conditions may be understood, the constitution and by-laws are printed in full in this number, along with a summary of the proceedings of the recent Cleveland meeting at which they were adopted.

Report of the New York Railroad Commissioners

The report of the State Board of Railroad Commissioners on the New York traffic situation was made public Feb. 11, and is published in full in this issue. The report is an able document and we recommend a careful perusal of it to our readers. It may be roughly divided into four sections: First, a general discussion of the problem and of the causes which led to the existing traffic congestion in New York; second, a consideration of the complaints made by the Merchants' Association; third, recommendations for limited early relief; fourth, suggestions for securing permanent relief.

The childishness of the demand to secure better transportation facilities by the mere putting on of more cars is conclusively shown by the Commissioners who rightly put the greater part of the blame for the present condition of affairs on the past dilatoriness of the city authorities. If any industrial or transportation enterprise should have been conducted with the same absurd disregard for the future as have been the affairs of New York City by the municipal authorities, bankruptcy would have been the result long ago. As an instance of this the report quotes a conspicuous example in the bridge communication between Brooklyn and Manhattan. In spite of the enormous demand for transportation between these two boroughs only a single bridge connects them, and that was completed and put in use twenty years ago. The same lethargy has characterized the action, or inaction, of the city authorities in various other directions, and the resultant loss to the city has been incalculable. We sincerely trust that, costly as this experience has been, its lessons will not be lost upon the city authorities. The present is as critical a time as any in the history of the city as far as transportation relief is concerned, and if the same disregard for the future of the city be followed now as has been pursued in the past the result may be even more disastrous than that caused by previous errors of judgment.

The complaints made by the Merchants' Association are then considered. As pointed out in a recent editorial in this paper a number of the recommendations of the Merchants' Association were withdrawn after consultation with the Board and eight only were retained. As thus modified the position of the Association, as we have pointed out, did not differ in any material point from that of the expert of the Board or even of

the railway company itself, with the single exception of the demand made by the Association for the employment of two conductors on each car. On the question of two conductors for each car "the Board does not believe that it would tend to check overcrowding of the cars or better the car movement, which are the two chief aims in the present effort to find relief. So far as the exemption of passengers from injury are concerned, the facts of record show that the percentage of casualties arising from causes which a second conductor might avert is very small, and that in all other than rush hours the second conductor on a car would be a superfluity and a nuisance." The Board, in our opinion, could very properly have added that besides being a nuisance the employment of a second conductor would be an absolute menace to the safety of passengers, owing to the inevitable division of responsibility between the two conductors. But it is gratifying that the Board has taken the stand which it has on a proposal having the mischievous character which this demand possesses.

Certain recommendations are made by the Board for limited early relief, and relate principally to police improvement in the regulation of wagon traffic. When this has been accomplished it is believed that the company can successfully operate a considerably larger number of cars than at present. The significant statement is also made that the Board is considering the advisability of a regulation that, during evening rush hours, the northbound cars in certain parts of the city shall stop only at the intersections of the odd numbered streets, and that during the morning rush hours the southbound cars shall stop only at the even numbered streets. No recommendation of this kind has yet been made by the Board, but we believe that it would be a step in the right direction. There is absolutely no reason why, with streets only 250 ft. apart, stops should be made on every corner. It is not only expensive in the way of wheels, brake-shoes and power, but affords a serious delay to the movement of the cars. This is one direction in which foreign railway practice is superior to our own, in that stops are only made at definite points, which are a considerable distance apart.

Taxation of Street Railway Properties

A contributor to "Municipal Affairs," who discusses the transportation problem of the larger American cities, suggests immunity from taxation for the street railway companies. It is contended that if the corporations were relieved of this expense and the patrons of the system permitted to enjoy the advantages derived from its expenditure, the public would be greatly benefited. The condition of the masses might be materially improved by placing within their reach transportation facilities that would enable them to live in suburban districts, where they could enjoy light and air and sunshine, and not be huddled and herded like cattle in tenement districts. "Instead of expending millions through its health and police departments in the effort to make the tenement districts habitable," says the author already quoted, "cities might, with more judgment, remit taxation of street railways and other urban transit lines and at the same time secure a reduction in the rates of fare." City officials throughout New York have displayed an eagerness to tax corporations, especially in the matter of franchises, that leaves little room for hope of immediate relief.

We do not believe that there is any general demand for reduction in the rate of fare charged by the street railway companies, and the action of the Chicago City Council, Feb. 9, in dismissing a proposal of this kind, supports this opinion, but a more liberal policy toward the companies in other matters would enable them to do much in the way of improvements. This change should not be restricted to financial affairs, by any means, but should be extended to all the relations between the corporations, the city and the public. At present every effort toward improvement and extension is met with objections on the part of politicians, and a demand for "remuneration," although in most cases extensions mean heavy expenditure without any immediate return; in fact, many of the improvements that have been made in the suburban service of New York and other large cities have not yielded any return for a long time, and often these lines are operated for years at considerable loss. The experience of practical railroad managers does not lend much encouragement to the idea proposed in "Municipal Affairs;" the tendency is all in the other direction, as was illustrated in the treatment of the Pennsylvania tunnel project. Yet it is encouraging to find recognition of the fact that the present attitude of cities toward street railway companies is detrimental to the best interests of the community served, and it is possible that the present discussion of the problems involved may result in diffusion of this knowledge among the public generally, and secure better treatment of the transportation companies at the hands of municipalities.

Chicago Transfer Problem

In all discussions of plans for improving the transportation facilities of Chicago the necessity for a universal transfer system is urged, and, so far as the public is concerned, it is contended that important concessions must be made by the companies along this line before any further extensions of franchises are granted. The recent decision of the Supreme Court of Illinois confirming the position taken by the city that companies controlled and operated by the same management or interests are to be considered as comprising one system, that only one fare may be collected in such cases and that transfers must be issued, has given much encouragement to the advocates of the one-city-one-fare idea, and has brought into greater prominence the plan to extend this arrangement to all divisions of the city, so as to embrace the lines of the Chicago City Railway Company as well as the Chicago Union Traction Company and the Consolidated Traction Company.

There are, however, many objections to such a plan from the operators' viewpoint, and these will have to be taken into consideration in fixing the terms between the city and the railways, and between the several operating companies themselves. In the Arnold report on the Chicago situation this problem received a great deal of attention, and several plans were discussed with the view of showing the difficulties that would be encountered as well as the advantages to be derived from such a radical change.

It would be impossible to introduce a universal transfer system in Chicago under divisional ownership and the present routing of cars without doing great injustice to the operating companies and inviting wholesale abuse of these privileges. The experience of the Chicago Union Traction Company and the Consolidated Traction Company, since the transfer decision of the Supreme Court went into effect, confirms this view and emphasizes the necessity of rearranging the downtown terminal facilities of the several systems and providing additional accommodations before attempting to exchange traffic between the South Side lines and those of the North Division and West Division. At present, as has been shown in the Arnold report, the cars entering the retail and office district of Chicago cannot take care of the traffic that is offered, and for this reason many people who live within 2 miles of their places of business do not rely upon the street cars during the rush hours. When it

is remembered that it is within the section in which this congestion is experienced that the transfers between the several divisions of the city would have to be made, it will be recognized at once as an impracticable plan under existing conditions. Of course, a consolidation of all the street railway interests of the city would make it imperative under the law to furnish transfers, but with joint ownership of tracks in the downtown districts this would not be necessary unless a special arrangement was entered into between the city and the companies. The city may insist upon universal transfers as a condition of settlement of the transportation problem, and it seems to be the general belief that this will be the attitude of the municipal administration when the subject comes up for final determination. Under the circumstances it is interesting to examine the conditions of operation and the plans proposed for relieving the congestion and making possible the granting of transfers to all parts of the city.

First of all, the population of Chicago is so distributed that the districts served by the several companies are very unequal, that of the North Division and West Division being greatly in excess of that of the South Side, and it is presumed, therefore, that the number of persons transferred from the North Side and West Side lines to the City Railway system would have approximately the same relative proportion; but it is believed that this would be equalized by return fares. About 80 per cent of the total travel is to and from the business district, and a large percentage of passengers would take advantage of this privilege if prompt service and convenient transfer points were offered. At present the holder of a transfer from one line to another in the business center would be compelled to walk from one to four blocks, and under the double-fare system passengers desiring to utilize both systems must often walk considerable distances in changing from one to another. This disadvantage discourages travel, and would doubtless be eliminated in any plan adopted for a reorganization of the transportation business either under unified management or with the view of exchanging traffic. A general plan of unified operation has been proposed by Mr. Arnold, including a comprehensive subway system and a belt surface line connecting railway stations and other important points. The principal advantages of this proposed plan, which was described and illustrated fully in the Street Railway Journal of Jan. 24, as Subway Plan No. 2, are the elimination of the surface cars from the downtown district, with the exception of the belt line mentioned; improved terminal facilities afforded by the subways, and the introduction of a universal transfer system, in which, it is claimed, no injustice would be done the railways. Under this arrangement three main subways will enter the downtown district from the West Side, extending to the Lake Front, with auxiliary lines affording loops and additional transfer points, and three low-level tunnels used by the North Side and South Side cars, which will be carried beneath the subways from the West Side. In support of this plan it is pointed out that the business center of the city would be underlaid with a system of subways intersecting each other at right angles and at a sufficient number of points to enable passengers to travel from almost any point in the business district to almost any other point at the least possible inconvenience. A feature that commends it to favorable consideration is the obstacles it places in the way of those who would use transfers improperly. In order to get on a car the passenger must pay a cash fare and pass through a subway entrance. In transferring from a high-level subway car to any other high or low-level subway car, the passenger cannot go to the surface to dispose of his transfer, but must take some car and use his transfer himself. Once he goes to the surface to dispose of the transfer it loses its value, as no one can enter the subway on a transfer. There would be no demand for a transfer by any one already in the subway, because persons entering the subway must first pay cash fare, and once in they are all on the same footing.

Outside of the business district conditions will remain the same so far as transfers are concerned. There will probably be more or less petty swindling as long as surface lines are operated and transfers are given, but in the downtown section where the several systems converge, and it is proposed to extend the transfer privileges from one system to the others, a new condition is created, and unless some plan is adopted that will protect the companies from the abuse of these privileges they ought not to be expected, and they cannot in justice be required, to adopt a universal transfer system. Mr. Arnold's plan looks practical on paper; whether it will prove adapted to Chicago's needs remains to be seen. He has evidently done his utmost to guard the companies' interests as well as provide the city with an efficient system. In the present condition of affairs it forms an interesting contribution that may well be studied by all who are interested in the problem of relieving the situation in Chicago.

Gaging the Third Rail

The installation of the third rail on an interurban road differs materially in some respects from its installation on elevated roads. On an elevated road nothing but accurately sawed ties are used for any of the construction. On an interurban road it is likely to be the case that hewn ties are used for both track and third rail, with the result that great care must be exercised at every tie where the third rail is supported, to see that it is accurately gaged, not only as to distance from the track rails but also as to height. Although there has not been any serious trouble on any third-rail interurban lines with flashing at the contact-shoe, what little trouble there has been is in no small measure due to variations in the height of the third rail. It seems to be true with the third rail, as it is well known to be with the trolley, that the best preventive of trouble through poor contact is a smooth, well aligned track. If the track is not smooth and evenly ballasted there will be vibration of the truck frame, of course, which tends to make poor contact between the shoe and third rail. If, added to this, there is a variation in the height of the third rail relative to the track rails, the case is made much worse. Any increase in speed, of course, magnifies the difficulties with poor contact. A shoe which may ride evenly on the third rail all the time at 30 miles an hour will jump considerably at 60 miles an hour. There are certain inherent reasons why a contact-shoe, dependent upon a spring, should maintain a more even contact with the third rail than one dependent upon the weight of a heavy cast-iron shoe. The explanation of this is obvious. The inertia of a cast-iron shoe, heavy enough to make good rubbing contact, is so great that it will not quickly change its direction with the variations due to vibrations of the truck frame carrying the shoe or variations in the third-rail gage. If a somewhat lighter shoe be used, and the spring be depended upon to give contact pressure, there will not be the amount of inertia in the shoe that there would be in the former case, and it will take up the vibrations more quickly.

The third rail appears to be something that we will have with us as long as low voltage direct-current motors are used in heavy electric railway work, so that problems connected with it should receive full consideration at this important juncture.

STEAM RAILROAD CONVERTED TO ELECTRIC SYSTEM

Another example of the conversion of an old steam railway line into a modern electric system is afforded in the Cincinnati, Georgetown & Portsmouth Railroad, which has just been placed in operation with the new equipment. The conditions under which the change was made and the effect which the transformation will have upon the policy of the company and the possibilities of the property form an interesting chapter in the history of electric railroading.

The Cincinnati, Georgetown & Portsmouth Railroad Company was chartered in 1872 to build and operate a steam railroad from Cincinnati through Hamilton, Clermont, Brown, Adams and Scioto Counties to Portsmouth. The line was completed to Georgetown in 1874, and has been operated as a steam road to that point ever since. While the road was always in fair financial condition, the depreciation of the equipment caused the operating expenses to form a high percentage of gross earnings, while the inability to improve the passenger service and reduce the rates, together with the disadvantage of a narrow gage of 3 ft., made it impossible to keep pace with the demands of a growing territory.

On Oct. 1, 1901, the property was purchased by W. R. Todd & Company, Cincinnati bankers, and A. W. Comstock, of Detroit, the latter an experienced electric railway man and one of the promoters of the Toledo, Fremont & Norwalk Railway, now a part of the Lake Shore Electric system. Plans were immediately made for changing from narrow gage to standard gage and equipping the road with electricity. The company decided to retain its original charter, and the change of power was made under an act passed by the Ohio Legislature in 1896, covering "electricity as a motive power upon railroads," and making the following provision: "Upon any railroad heretofore or hereafter constructed in this State, electricity may be used as a motive power in the propulsion of cars; provided, however, that before any line of poles and wires shall be constructed through or along the streets, alleys or public grounds of any municipal corporation, plans of such construction shall be submitted to and approved by the Council of such municipal corporation."

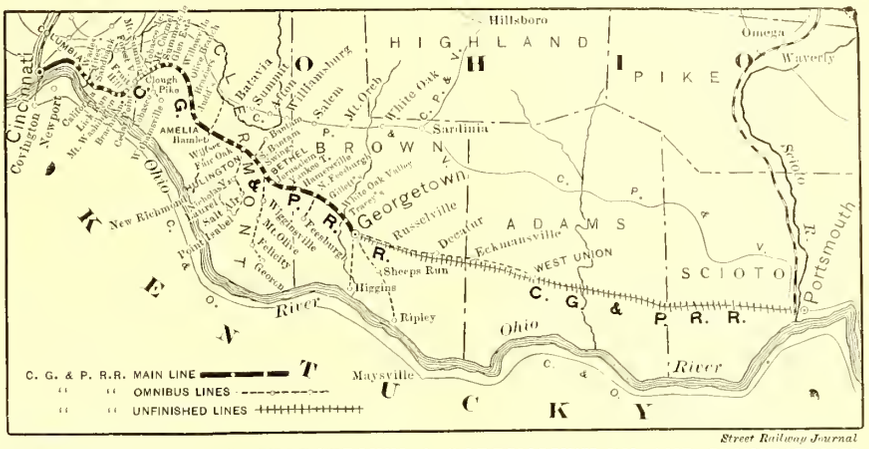
YARDS OF CINCINNATI, GEORGETOWN & PORTSMOUTH RAILWAY, SHOWING COMPLICATIONS OF TRACKS CAUSED BY THREE GAGES

It will be seen, therefore, that this line differs from the majority of electric railroads operating in Ohio, and that it enjoys all the privileges of a steam road.

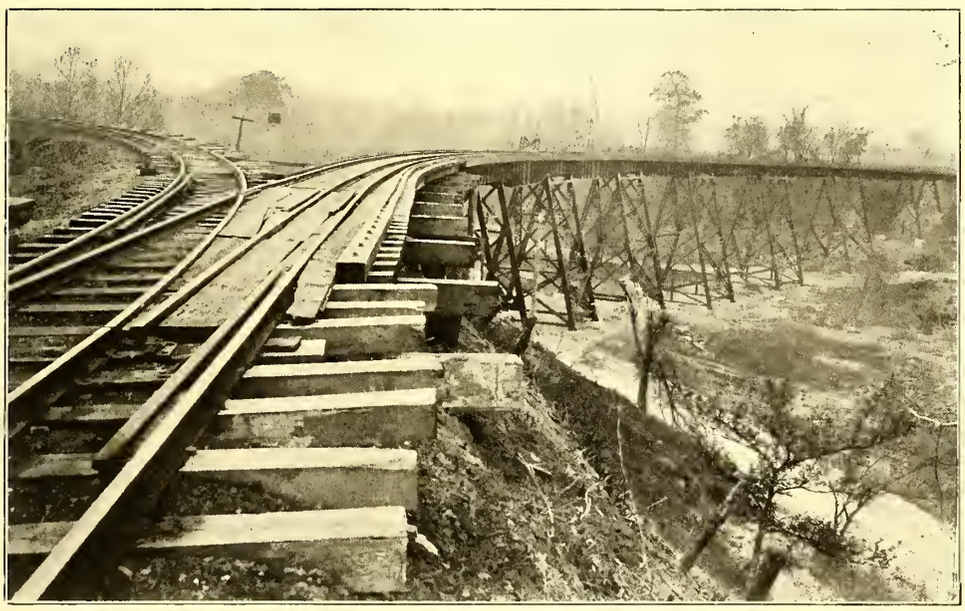
The first step made by the new owners was to change the line to standard gage. This was done in the short space of four hours. All the spikes on one side of one of the rails, and all but every fifth spike on the other side of the same rail were drawn beforehand. The last narrow-gage train, an excursion party in ten coaches, drawn by two locomotives, went over the line in the morning, and the crowd came back in the afternoon

on a standard-gage train. The old narrow-gage train still stands on the siding at Georgetown, and it will probably remain there until it is sold as scrap. The company leased several standard gage equipments, and during the electrification two passenger trains a day were operated each way. Two branches were built while the change of equipment was going on, one from the main line at the Cincinnati Water Works to Coney Island, on the Ohio River, a distance of 9 miles, where a very popular summer resort is located, and the other from Olive Branch, a distance of 3 miles, to Batavia, the county seat of Clermont County.

Through a queer combination of circumstances the first-mentioned branch was laid with a broad gage (5.25) as well as standard gage. The old steam road operated only to Carrel Street station, formerly known as Columbia, where connection was made with the Pennsylvania suburban trains. The new company made a traffic arrangement with the Cincinnati Traction Company to operate into the center of the city over its tracks, a distance of 5 miles, but as the city company employs the wide gage and double trolley system, the railway company will be unable to take advantage of this arrangement until the plans of the new terminal company, formed by the Cincinnati Traction Company, materialize. In the meantime, desiring to secure the full advantage of the Coney Island business, the company purchased a number of cars conforming to the city gage and equipped with double trolleys, and these were placed in operation as soon as the spur line could be completed. Thus, between Carrel Street and the Coney Island junction, for several weeks, there was probably the most remarkable complication of gages ever known in the history of railroading. At the same time there were in actual operation narrow-gage passenger trains, standard-gage construction trains and broad-gage street cars. The complication of tracks at the Carrel Street terminal yard is shown in one of the accompanying illustrations.



MAP OF CINCINNATI, GEORGETOWN & PORTSMOUTH RY. AND CONNECTIONS



LONG STEEL BRIDGE AND JUNCTION

ROADBED CONSTRUCTION

In addition to changing the gage the new owners have made vast improvements in the roadbed. The line traverses high table land, and owing to the difficulty in reaching it through heavy cuts and deep fills, there were, up to the time the change was made, thirty-seven wood and steel trestles. Nearly all of the wooden structures have been abandoned, and in their place fills made, while the balance have been strengthened so as to permit heavy freight trains to pass over them. Nearly 400,000 cu. yds. of material were used in making these fills, and at the present time the roadbed is in excellent condition. New 70-lb. steel rail has since been laid over half the road, and 60-lb. rail on the rest. New standard gage white oak ties have been laid over the entire length of the road, and the roadbed ballasted with washed gravel. Several very fine steel bridges were built a few years ago, and, fortunately, they were made standard width, to provide for possible broadening of gage. One of these bridges, which is 1800 ft. long, 600 ft. being iron work, forms the subject of one of the accompanying illustrations. It is 110 ft. above water.

The right of way is owned in fee for almost the entire distance. It is 60 ft. wide through the country, while in several of the towns it is wider, furnishing ample space for sidings. The

TYPICAL BRIDGE OVER HIGHWAY CROSSING

track is fenced on both sides with American Steel & Wire fencing, and there are cattle guards at all crossings. A private right of way, 60 ft. wide, has been secured, and surveys made to extend the road to West Union, the seat of Adams County, which at present has no railroad facilities of any kind. This will add 25 miles to the main line, giving the system a total of 72 miles, including 8 miles of siding. This extension will be bult this year, and it is quite probable that in another year the line may be extended to Portsmouth. The maximum grade on the extension will be 1 per cent. The average grade on the present line is less than 1 per cent, although there are several rather severe grades for short distances. The accompanying

STEEL BRIDGE AT JUNCTION OF TWO DIVISIONS, SHOWING COMPLICATIONS OF THREE GAGES

map shows the route of the line with extensions, proposed and tributary lines.

INDUSTRIES AND POPULATION

The country traversed is largely agricultural. There are thousands of acres of fruit farms and immense quantities of tobacco are raised in this district. At Georgetown the company maintains a large tobacco warehouse, and at this point

PRIMITIVE HOME DIRECTLY UNDER LONG TRESTLE OF CINCINNATI, GEORGETOWN & PORTSMOUTH RAILWAY

millions of pounds of fine tobacco are handled. There are a number of fruit canneries, which do a very large business, and there are a large number of poultry farms, which furnish the road with much freight. At Bethel there is a shoe factory which employs 300 people and produces 10,000 pairs of shoes per week. Georgetown has a woolen mill, a pump factory and several flour mills. The town prides itself as having been the boyhood home of General U. S. Grant, and the house in which he spent his early years and the tannery where he worked until he went to West Point, are pointed out to every visitor.

It is a noteworthy fact that while the greater number of Ohio towns have shown steady gains in population this territory stood still for a score of years. Within the last three or four years, however, the country seems to have taken on new life. The remarkable growth of Cincinnati and nearby cities, the increased demand for food products, the advent of the telephone, and now the marked improvement in the railroad facilities seem to be changing the entire aspect of this territory. A sample of the primitive life which is fast being superseded is shown in the cut of a "squatter's" home. A man, his wife, ten children and several dogs occupy this residence. The company desired to build a new bridge on a line with the house, but the occupants declined to vacate, so the company decided to build its track over them. The passenger in the handsomely appointed electric car can look down the chimney of this relic of the early days of the nineteenth century.

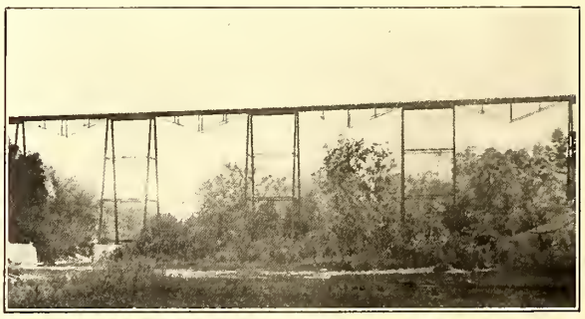
The population of the several towns on the line follows:

Cincinnati	450,000
California	800
Mt. Washington	1,000
Forestville	300
Mt. Carmel	1,000
Summerside	200
Olive Branch	300
Batavia	2,500
Amelia	1,000
Bethel	2,500
Hamersville	800
Georgetown	3,000
Russellville	800
Eckmansville	1,000
West Union	2,500

Other tributary population is about 20,000.

PASSENGER, FREIGHT AND EXPRESS SERVICE

Freight has always been the heavy end of the business of the Cincinnati, Georgetown & Portsmouth. This has been divided into two classes, the ordinary freight, and what has been designated as "fast freight," more properly express. The reason for this appellation is that being a railroad company it is not chartered to engage in the express business. The relation existing between the road and other steam roads has always been very friendly, and there is no reason to believe that the change of power will make any difference in these



STEEL TRESTLE 110 FT. ABOVE WATER

relations. Since the road has been changed to standard gage freight cars have been interchanged with other roads on the ordinary per diem arrangement. The company owns ten standard coal cars, ten flat cars, ten box cars, ten stock cars and ten coal cars. At present regular freight trains are operated by steam locomotives, but the company is having constructed two 50-ton electric locomotives. These are being designed to haul ten loaded cars up a 3 per cent grade. Freight

is handled at ordinary freight rates, and the forms and methods of billing are the same as are generally employed on steam roads.

In its express business the company has developed a number of novel features which may be studied to advantage by electric railway managers, for never was a territory better served by a transportation company. Express is handled on standard steam express cars, which at present are hauled as trailers, but the company has already arranged for the early delivery of three electric express and mail cars. The express cars are shunted to the Pennsylvania tracks at Carrel Street, and attached to the Pennsylvania suburban trains operating to the station in the heart of the city. At its city office, 333 Walnut Street, the company maintains an express station, and goods may be shipped from this point from the Pennsylvania station or from Carrel Street.

Express wagons are operated from the Walnut Street office, and collections and deliveries are made throughout the business district of Cincinnati free of charge. Agents are maintained at all towns and express messengers are on all express cars. The company collects notes, bills, and drafts for city merchants who ship goods into the country, or for country merchants who ship into the city. A charge is made for the collection, and the money is carried at rates shown in the express tariff. Money is also handled for the country banks and for the pay rolls of factories along the line. Milk is delivered to hotels, restaurants or depots, collections are made at stated periods and the money returned to the consignor.

TARIFF RATES
ON THE
CINCINNATI, GEORGETOWN & PORTSMOUTH RAILWAY

STATIONS.	MILES.	Per 100 Lbs. West Bound Produce, Poultry, Etc.	Pack'ge 5 Lbs. & under.	Pack'ge 10 Lbs. & under.	Pack'ge 15 Lbs & under.	Pack'ge 20 Lbs. & under.	Pack'ge 30 Lbs. & under.	Pack'ge 50 Lbs & under.	Pack'ge 100 Lbs. & under.	MONEY. $5.00 & under.	$30.00 & under.	$100.00 & under.	$500.00 & under.
CINCINNATI			EAST AND WEST BOUND.							CINTI. & COL. SAME.			
COLUMBIA	5												
CALIFORNIA	7	20	20	25	25	25	30	30	35	15	25	35	45
		25	20	25	25	25	30	30	35				
MT. WASHINGTON	10	20	20	25	25	25	30	35	40	15	25	35	45
		25	20	25	25	25	30	30	40				
BRACHMANS	10½	20	20	25	25	25	30	35	40	15	25	35	45
		25	20	25	25	25	30	30	40				
CEDAR POINT	11	20	20	25	25	25	30	35	40	15	25	35	45
		25	20	25	25	25	30	30	40				
FRUIT HILL	12	20	20	25	25	25	30	35	40	15	25	35	45
		25	20	25	25	25	30	30	40				
FORESTVILLE	13	20	20	25	25	25	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
CHERRY GROVE	14	20	20	25	25	25	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
MT. SUMMIT	15	20	20	25	25	25	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
CLOUGH PIKE	15½	20	20	25	25	25	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
MT. CARMEL	16	20	25	25	25	30	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
KYLES	17	20	25	25	25	30	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
GLEN ESTE	18	20	25	25	25	30	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
WILLOWVILLE	20	20	25	25	25	30	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
OLIVE BRANCH	20½	20	25	25	25	30	30	35	40	15	25	35	45
		25	25	25	25	30	30	40	45				
CENTERVILLE	21	20	25	25	25	30	30	35	40	15	25	35	45
		30	25	25	25	30	35	40	45				
JUDDS	22	20	25	25	25	30	30	35	40	15	25	35	45
		30	25	25	25	30	35	40	45				
AMELIA	24	20	25	25	25	30	30	35	40	15	25	35	45
		30	25	30	30	35	35	40	45				
HAMLET	25	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
WILTSEE	27	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
FAIR OAK	28	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
HULINGTON	29	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
SOUTH BANTAM	30	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
SWINGS	31	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
BETHEL	33	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
JERUSALEM	36	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
YANKEETOWN	38	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
HAMERSVILLE	39	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
NORTH FEESBURGH	41	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
GILLETS	42	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
WHITE OAK VALLEY	44	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
TRACYS	45	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				
GEORGETOWN	47	20	25	25	30	30	35	40	40	15	25	35	50
		30	25	30	30	35	40	40	45				

Money, $1,000.00 to $5,000.00, charges will be 40 cents per thousand.

Rate on Calves to Columbia, 40 cents each; to Cincinnati, 60 cents each.

Rate on Berries to Columbia, from west of Amelia, 25 cents; same delivered in Cincinnati, 40 cents per stand.

Rate on Milk from all stations to Columbia, 2 cents per gallon; to Cincinnati, 3 cents per gallon.

To find rate between stations, take number of miles between the stations, then follow down the column of miles and take rate opposite.

Agents must use judgment when billing bulky and light shipments to double or treble the weight in order to secure correct charges for space occupied.

Live Stock crated must be charged double rates.

Agents must invariably take receipts for all goods delivered.

Empties will be returned free, but must be delivered at Pan Handle Baggage Room.

NOTICE.—Under the heading "East and West Bound" the figures at the left show rates between Columbia and all points, while those set to the right show rates between Cincinnati and all points.

Rates for express service are 25 per cent below those of ordinary express companies, and are determined by weight and bulk of packages rather than by class. The express tariff is shown in the accompanying table.

Formerly the company operated a telephone system, with public toll stations in all towns, but this has recently been leased to the City & Suburban Telegraph Assocation, of Cincinnati. The lines have been improved, and are now largely used by country people in ordering goods in Cincinnati. One line is retained by the company exclusively for despatching trains. Frequently patrons telephone to the company's office and direct the agent to purchase certain goods for them. Postal card blanks are supplied to patrons in the several towns, and when they have sent an order to the city merchant the company is notified to collect and deliver the goods.

It goes without saying that the most important change in the road has been in the passenger service. In place of two trains per day the company now operates cars every hour. Rates have been reduced about one-third, and are now about 2 cents a mile. The road traverses a beautiful scenic route, and travel on Sundays and holidays is particularly heavy, as a fare and a half rate for the round trip is made for these days. Tickets are sold to the center of the city in connection with the Pennsylvania suburban trains, or passengers can save 10 cents by taking the cars of the Cincinnati Traction Company at Carrel Street, thereby securing transfers to all parts of the city. Ultimately the passenger cars of the Cincinnati, Georgetown & Portsmouth will enter the city over this route. Low rates are made to commuters, and a 500-mile book, good for any member of a family within a year, is sold at $8. The mileage must be signed by the person using it. For commuters a single form of ticket is used for all towns, the agent in selling the book punches through the entire pad the points between which the ticket is good, thereby saving the cost of a great variety of tickets. School tickets are also sold under this plan. They are good for forty-six rides during a month, and may be purchased by persons under 18 years of age, who must satisfy the agent, however, that they are actually attending school. Tickets are sold by Cincinnati, Georgetown & Portsmouth agents over all steam lines in that part of the country, and baggage is checked through over other roads. Stage routes connecting a number of hamlets and towns in Clermont, Brown and Adams Counties connect with Cincinnati, Georgetown & Portsmouth cars at Forestville, Hamlet, Bethel and Georgetown, and tickets are sold over these lines or packages to these points may be shipped in care of the company. Mail is also handled for a large number of towns throughout this district.

Near Olive Branch the company built a large lake to furnish a water supply for its power house, and it is planning to establish a summer resort at this point. The plans contemplate a large hotel and park. In addition to this there are parks and picnic grounds at Cedar Point, Cranes Grove, Berry's Grove and Amelia. These, in connection with the Coney Island resort on the Ohio, give a very large summer traffic.

ROLLING STOCK

The new passenger coaches purchased by the company, ten in number, were built by the St. Louis Car Company. They are 50 ft. over all, 8 ft. 10 ins. wide and 9 ft. 4 ins. from sill to roof. They are constructed for high-speed service, bottom framing reinforced with steel channels along side sills, and steel I-beams in center or intermediate sills. The sides are double sheathed with windows arranged in pairs, similar to Pullman construction; the lower sash is arranged to raise. Interior finish is white oak with ceiling of the same material. They are provided with smoking compartments and toilet room, and are heated by Smith hot-water heaters at the rear end. Pantasote curtains are used, and the seats are of the St. Louis Car Company's walk-over type with canvas-lined rattan. Cars are

vestibuled at both ends, and each platform is provided with double steps and folding drop floor. The bodies are mounted on St. Louis Car Company's 23-B high-speed trucks, M. C. B.

NEW 50-FT. PASSENGER COACHES

type, equipped with four Westinghouse 56-motors. These cars stop only at regular stations, which, together with the fact that

MOUNT WASHINGTON SUB-STATION AND PASSENGER DEPOT

the road is entirely private right of way even through towns, permits of a very fast schedule.

Two express, mail and baggage cars and one combination baggage car are equipped in the same manner. The twelve broad-gage cars, six closed and six open, already mentioned, are of the latest double-truck city pattern, and were built by the Cincinnati Car Company. They are equipped with four 40-hp Westinghouse motors. All of the freight cars are equipped with Westinghouse air brakes and automatic couplers, M. C. B. type.

POWER HOUSE

The power house at Olive Branch is a fine brick structure, 151 ft. 10 ins. x 95 ft. 10 ins., with steel roof trusses and slate roofing on 2-in. tongued and grooved sheathing. The engine room measures 151 ft. 10 ins. x 45 ft. 6 ins., and the boiler room is of similar length, measuring from center to center of walls 48 ft. 6 ins. The boiler house is arranged for four batteries of boilers of 500 hp each, there being two 250-hp Cahall boilers in each battery. They have 3000 sq. ft. of heating surface each, and built to run at 150 lbs. steam pressure. Each battery has a steel stack, 6 ft. in diameter and 125 ft. tall. These are cross-braced and guyed to the roof of the building. The foundation is constructed for an additional battery of boilers, if required in the future. In the boiler room there are two Worthington boiler feed pumps, each of sufficient capacity for feeding 2000 hp of boilers. These are arranged to take water either from the hot well or from the lake. The water supply was obtained by building a dam across a natural ravine, through which flowed a small stream. The width of this lake will average about 300 ft. x 3000 ft. long, with an average depth of 14 ft., giving an ample and permanent supply of pure water, which requires no treatment. In the boiler room there is also one 2000-hp Stilwell-Bierce open type feed-water heater. The main header is of heavy wrought iron pipe, 16 ins. in diameter, with rolled steel flanges. Bends in the piping are all wide curves. Valves are of the Fairbanks type and are equipped with automatic direct-lift damper regulators. The steam piping and fittings are extra heavy.

Coal storage is arranged along one side of the boiler room, so that cars can be run on a trestle and dumped into bins

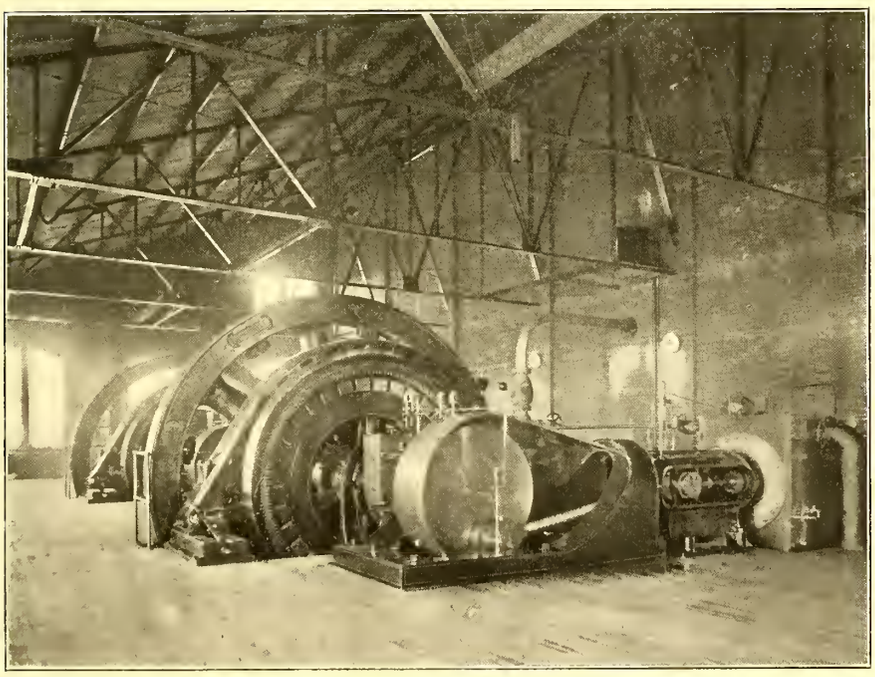
POWER HOUSE, POND AND PARK OF CINCINNATI, GEORGETOWN & PORTSMOUTH RY.

below, which have a capacity of 400 tons, facilitating handling.

The engine room floor is 8 ft. above that of the boiler room. Engine foundations are of stone with Portland cement mortar. There are foundations for three cross-compound engines, together with foundations for exciter engines, rotary converters and a switchboard. There is a space at one end of the engine room, measuring 14 ft. x 45 ft., partitioned off for the transformer room. At the opposite end of the engine room is a pump pit measuring 22 ft. x 45 ft., the floor of this pit being 14 ft. below the level of the engine room floor.

There are at present installed two cross-compound condensing Hamilton Corliss engines. The dimensions of cylinders are, high pressure, 24 ins., low pressure, 44 ins. x 42-in. stroke. They are intended to operate at 90 r. p. m., and are designed for a normal capacity of 1400 hp. Connected to these engines by shaft are Westinghouse 600 kw, 3000 alternations, 360-volt 25-cycle alternating-current generators of the revolving field type. There are also in the engine room one Harrisburg exciter engine, direct-connected to a 50-kw Westinghouse generator; also one Westinghouse motor-driven exciter set, consisting of one 75-hp, 360-volt three-phase motor, direct connected to a 50-kw, 110-volt generator. The engine-driven exciter set is used for starting, and when the generators are up to load it is shut down, and the motor-driven exciter set is thrown on. At this end of the power house there are also two 250-kw, 25-cycle, 360-alternating current, 600-volt direct-current rotary converters, together with a marble switchboard, carrying a complete equipment for the control of generators and rotary converters and having panels for the control of long-distance transmission circuits.

In the transformer room there are six 200-kw, 360-15,000-volt step-up transformers of the Westinghouse oil cooled type,



ENGINE ROOM IN MAIN POWER HOUSE

together with circuit breakers and lightning arresters for long-distance transmission.

The condensing apparatus, which is located in the basement, consists of one central condenser of sufficient capacity for the operation of three units, for which the station is designed. There is a Worthington compound pump having 22-in. suction and an auxiliary pump to draw air from the condensing system. In the basement there is also a white star oil filter system, furnished by the Pittsburg Gage & Supply Company. Automatic sight-feed oilers on the engines lubricate all bearings, and the oil runs by gravity to the filter, from which it is then pumped to a supply tank in the engine room.

SUB-STATION EQUIPMENT

On the present line there are three sub-stations, located at Mt. Washington, Bethel and Sunshine. The stations at Mt. Washington and Bethel, which are illustrated herewith, supply

BETHEL SUB-STATION, PASSENGER AND FREIGHT HOUSE

current to the trolley line a distance of 5 miles each way. These stations are also used as freight and passenger depots.

The sub-station at Mt. Washington is of brick, 72 ft. x 30 ft., the freight room, which is located at one end, being 13 ft. long, and the passenger waiting room at the other end being the same size. The electrical apparatus is in the center room, and consists of two 250-kw, 360 alternating-current, 600-volt direct-connected 25-cycle Westinghouse rotary converters and three 200-kw, 360-15,000-volt step-down transformers, together with switchboard having alternating and direct-current panels, lightning arresters, choke coils, circuit breakers, etc. The sub-station at Bethel is of similar design, excepting that the waiting room is 17 ft. wide and the freight room 19 ft. wide, the over-all dimensions being 81 ft. The general architectural design of this station is superior to the other stations, as Bethel is the most important town on the line. There is a covered platform, 25 ft. wide, to serve as a waiting place in summer. The electrical equipment at this station consists of two 150-kw rotary converters and three 100-kw, 360-15,000-volt step-down transformers, together with switchboard and auxiliary apparatus. The Sunshine sub-station is similar in size to the sub-station at Mt. Washington, except that the waiting room is omitted, while the electrical equipment is similar to the apparatus installed at Bethel.

LINE CONSTRUCTION

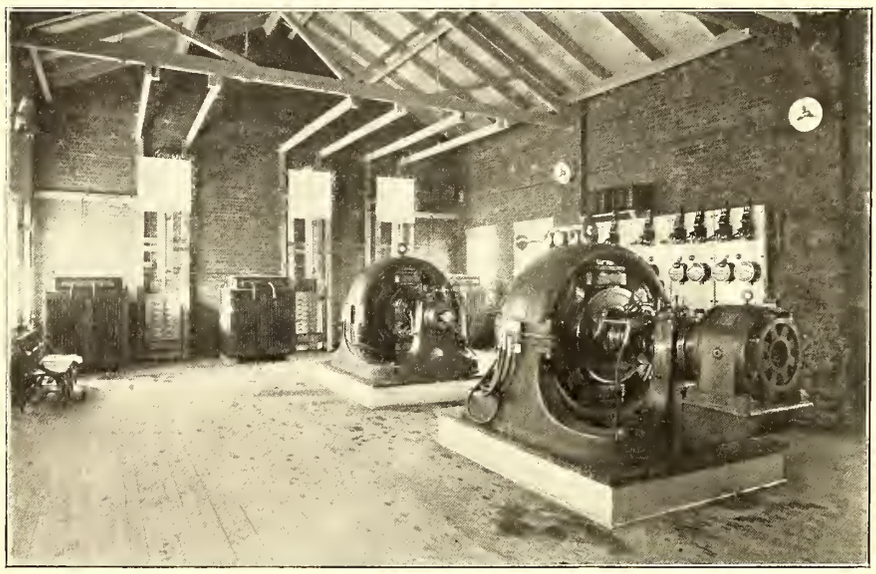
The line construction is of the span-wire type throughout. Two 000 trolley wires are supported by span wire from poles measuring 30 ft. on one side and 35 ft. on the other side of the track. The long-distance transmission wires, which are double-braided weather proof, are suspended on cross arms on 35-ft. poles. The arms are 4 ins. x 5 ins., and 1½-in. pins with hard wood maple braces are used. Insulators are of the Loche Victor 25,000-volt type. Provision is made in the construction of the transmission line westwardly from the power house for the installation of an additional three-phase circuit, to be used for the contemplated extension of the road. Both rails are

bonded with 0000 Protected rail-bonds under fish-plates. Both the S type, with 8-in. center, and the U type, with 4-in. center, are used. There are cross-bonds every 1000 ft., and all frog switches are bonded around with 0000 solid wire bonds.

The steam road had an ample car house and paint shop at the Carrel Street terminal, and the locomotive repair shop required but little change to make it suitable for the new work.

ORGANIZATION

Of course, it is altogether too early to attempt to estimate intelligently the increase in business and the saving in the cost of operation that can be effected through frequent service, lower rates and the superior economy of electrical operation, and the month of December, 1902, cannot be accepted as a criterion for the future, particularly in view of the fact that the new system could not be expected to operate satisfactorily the first month. Nevertheless an interesting comparison can be made in the statements for December, 1900, when the road was a narrow-gage steam road; December, 1901, during which it was operated as a standard-gage steam road under a new and progressive management, and December, 1902, the first month for the electric service:



INTERIOR MOUNT WASHINGTON SUB-STATION

	Gross Earnings	Operating	Net
December, 1900.....	$6,669	$5,633	$1,037
December, 1901.....	8,818	5,686	3,133
December, 1902 (estimated)..	10,000	5,900	4,100

The company is capitalized at $1,500,000, and there is a first mortgage bond issue of $1,000,000, which covers also the proposed extension to West Union, less $15,500 to the mile, a very low figure compared with many electric roads. The officers are: A. W. Comstock, Detroit, president; W. R. Todd, Cincinnati, vice-president; R. E. Field, Cincinnati, secretary-treasurer, and E. M. Stevens, general superintendent. These, with Judge John S. Conner, F. F. Dinsmore and Samuel Tappin, Cincinnati, and W. J. Thompson, Georgetown, constitute the directors. General Superintendent Stevens took charge the first of the year. He was formerly with the Westinghouse Electric & Manufacturing Company, and had charge of the erecting of the electrical equipment of the road. He is a practical electrical engineer and has had much experience in the building and operation of electric roads. The contractors for the reconstruction of the road were the Tennis Railway Equipment Company, of Cincinnati. The construction and installation of the electrical equipment were under the personal supervision of Graham Bright, who furnished much of the technical information presented herewith.

SURFACE RAILWAY OPERATION IN MANHATTAN*

These complaints, like others which have recently come before this Board from the Greater New York and have engrossed its attention to the exclusion of nearly all other business during the last eight weeks, relate chiefly to the overcrowding of street surface railroad cars, particularly in the Borough of Manhattan, and incidentally to the lack of sufficient car service in the Borough of the Bronx. In the endeavor to work out a plan for the general improvement of this service the Board gave two public hearings at the City Hall, in the Borough of Manhattan, in addition to which it examined at length the chief operating officers of the company and the company's traffic statistics and diagrams, besides making careful personal study of the situation by the members of the Board and its regular as well as special experts and inspectors.

It is unnecessary here to describe the situation beyond saying that all of the available street car facilities in the Greater New York, surface and elevated are inadequate for the reasonable comfort and rapid transportation of the people at the times when they most need to be transported, namely, during the hours between 7 a. m. and 10 a. m. and 5 p. m. and 7 p. m. This inability to handle traffic arises from the fact that practically the whole movement, in the morning hours, is from north to south, and in the evening from south to north, and that a large proportion of the whole number of passengers ride for long distances. While these lines of overburdened cars are moving one way there is a corresponding number of empty or only half-filled cars moving in the opposite direction. Every north and south thoroughfare in Manhattan, except Fifth Avenue, is already occupied by a surface or an elevated railway or by both. New lines on the surface are out of consideration—there is no place for them. The only ways open to add to the trackage are by building several lines of underground railway and by making the elevated railway a two-story structure. These constructions would occupy three to five years for completion if begun now.

But what the public urgently need and should have, if obtainable, is immediate relief. It is not the purpose or the duty of this Board to deal in vague phrases or to mislead the public. The Board has been harshly and unjustly criticised, and without limitation, but not in a single instance has any one of these self-constituted judges made a practical suggestion toward the solution of the problem. The seemingly conclusive outcry, "Put on more cars," is absolutely childish in the face of complexities such as surround this case. If "putting on more cars" would meet the needs the Board would have solved the difficulty before the critics knew there was a difficulty. The real difficulty is to move the cars after they are on the tracks. Therefore, the Board expresses the opinion, frankly, that no measure of immediate relief during the rush hours is at present obtainable. The very first and largest measure of immediate relief that can be obtained is that which can be derived from the regulation of the movement of independent vehicles in the streets. Of course, it is not to be assumed that the vast private and commercial vehicular traffic of New York can, or must, or should be unduly hindered, or impeded or its rights invaded. It is this great activity of commerce which gives the city its imperial importance and which causes this very overcrowding of all its

*Report and recommendations of the Board of Railroad Commissioners of the State of New York, dated Feb. 11, 1903, in the matter of the Merchants' Association, of New York, and others against the Interurban Street Railway Company and the Union Railway Company, of New York.

traffic arteries. These intolerable local traffic conditions of to-day are due to the unexampled business activity of the whole country, coming down directly upon the stagnant, lethargic attitude of the municipal authorities for more than twenty years past. Think of it! A single bridge connects the former cities of New York and Brooklyn, and that one completed and put in use twenty years ago next May. And even that one was begun and carried far along in construction by private enterprise. The building of bridges or tunnels across the East River would make the landing and detrainment of large masses of people on Manhattan Island, at various points on its length, an easy matter. The building of new north and south lines of conveyance, even where practicable, will only add to the wearisome long distance riding of the night and morning. The added capacity of the new underground railway will be wholly lost sight of, or neutralized, by the growth of traffic within, probably, three years after it is opened for business. It is the judgment of this Board that at least two new lines of underground railway, wholly in Manhattan and The Bronx, and three new bridges or tunnels between Manhattan and the Boroughs of Brooklyn and Queens, should be at once begun. Unless some comprehensive work along these lines is forthwith undertaken and carried to completion with despatch, the city will find itself beset by stagnated traffic difficulties and dangers which will completely overshadow even the hard conditions which are to-day regarded as intolerable.

And it is pertinent for the Board right here to point out the place at which these increasedly distressing and dangerous conditions will be first felt, to wit: in the contracted and obstructed little Tryon Row plaza at the Manhattan end of the Brooklyn Bridge. All of the bridge traffic from Brooklyn debouches into this irregular space, as well as the business of the terminals of three active through lines and three local lines of surface cars and the City Hall station, itself a terminal of the Manhattan Elevated Railway. To this now seething mass of traffic, in a space seriously obstructed by iron columns of the elevated railway platform and the approach to the bridge, will be emptied and drawn to and fro every day the presumably large number of passengers using this terminal of the underground railway. This road is to have one of its principal stations alongside this little plaza. There is no speculation about estimating the result. It will make that which is already bad dangerously worse. And this remedy, though costly, is easy and just as obvious as the danger. It is to require the city of New York, the Manhattan Railway Company, the Interurban (Metropolitan) Street Railway Company and the Interborough (underground) Rapid Transit Company to purchase jointly the entire block of property fronting on Tryon Row, Park Row, Chambers Street and Center Street, and the small triangle bounded by Park Row and North William Street, and convert the space into a system of terminal elevated, surface and subterranean loops for the elevated, the surface and the underground railways. At the same time a freer movement would be afforded for vehicles by opening the way for clear entrance into the new Elm Street extension and other thoroughfares. This expense might very properly be shared by the city as the owner of the Brooklyn Bridge. The city has been for many years the owner of several parcels of the realty comprised in the Tryon Row, or "Staats Zeitung" block.

And while this branch of the situation is presented it is not inopportune for this Board to say that everything bearing upon it that has been done by the city government for many years has been tardily undertaken and slothfully carried out. Improvement at and on the bridge has been dickered over in matters costing only paltry sums; the Elm Street widening has lagged for years and still lags; there is no tunnel as yet and but one bridge between Manhattan and Long Island; departments of the city government only a few years ago systematically attacked the elevated railway company, tried to show that the structure was rotten and worn out, endeavored to break down the company's credit and play with its stock in Wall Street, and made every possible attempt to deprive the company of the use of its tracks in the Battery Park. And so with the surface lines. Every attempt to lay a new track or make a new connection was denounced as "a grab;" the city has paid the full cost of the widening of Fifty-Ninth Street, between Fifth Avenue and Eighth Avenue, as it will also do for the widening of Eighth Avenue, on Central Park West, and for the widening of Fifty-Ninth Street east of Fifth Avenue, notwithstanding the street railway company was ready and offered to pay the whole expense. And it should be borne in mind that the company did not seek to lay down any new tracks in these widened thoroughfares, but only to help a freer car movement by giving greater room for all other vehicles. The Board might multiply examples and give some very specific instances to show that there has been a petty, demagogic policy persistently pursued against all interurban railway enterprises in New York city, probably instigated by and dating, of course, from the Broadway Railroad scandal of 1884, and that the tendency has been to treat the corporations as the public enemy. To this very combination of circumstances is in some degree due the difficulties and the backwardness and the incapacity of the service to-day.

THE COMPLAINTS CONSIDERED

Incidental to the general complaint of overcrowding or insufficient cars the Merchants' Association submitted some fourteen other subjects for remedy. Of these, in a consultation had between this Board and the Association's committee of engineers, the Association relinquished six of its demands as either impractical or undesirable, and has made public its official report to that effect, but expressing itself as in favor of putting the other eight recommendations into operation. These eight affirmative conclusions relate to the extension of the Eighty-Sixth Street crosstown line; the recognized inadequacy of the service and the unclean and badly-lighted cars used on the downtown crosstown lines; the need of shelter at exposed intersecting or transfer points in The Bronx Borough; the removal of unused car tracks from the pavements, under certain conditions; the employment of two conductors, or a conductor and a collector on each car; the more distinct marking of cars to indicate their routes; the proper municipal regulation of street traffic and the removal of obstructions; the enforcement of proper sanitary regulations and improved ventilation in cars.

The Board is in accord with the Association on each of these recommendations, except that requiring two conductors on each car, and will issue explicit directions to the Interurban Street Railway Company and the Union Railway Company, respectively, in relation thereto as the subjects affect each. On the question of two conductors for each car, the Board does not believe that it would tend to check overcrowding of the cars or better the car movement, which are the two chief aims in the present effort to find relief. So far as the exemption of passengers from injury is concerned the facts of record show that the percentage of casualties arising from causes which a second conductor might avert is very small, and in all other than rush hours the second conductor on a car would be a superfluity and a nuisance. Among the subjects relinquished by the Merchants' Association, and not further considered here, are the proposed diversion of the Broadway and Sixth Avenue cars, each to the lines of the other, at Thirty-Fourth Street; the forbidding of passengers standing between cross-seats in open cars; the proposed vestibuling of the surface cars; the diversion of Lexington Avenue cars from Broadway at Fourteenth Street, and of Broadway cars east and west on Fifty-Ninth Street, and the extension of the transfer system. The reasons adverse to these propositions were apparent to this Board, and were expressed by it from the beginning, and the Association has yielded only

to the force of these reasons, as presented and confirmed by its own experts.

SOME LIMITED EARLY RELIEF

Among the recommendations for improvement of the surface car service the Board places first those which promise the earliest forms of relief available and in which the city can take an active part.

The Board respectfully recommends and urges upon the municipal authorities of New York city:

The completion of the Elm Street widening improvement and the opening of that street to general traffic at once.

The formulation, adoption and enforcement of a code of regulations for vehicular traffic in the streets. This recommendation is deemed the most important because it is the source from which the largest and earliest measure of immediate relief can be obtained. The Board has assurances from the city authorities that they will co-operate in their proper departments for the prompt application of this remedy.

It is probable that about 25 per cent more cars can be operated on the congested lines during both rush and non-rush hours of the day time under proper traffic regulation and when the street conditions are made such as to permit this addition of cars, the Board will instantly require them to be put into service. There has been found a great discrepancy in the figures collected to show the actual maximum movement of cars across the complex intersections at Broadway, Sixth Avenue and Thirty-Fourth Street. The company's expert gave it as his opinion that 900 cars passing per hour was the maximum "with a perfectly free, unobstructed movement," and that even under existing conditions 600 car to 700 car movements an hour were feasible. Numerous tallies at these crossings, taken for whole days and for rush hours, by inspectors for this Board, failed to show more than about 625 car movements per hour, and these were during the afternoon "rush." The facts of the situation show that the vehicular obstructions on Broadway, especially below Fourteenth Street, are greatest between about 9:30 a. m. and 5:00 p. m.—those being the hours of largest commercial activity. And it is on this part of Broadway that the car movement is most irregular and sluggish. It is apparent that with recent unsystematized police improvement in the regulation of wagon traffic, conditions have been somewhat bettered as to the rapid, or free, movement of cars, and it appears to this Board also that still further improvement may be had along the same lines. It is not possible to-day to formulate an enforceable order to the company, but so soon as traffic regulations are put into effect the Board will require all the cars that can be operated to be put into service. To this end the Board recommends that the Interurban Street Railway Company add to its present main line equipment not less than 250 closed cars of the new standard size and pattern, exclusive of the 175 open cars now under contract for construction. The company has ample car equipment and electrical power capacity to move traffic considerably in excess of the maximum permitted by present conditions, but with improved conditions and the assumed normal growth of population, the Board believes that this addition to equipment should be made at the earliest practicable day to provide for the public necessities.

The Board invokes also the energetic action of the municipal authorities toward the removal of obstructions and encumbrances placed in the streets and public places by contractors, including those which have for more than two years in some instances been maintained by the contractors engaged in building the underground railway. Great as is the need of this improvement there does not seem to be good reason for allowing both sides of leading thoroughfares to remain open for years, blocking not only the ordinary traffic but practically blockading merchants in their stores and adding the immense carting business of the subway contractors themselves to the constructed passageways. If other underground railways are to be built in Manhattan this greatest of all the attendant evils and inconveniences should be guarded against zealously. If experience is worth anything something should be learned from this present work to aid in preventing or avoiding similar public nuisances and encroachments on every man's right. Every resident of and visitor to Manhattan for two years past has suffered from this cause. One of the most frequent and prolonged causes of delay has arisen from the sinking of truck wheels through the worn or imperfect floor planking laid over the subway excavations. This is a matter also worthy of consideration and prevention by the city authorities having charge of streets and highways.

A further subject which is recommended by the Board to the city authorities and to the Interurban Street Railway Company is the making of an agreement between them for the removal of the rails from car tracks not now in use. The power to force the relinquishment of these tracks may be in doubt, and in any event long litigation might ensue; but what is urgently needed is public relief in every available form. If an agreement, a contract, be made by which the city binds itself to permit the rails to be relaid whenever the company proposes to relay them and to run car lines over them, no harm would result to the company's interests, and the streets might in the interval be repaved and made serviceable, as they are not at present, for ordinary traffic. There are, according to reports made to this Board, nearly 19¾ miles of unused single tracks in Manhattan, situated on fifty-nine different streets and avenues, and varying in length from 200 ft. to 2¾ miles, this last item being on Amsterdam Avenue.

The Board is considering the advisability of a regulation that, during evening rush hours only, all northbound cars shall, after passing Eighth Street, stop only at the intersections of the odd numbered streets, and that during morning rush hours all southbound cars shall stop only at the even numbered streets down to and including Eighth Street. This plan will reduce the number of stops by one-half and give longer free running, thus greatly facilitating the car movement. The transverse street blocks do not average more than 250 ft., and passengers would not be greatly inconvenienced by such a walk, which would be the maximum after leaving the cars.

If deemed necessary such a recommendation will be hereafter issued.

The Board suggests that whenever it can be done without manifest disadvantage the public use the side lines, as, for example, Second Avenue and Third Avenue on the east, and Eighth Avenue and Ninth Avenue on the west, instead of taking transfers to reach the congested, because more popular, center lines, such as Broadway, Madison Avenue and Sixth Avenue.

Among means for permanent betterment of the conditions the Board recommends for consideration: 1. The feasibility of construction of a tunnel, running from south to north, between Thirty-Second Street and Thirty-Fifth Street, on the line of the open plots of ground known as Greeley Square and Herald Square, in which subway the tracks of the Broadway line of surface cars may be carried beneath the crossing of the Sixth Avenue and Thirty-Fourth Street lines of cars. The Board has prepared a preliminary plan showing the advantage of this method of relieving the congestion at this now very much complicated crossing. It provides for taking the tracks entirely off from Broadway, between Thirty-Second Street and Thirty-Fifth Street, abolishing the present long "Broadway skew" intersections with the Sixth Avenue tracks and with the Thirty-Fourth Street tracks, and will increase the free carriage space and leave only a simple right-angled crossing of the Sixth Avenue and Thirty-Fourth Street lines. The plan also provides for a subway station and a safe subway crossing for foot passengers in a location that will, as soon as the new Pennsylvania Railroad station is completed, be by far the most congested and

dangerous crossing in the city. 2. The construction at the Manhattan end of the Brooklyn Bridge of an open plaza on the general lines mentioned in the earlier reference made herein to this subject. The early and definite determination of a plan for the improvement of this plaza is regarded by the Board as an imperative necessity.

The determination by the city authorities and the early completion of the plaza and approaches for the new Williamsburg Bridge. This matter will fix definitely the time within which the Interurban Street Railway Company can begin, as well as the character of, the work of electrifying its most southerly crosstown lines connecting with the great East Side. This large neighborhood, densely populated and industrially very active, is now mainly dependent upon lines of dilapidated horse cars, heated by old-fashioned stoves and badly lighted by oil lamps. No material improvement is practicable until the company is able to learn how and where and when it may connect with this bridge. In the meantime the Board recommends that particular attention be paid to the cleaning and repainting of these cars and that some betterment be made in the style of lamps used for lighting them.

The extension, as soon as practicable, of the Eighty-Sixth Street crosstown line through West Eighty-Sixth Street, and the electrification of this line (now operated as a horse railroad) from east to west. The co-operation of the Legislature and the city authorities is respectfully recommended to this end for the convenience of the general public living east and west of Central Park.

The earliest practicable completion by the company of the connection of the Second Avenue line at Grand Street and the Bowery with the tracks of the Third Avenue line, so as to give a more direct and shorter connection with the Brooklyn Bridge. This will give needed relief to Center Street and will enable all Second Avenue cars to run to Broadway at the postoffice. The special steel work for this connection was long since contracted for, but the delivery has been unavoidably delayed.

With respect to the cleaning and ventilation of cars: The Board has investigated the methods employed by the company in the cleaning of its electric cars and finds that due attention is given to the subject. The Health Commissioner has caused proper inspection to be made and has made recommendations accordingly. This Board has examined the methods of ventilation and finds wide differences of opinion as well as of results. It is a matter of great difficulty to both heat and ventilate a street car at the same time, to suit the desires of a number of passengers with widely varying wishes and in various degrees of health or debility. The subject properly belongs to the health authorities. The Board will make a further report, with especial reference to the Borough of the Bronx, in the near future.

Representatives of the Merchants' Association of New York visited Albany Tuesday and urged upon the Governor a recommendation that the membership of the State Board of Railroad Commissioners be increased from three to five, the two extra members to be practical engineers living in New York City. The suggestion was also made to increase the powers of the Board so that it could enforce its orders. At present the Board has power only to make recommendations to the railroad corporations.

The Merchants' Association is not in favor of the plan proposed by the West Side Association for a separate railroad commission for New York City.

The Merchants' Association has asked for the appointment of Mr. Brinkerhoff, as an inspector, to see to it that the Board's recommendations regarding the betterment of transportation facilities on the New York lines were carried out. The Board is undecided as to whether it has power to make such an appointment.

PRESENT PRACTICE IN INTERURBAN ELECTRIC RAILROADING

BY W. W. BRIGDEN

The rapid advances made by interurban railways during the last few years has been marvelous, nevertheless there is little room for doubt that most of it could have been much better. Many steam railroad engineers will remember the days of the narrow-gage railroad when our friends, the promoters, told us that railway lines could be built for one-half to two-thirds the cost of those of standard gage, if we would only let them reduce the gage from standard to 3 ft. or 3 ft. 6 ins. It was not exactly clear how it was possible to make such a wonderful saving in construction by a reduction in the width of cuts and fills and in lengths of ties of from 1 ft. to 1½ ft., but it was accepted by many of the profession and very generally by the public. Clear-headed engineers of experience denounced the whole matter as a fallacy that would soon be exposed, but this had little or no effect on those who controlled many railroad lines, and narrow-gage construction was carried on at nearly the same cost as standard gage. Then, after a few years, it became necessary to interchange business with other lines, to widen the grading and put the narrow-gage lines to standard gage at enormous expense for construction, delays in traffic and change of rolling stock.

The constructors of interurban railways often follow in the lines of the narrow-gage projectors. An extremely narrow right of way is purchased, say 20 ft. wide, and the track is made to fit it, or worse, the line is laid largely along public highways. Sharp curves and heavy grades are introduced at many points to save present expense. But these will either handicap the road so that it can never do a first-class business or will require the reducing of curves and grades to meet the necessities of traffic, at a cost far beyond what it would have been if done in the beginning. It is said that in some cases alignment has been altered to avoid a tree. Ask any old trainmen what would become of a train of twenty or thirty freight cars, such as are run every day on steam roads, if it was pulled at 15 miles to 30 miles per hour along a road like this, with a descending 10 per cent grade 500 ft. long, followed immediately by an ascending one of the same slope, with occasionally a curve, of say 300 ft. radius, thrown in. The crew would have to be lashed to the cars or lie down and hold on for dear life, and the train would separate into sections that would strongly dispute with each other for the right of track, and the weakest would have to give way.

The matter of right of way is not always the fault of interurban officials, as in many States there is as yet no right of eminent domain for street railway lines. But in many cases land could be obtained of sufficient width if the railway company was willing to pay the price. Some few lines, constructed by people with abundant capital and under the supervision of steam railroad civil engineers of experience, have followed very closely the lines of the best steam railroad construction, and these roads will be found greatly superior to those constructed in the ordinary manner.

In many cases the contract for the construction of an interurban line is let to a construction company with little or no restrictions beyond the general manner in which the line shall be built. The nominal company has little or no money or means of obtaining money, and the construction company owns and controls everything, sometimes even to taking the line at the end of its construction. The construction company often pays and controls the engineer, although he may be appointed by the company. This, of course, is a state of affairs that can only result in disaster to the final owners of the road.

When we are aware that the increase in a number of our Northern States has been in the last year from 40 per cent to

100 per cent in the number of cars used, and that the number of miles of track has nearly kept pace with the number of cars, we are able to form some idea of the rapidity with which we are increasing our electric railway system. It seems that there is but one thing that will stop this boom, namely, the coming of the usual panic following great expansion like the present. This is sure to come, and when it does, nine-tenths of the street railway projects will fail of materialization until better times come again. Still it does not seem that capitalists should be discouraged when we consider the prosperity which has been enjoyed by most of these lines.

As soon as electric railways can make an average of from 20 miles to 30 miles per hour, and a number of them are already doing this, there should be a large diversion of the traffic due to the lower rates and the convenience of the electric lines. The distance, for example, from Battle Creek, Mich., to Detroit is about 120 miles. The time by the Michigan Central Railroad is from three hours to four hours and twenty minutes, but one train makes the trip in less than four hours. A good interurban line should be able to make this trip in about six hours. It is probable this time could be reduced by the electric railways after some practical experience, but should a difference of two hours remain it is quite evident that many people will travel by the interurban line, as the saving in fare would be about 60 cents, and this would pay for the extra time of nine-tenths of those who would desire to make the trip.

The first difficulty will be the passage through the larger cities and towns, where the speed must be reduced because of local regulations and the slow speed of local cars. Whether this difficulty can be remedied is more than the writer can say. In Battle Creek it would be almost impossible to construct a line passing through streets in the central portion of the city on which high speeds could be maintained. This would not be equally true in cities with uniformly parallel streets, but even there it would be no easy task, and it does not seem probable that anything like steam railroad speed could be reached. If lines were constructed not passing near the centers of cities it is probable that a large portion of the traffic in the cities in question would be lost or endangered by the inconvenience attending getting to and from cars. On the present interurban line from Detroit to Jackson the average speed exceeds 25 miles per hour between terminal city limits, and this, no doubt, can be increased somewhat. That the difficulties mentioned will ultimately be overcome is the belief of the writer, and the electric railway will equal the steam railway in speed.

As steam engines, boilers, generators, motors and cars are largely provided by great corporations whose reputations are at stake, and they have the knowledge necessary to bring about good results in these lines of electric railway construction, there is less opportunity to criticise than in those that have been mentioned.

SUBWAY CONSTRUCTION WITHOUT DISTURBING BUILDING FOUNDATIONS

The question of subway construction is now being actively discussed in Chicago, and, as stated before in these columns, the Washburn-Alexander syndicate, which is closely allied with the George A. Fuller Company, has already made some offers to the city. John Meiggs Ewen, consulting engineer of the George A. Fuller Company, appeared before a Council committee meeting recently in Chicago, and outlined plans whereby subway construction could be carried on in Chicago without danger of interfering with the foundation of buildings. Some difficulty of this kind has been experienced with the New York subway construction. In Chicago, where the soil is all clay, and of a kind that is noted for its creeping qualities, one of the chief difficulties to be avoided in subway construction would be the bulging out of the clay from under building foundations should the street be excavated to a sufficient depth to build a subway without in some way bracing against this soil pressure. The plan outlined by Mr. Ewen is first to excavate trenches into which the side supporting columns of the subway will be placed. As fast as these trenches are dug jack-screw braces would be put in to prevent the trench from caving in or being closed by the soil pressure from the building foundations. After the side columns are put in and the roof girders are put across the street the concrete arch walls can be put in between the steel frame, and the steel and concrete structure will take the earth pressure from that time on. The excavation of the subway can then proceed.

TELEPHONES IN ELECTRIC RAILWAY SERVICE

BY FRANCIS G. DANIELL

The use of the telephone is becoming so universal in railway work that a few words descriptive of some of the methods followed may be of interest. There are so many different conditions that a special layout is necessary in nearly every case in order to get the best results.

Where there is a good local exchange in the territory to be covered it is usually better for the railway company to lease the right to use the telephone wires, rather than put up its own system, provided, of course, that satisfactory arrangements can be made. By doing this, even at what seems to be a large rental, the railway company is assured of a service maintained by men who are trained in their particular branch of business. Moreover, at times of storms the company is not obliged to depend upon its own men to make repairs. At such times the railway men are sure to have their hands full, and these extra strenuous periods are just those when the company wants a good telephone service if at all.

Another advantage in doing business with the local company is that the railway company has the benefit of the telephone company's underground conduits where they exist, which is an additional insurance against interruptions during bad weather.

All telephones which are not placed in an office or some place where they can be watched should be put in a box and locked. A good plan is to put a numbered key in each car in a small box under glass, which has to be broken to remove the key. This makes it possible to know every time a telephone is used, as the key is returned in an envelope with the conductor's report, giving the reason for its use. Keeping close watch of the key and of its use is very necessary, as instances have been known where keys have been sold to persons living near a pole-box, who thus got telephone service very cheaply, and by giving the name of some subscriber on the line have obtained long-distance connections at the expense of the railway company.

In the case of a large city railway system operating cars on a very short headway, it is desirable to have a telephone at every important point and all on circuits run direct to a switchboard in the main office of the railway company, in charge of a private operator. It is needless to say that there should be several mains connecting the switchboard in the company's office with the main switchboard in the central exchange. This will prevent delays which may be very serious during construction or in case of accident.

On a road in a moderate sized city, where the lines radiate from a common center, a very good plan is to have a private switchboard connected directly with the principal offices, car houses, parks, etc., and also a few circuits to the telephone central. The less important or more distant points on the railway system can then have pole-boxes connected to the regular telephone circuits. This plan saves the expense of an entire system of private lines and gives very good satisfaction, as on the smaller lines there is not much use for the telephones ex-

cept at night, and then the residences do not use the wires to any great extent. On a system which is pretty well scattered the last method answers very well, i. e., to have all the telephones on poles and bridged on the local circuits. This saves all expense of an operator and switchboard and gives an all-night service.

On any except the very largest systems it is a good plan to arrange to plug the private switchboard circuits onto the local company's board after the railway company's office closes for the night. This saves the expense of a night operator.

In deciding upon the system to be adopted the ratio of telephones to the number of cars should be considered.

On a large road using the system just described 125 cars were operated regularly, and forty pole-boxes besides the office telephones covered the needs of the system in good shape, as the road was nearly all double track. On the other hand, a 55-mile interurban railway, which requires only eight trains to give a half-hourly service, would have to have thirty pole-box telephones in order to have one every 2 miles. A better plan on such a system would be to use a portable set in each car, and have leads at certain poles into a box where the set could be plugged. This could be installed at only about one-third the expense of the pole-box plan, and would give a conection every half mile instead of every 2 miles. Where pole-boxes are used they should be so arranged that closing the door opens the circuit and prevents all possibility of lightning entering the instrument. In regard to contracts with the telephone company a great many different plans may be followed, based upon what is furnished. Some railway companies wish to own all the wires and fixtures except the instruments, others want to own all aerial lines and have the telephone company own the underground conductors; others prefer to rent the entire equipment from the telephone company.

The usual plan is to pay the telephone company a rental based on its regular rates for such service, that is, so much per instrument and so much per foot of conductor or conduit where the latter are used, and to allow the telephone company all necessary transportation for its employees when on company business. The rental is usually one-half the regular rates for the apparatus furnished.

MAKING UP LOST TIME

In order to maintain a prompt schedule and have cars always leave terminals on time the Elgin, Aurora & Southern Traction Company makes it a practice to keep a car in readiness at its car houses, both at Elgin and Aurora, so that in case a car is delayed on a long run between these two points a car can be sent out from either end on the regular schedule time to meet the delayed car and exchange passengers at some point on the road. This enables the belated car to get back on its regular time, and avoids delay to passengers. Of course, the telephone despatching system is in use, so that terminals can be notified when a car is behind time far enough to justify sending out the reserve car. Men having other duties around the car houses serve as conductors and motormen on the reserve cars.

GENERAL ELECTRIC-STANLEY DEAL

The latest reports indicate that the much discussed deal between the General Electric and Stanley interests has at last been closed, but that it does not include the Electric Storage Battery Company, as was expected by some people, and even announced in the daily papers. The price for the Stanley property is understood to be somewhere in the vicinity of $120-$125 per share.

PROPOSED RAILROAD BOARD FOR NEW YORK

The West Side Citizens' Transit Reform Committee of One Hundred has submitted a bill at Albany providing for transferring to a local board the supervision of railways in New York City and all powers now vested in the State Board of Railroad Commissioners over local traction companies. The committee has also issued an address to the public, advocating the passage of this bill, and asking for the support of patrons of the transportation companies who are dissatisfied with present conditions. The address says:

The present intolerable conditions of overcrowding on the surface and elevated railroads of this city have made it painfully evident that the State Railroad Commission is incompetent to deal with the conditions of municipal transportation. The State board cannot, and does not, devote the necessary time and attention to transportation operations and facilities in New York City. The transportation problem of Greater New York is so vast and so complicated that no commission can deal with it as a part only of its duties.

The commission ought to have foreseen and devised plans to prevent the occurrence of present conditions. It is only too clear that it did nothing of the kind, and that it is not qualified to deal with the problem as now presented. We do not mean to arraign the commission as such, but only in its relation to the problem of railroad transportation in the city of New York. The facts are the strongest arraignment of the present system. We have been crushed and herded like cattle in pens; our wives and daughters have been insulted; our friends and neighbors have been physically injured.

It is an absolute necessity that the power of controlling interurban railroad facilities be placed in the hands of local officers, cognizant of the conditions and free to give the necessary time and study to the questions of present remedy and future betterment.

The same body has also filed with the Attorney-General a complaint against the Manhattan Company, and has petitioned that officer to proceed against the corporation for alleged violation of the charter provisions. The committee which formulated the report quotes sections of the elevated road's charter hitherto undiscovered, which, if they are correctly stated, point the way for the Attorney-General to act. The first of the two sections particularly specified requires that the road make ample provision for sheltering its passengers while they wait for trains, the other section says that each passenger is entitled to a seat, except in four specified hours. The charter, according to the committee, says that where a passenger can't get a seat after demanding it "such passenger shall be entitled to ride free."

Regarding station and platform accommodations the committee cites the conditions at Rector Street, which it is acknowledged, however, cannot be taken as a fair example:

The condition of affairs at Rector Street is well known. There is no cover over the station platform, except for a few feet. There is no adequate accommodation for passengers, and the crowd upon the platform is such that it is almost impossible to board a train during the rush hours without being crushed. At certain hours of the day no lady can board trains at this and other stations without being exposed to disagreeable physical contact with other persons.

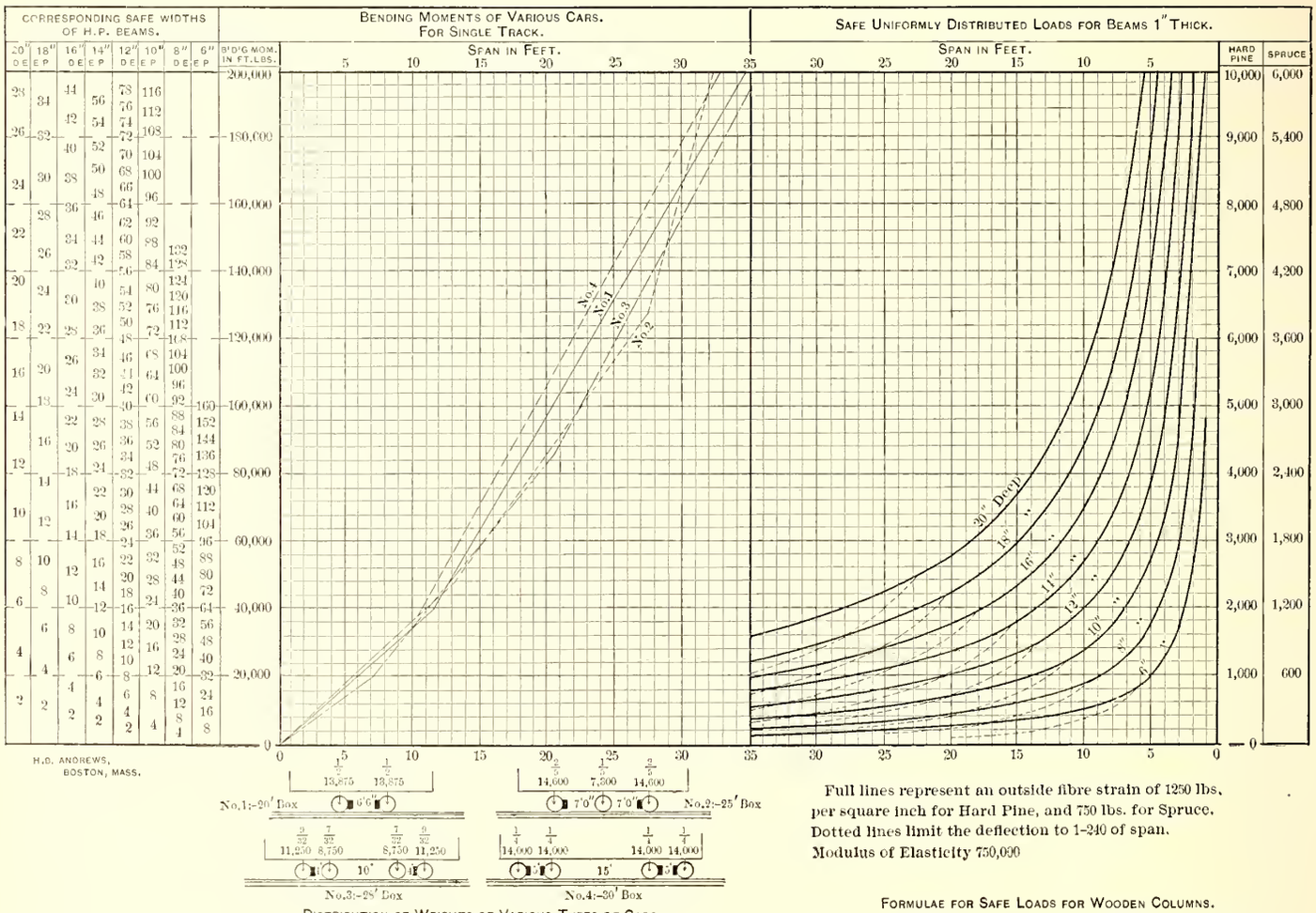
There are four tracks at that point, and the road has condemned no property for a station, although they are authorized by law so to do, and the rush of passengers for express trains often so blocks the intending passenger of an accommodation train that he is compelled to look over the heads of a crowd of several hundred people while his train comes into the station and leaves it without giving him an opportunity to board it, although there may be room and even empty seats on his train.

The report also charges that the elevated road has erected stations in the side streets, instead of acquiring the station space needed by condemning property, and declares that this is illegal. The committee petitions the Attorney-General to begin an action to annul the road's charter, or by instituting proceedings by mandamus to compel the road to perform its duties as required by law. The committee declares it will seek legal redress itself if the Attorney-General does not act.

WOODEN BEAMS AND COLUMNS IN STREET RAILWAY BRIDGE CONSTRUCTION

BY H. B. ANDREWS

In street railway construction, or in connection with its maintenance, it is very often necessary to span temporary excavations, to build new, and strengthen existing bridges and to meet other conditions which may arise requiring temporary or permanent floor timbering.



Distribution of Weights of Various Types of Cars.
(Including estimated maximum loads).

Full lines represent an outside fibre strain of 1250 lbs. per square inch for Hard Pine, and 750 lbs. for Spruce. Dotted lines limit the deflection to 1-240 of span. Modulus of Elasticity 750,000

Formulae for Safe Loads for Wooden Columns.

Kind of Wood	Where length is less than twelve times least thickness Safe Load =	Where length is not less than twelve times least thickness Safe Load per Sq.In. =
Yellow Pine	Area of Cross-Section x 1000	$1000 - \frac{10 \times \text{length}}{\text{least diameter}}$
Oak	Area of Cross-Section x 750	$750 - \frac{7.5 \times \text{length}}{\text{least diameter}}$
White Pine or Spruce	Area of Cross-Section x 625	$625 - \frac{6 \times \text{length}}{\text{least diameter}}$

Note:-All dimensions to be considered as inches. Street Ry. Journal

As in most cases a light T-rail or stringer rail is used over bridges, the stiffness of the rail will not warrant the assumption of a uniformly distributed load over the span. Therefore, it is obvious that quite a little labor is involved in calculating the bending moment, due to the concentrated loads on the trucks, assuming, of course, the heaviest car, including maximum load, which will pass over the structure.

The accompanying diagram and information will be found very convenient for readily determining the requisite size of timbers for various spans and loads.

On the diagram at the left are shown curves representing the bending moments for single track of various types of cars, including their estimated maximum loads. The horizontal spacing represents the span in feet, and the vertical spacing the bending moment in foot-pounds. At the left, in the several vertical columns, are shown the widths of Southern pine timber for various depths to support the load causing the bending moment opposite.

For example, to determine the proper size of timber to carry car No. 1 over a 25-ft. span. From the 25-ft. mark at the top or bottom of the diagram follow the vertical line to the point where it intersects the line of bending moment of car No. 1, thence follow the horizontal line to the left, where the figures in each column will show the proper width for the corresponding depth at the top of the column.

If in any case on short spans it is necessary to use spruce multiply the figures representing the widths by 5/3.

On the diagram at the right are shown, by full lines, curves representing safe uniformly-distributed loads for different depths of sticks, 1 in. wide, the columns to the right giving safe loads for both spruce and Southern pine.

The dotted lines limit the deflection to 1-240 of the span; no greater deflection should be allowed in permanent work, although for temporary work values obtained from the full line may be used.

This diagram does not apply on building construction, where plastering, masonry, etc., is to be supported, requiring the deflection to be limited to 1-480 of the span.

These diagrams have been based on the usual formula:

$$\frac{Wl}{8} = \frac{bd^2S}{6} \text{ in which}$$

l = span in inches.
b = breadth of beam in inches.
d = depth of beam in inches.
S = extreme fibre stress.

For the value of S, 1250 lbs. has been used for Southern pine and 750 lbs. for spruce. This gives a factor of safety of about four. In calculating the deflection curves a modulus of elasticity of 750,000 was used.

Although values are given for any span up to 35 ft., it is not advisable or economical to use plain beams for a span of more than 20 ft.

In addition to the information given in connection with the diagrams, formulae are given showing the safe supporting power of wooden columns.

THE ORGANIZATION OF THE AMERICAN RAILWAY MECHANICAL AND ELECTRICAL ASSOCIATION

The master mechanics, superintendents of motive power and electrical engineers from a dozen or more electric railway companies met at the Hollenden Hotel, Cleveland, Feb. 12, in response to the call of the committee which was formed at Detroit during the last American Street Railway Association convention. The purpose of the meeting was to complete an organization of the men of the mechanical and electrical departments of the electric railway companies of America, and arrange for a regular convention along lines suggested by the circular sent out by the committee and published in these columns last week.

Thomas Farmer, superintendent of motive power of the Detroit United Railway, acted as chairman of the meeting, and Walter Mower, of the same company, as secretary.

E. W. Olds, superintendent of rolling stock of the Milwaukee Electric Railway & Light Company, in a few introductory remarks, said that it was well known that at present electric railway master mechanics do not get together as they should. They had never taken much part in the proceedings of the American Street Railway Association. That organization was essentially for presidents and general managers and transportation men, and its proceedings were of value chiefly on matters of general policy or transportation. An organization of mechanical and electrical men was needed to discuss questions pertaining to those departments, to raise the standard of practice and to work toward uniformity.

After further brief discussion on the same lines the chairman said it was undoubtedly the sense of the meeting that an organization should be perfected, and the convention took the necessary steps to accomplish this purpose.

The question of a proper name to fit the new organization drew out a long list of suggestions. It was evidently the desire of all to have a name adopted which would properly cover an organization of men drawn from all the mechanical and electrical departments of a city or interurban road, but a name not cumbersome was hard to find. The choice of a name from the list suggested was finally left to a committee consisting of D. F. Carver, of Cleveland; Alfred Green, of Rochester; E. W. Olds, of Milwaukee, and H. H. Adams, of Baltimore.

NAME SELECTED

The committee reported in favor of the name "American Railway Mechanical and Electrical Association," which was adopted.

Further details of organization, especially the question of whether the membership should be vested in companies or individuals, was discussed at length, some favoring having it an organization of men and others an organization of companies. It was developed that while it was in many ways desirable to make the membership individual, and not of companies, the association would have greater weight if it were representative of companies, and if questions of standards to facilitate interchange came up it would be essential to have the active voting membership in the companies involved.

The constitutions and by-laws of the American Street Railway Association and of the American Street Railway Accountants' Association were read, and changes suggested to adapt them to the needs of the new organization. The final decision on rules was left to a committee, which reported at the afternoon session.

When this committee presented its findings there was more discussion, and the constitution and by-laws, as they appear herewith, were adopted. In the all-important matters of membership the active membership with voting powers is vested in companies, with $20 dues, and individual membership is provided for in non-voting associate membership, with $5 dues and junior membership for $3 dues. Individual members are thus provided for without detracting from the weight given an organization whose membership is vested in companies. Although there was at first some difference of opinion as to holding the meetings at the same time as the American Street Railway Association, it was finally agreed that it would be detrimental to both bodies to separate the time and place of convention.

Following is the constitution and by-laws as finally adopted:

CONSTITUTION.

I.—NAME.

1. The name of this association shall be "The American Railway Mechanical and Electrical Association," and its offices shall be at the place where the secretary resides.

II.—OBJECT.

2. The object of this association will be the acquisition of experimental, statistical, scientific and practical knowledge relating to the construction, equipment and operation of street and interurban railways.

III.—MEMBERS.

1. The active members of this association shall consist of American railway companies or lessees, or individual owners of railways, and each member shall be entitled to one vote by delegates presenting proper credentials.

2. The head of any mechanical or electrical department of a railway company may be elected an associate member of this association, and will be entitled to all privileges, except that of voting.

3. Other employees of railway companies not eligible as associate members may become eligible to junior membership upon the recommendation of at least one official of the company by whom he is employed and one associate member, and will be entitled to all privileges except that of voting.

The technical periodicals shall be eligible to honorary membership upon recommendation of the executive committee.

IV.—AMENDMENT.

This constitution may be amended by two-thirds vote of the members present at a regular meeting after thirty days' notice thereof has been given to each member in writing by the secretary.

BY-LAWS.

I.—APPLICATIONS.

1. Every applicant for membership shall signify the same in writing to the secretary, enclosing the requisite fee, and shall sign the constitution and by-laws.

II.—OFFICERS AND EXECUTIVE COMMITTEE.

The officers shall consist of a president, three vice-presidents, a secretary and treasurer and four others, who shall constitute the executive committee. The executive committee shall have the entire charge and management of the affairs of the association. The officers and executive committee shall be elected by ballot at each regular meeting of the association and shall hold office until their successors shall be elected. The duties of secretary and treasurer shall be performed by the same person.

III.—DUTIES OF OFFICERS.

The officers of the association shall assume their duties immediately after the close of the meeting at which they are elected. They shall hold meetings at the call of the president, or, in his absence, at the call of the vice-presidents in their order, and make arrangements for carrying out the objects of the association.

IV.—PRESIDENT.

The president, if present, or, in his absence, one of the vice-presidents in their order, if present, shall preside at all meetings of the association and of the executive committee.

V.—TREASURER.

The duties of the treasurer shall be to receive and safely keep all moneys of the association; keep correct account of the same and pay all bills approved by the president; and he shall make an annual report to be submitted to the association. He shall give a bond to the president in such sum and with such surety as shall be approved by the executive committee.

VI.—SECRETARY.

The duties of the secretary shall be to take minutes of all proceedings of the association and of the executive committee and enter them in proper books for the purpose. He shall conduct the correspondence of the association, read minutes and notices of all meetings and also papers and communications, if the authors wish it, and perform whatever duties may be required in the constitution and by-laws appertaining to his department. He shall be paid a salary to be fixed by the executive committee.

VII.—MEETINGS.

The regular meeting of this association shall convene at the same place as The American Street Railway Association and one day in advance of the meeting of that association. Notice of

every meeting shall be given by the secretary in a circular addressed to each member at least thirty days before the time of meeting. Ten members shall constitute a quorum of any meeting.

VIII.—Order of Business.

At the regular meeting of the association the order of business shall be:

1. The reading of the minutes of the last meeting.
2. The address of the president.
3. The report of the executive committee on the management of the association during the previous year.
4. The report of the treasurer.
5. Report to special committees.
6. The election of officers.
7. The reading and discussion of papers of which notice has been given to the secretary at least thirty days prior to meeting.
8. General business.

IX.—Order of Business (*Special.*)

At other general meetings of the association the order of business shall be the same, except as to the third, fourth and sixth clauses.

X.—Notices.

The secretary shall send notices to all members of the association at least sixty days before each meeting, mentioning the papers to be read and any special business to be brought before the meeting.

XI.—Executive Committee.

The executive committee shall meet one day in advance of each annual meeting of the association, and on other occasions when the president shall deem it necessary, upon such reasonable notice specifying the business to be attended to as the committee shall by vote determine. A vote of the executive committee may be taken by mail when deemed advisable.

XII.—Voting.

All votes except as herein otherwise provided shall be by the uplifted hand unless a ballot is called for, and in case of a tie a presiding officer may vote.

XIII.—Reading of Papers.

All papers read at the meetings of the association must relate to matters connected with the objects of the association and must have the approval of the executive committee before being read. Persons to whom subjects are assigned must signify in writing their intention to prepare the paper, and forward it to the secretary at least sixty days previous to the date of the meeting so that advance copies of the paper may be printed and forwarded to the members.

XIV.—Papers, Drawings and Models.

All papers, drawings and models submitted to the meeting of the association shall remain the property of the association at the option of the executive committee.

XV.—Fees.

1. Active members shall pay annual dues of $20, payable in advance. The executive committee shall have no power to expend for any purpose whatever an amount exceeding that received as hereinbefore provided for. It shall be the duty of the members to pay such returns to the secretary as shall be required by the executive committee.
2. Associate members will pay annual dues of $5.
3. Junior members will pay annual dues of $3.

XVI.—Arrears.

No member whose annual dues shall be in arrears shall be entitled to vote.

XVII.—Withdrawal.

Any member may retire from membership by giving written notice to that effect to the secretary and the payment of all annual dues, but shall remain a member and liable to the payment of annual dues until such payments are made, except as hereinafter provided.

XVIII.—Expulsion.

A member may be expelled from the association by ballot of two-thirds of the members voting at any regular meeting of the association upon the written recommendation of the executive committee.

XIX.—Rules of Order.

All rules not provided for in these by-laws shall be those found in Roberts' Rules of Order.

XX.—Amendment.

Notice of all propositions for adding to or altering any of these by-laws shall be given to the members of the association at least thirty days before the meeting at which they are to be acted upon.

XXI.—Copy of Constitution and By-Laws.

Each member of the association shall be furnished by the secretary with a copy of the constitution and by-laws of the association and also a list of the members.

After the adoption of the constitution and by-laws officers were elected as follows:

OFFICERS

President—Thomas Farmer, superintendent of motive power, Detroit United Railway Company, Detroit, Mich.

First Vice-President—E. W. Olds, superintendent rolling stock, The Milwaukee Electric Railway & Light Company, Milwaukee.

Second Vice-President—Alfred Green, master mechanic, Rochester Railway Company, Rochester, N. Y.

Third Vice-President—C. F. Baker, superintendent motive power and machinery, Boston Elevated Railway Company, Boston, Mass.

Executive Committee—W. O. Mundy, master mechanic, St. Louis Transit Company, St. Louis. Mo.; T. J. Mullen, master mechanic, Scranton Railway Company, Scranton, Pa.; H. H. Adams, master mechanic, United Railways & Electric Company, Baltimore, Md.; D. F. Carver, chief engineer, Cleveland Electric Railway Company, Cleveland, O.

Secretary and Treasurer—Walter Mower, Detroit United Railway Company, Detroit, Mich.

ATTENDANCE AND MEMBERSHIP

The following gentlemen, representing electric railway companies, were present at the meeting. The companies represented are charter members of the new organization, and the majority of the gentlemen present also took personal associate membership in the American Railway Electrical and Mechanical Association:

H. H. Adams, superintendent shops, United Railways & Electric Company, Baltimore.

W. W. Annable, master mechanic, Grand Rapids Railway Company.

C. F. Baker, superintendent motive power and machinery, Boston Elevated Railway Company.

C. A. Brown, master mechanic, Toledo Railway & Light Company.

D. F. Carver, chief engineer, Cleveland Electric Railway Company.

R. E. Danforth, general superintendent, Rochester Railway Company.

Thomas Farmer, superintendent motive power, Detroit United Railway Company.

Alfred Green, master mechanic, Rochester Railway Company.

Fred Heckler, master mechanic, Lake Shore Electric Railway, Toledo, O.

W. O. Mundy, master mechanic, St. Louis Transit Company.

T. J. Mullen, master mechanic, Scranton Railway Company.

J. Millar, superintendent rolling stock, International Traction Company, Buffalo.

E. W. Olds, superintendent rolling stock, the Milwaukee Electric Railway & Light Company.

W. Roberts, master mechanic, Northern Ohio Traction & Light Company, Akron, O.

Other applications for membership were received from:

Worcester Consolidated Street Railway Company, William Pestell, superintendent motive power.

Chicago City Railway Company, M. O'Brien, master mechanic.

Santa Barbara (Cal.) Consolidated Railway Company, W. H. Harding, master mechanic.

Mobile Light & Railroad Company, S. M. Coffin, master mechanic.

At the meeting of the executive committee the Street Railway Journal and Street Railway Review were made honorary members.

Now that the organization has been formed it is expected that a large number of companies will at once join, and a largely-attended convention next fall is assured.

LUNCH AT CENTURY CLUB

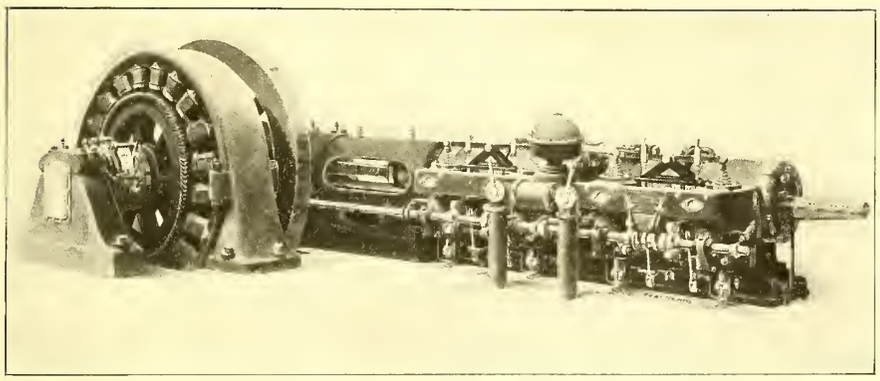
The railway men were entertained by the supply men with a lunch at the Century Club and at the Empire Theater in the evening.

The supply men attending were:

W. D. Ray, F. V. Green and C. N. Townsend, of the Westinghouse Traction Brake Company; Messrs. J. E. Eldred, Jr., H. N. Ransom, F. C. Randall, C. P. Tolman and Charles W. Leet, of the Christensen Engineering Company; D. B. Dean, of J. G. Brill Company; H. F. Tate, of the National Conduit & Cable Company; W. R. Kerschner, of the Columbia Machine Company; M. DeF. Gates, of the New Haven Car Register Company; H. E. Ackerly, of the American Car Seat Company; C. F. Wickwire, of the Sterling-Meaker Company; F. A. Elinquist, Sherwin-Williams Company, and A. L. Wilkinson, of the Ohio Brass Company.

LARGE HORIZONTAL GAS ENGINE

Power users who are investigating the merits of gas engines will be interested in the latest type of internal combustion engine of American manufacture, especially as it marks a radical departure from the established practice of its builders, the Westinghouse Machine Company. Heretofore, few American makers have ventured above 250 hp, and until recently none above 500 hp, with the exception of the Westinghouse Company, whose three-cylinder, vertical, single-action engine is well known. This company has now developed the double-acting engine, shown in the accompanying cuts, in sizes ranging as high as 3000 hp. Fig. 1 shows a perspective view of a single-crank engine of the new type, and Fig. 2 a double-crank engine.



(Copyright by the Westinghouse Machine Company.)

FIG. 1.—SINGLE-CRANK HORIZONTAL GAS ENGINE, 750 HP

Figs. 3 and 4 show the general design of a 1500-hp double-crank engine, directly connected to a generator.

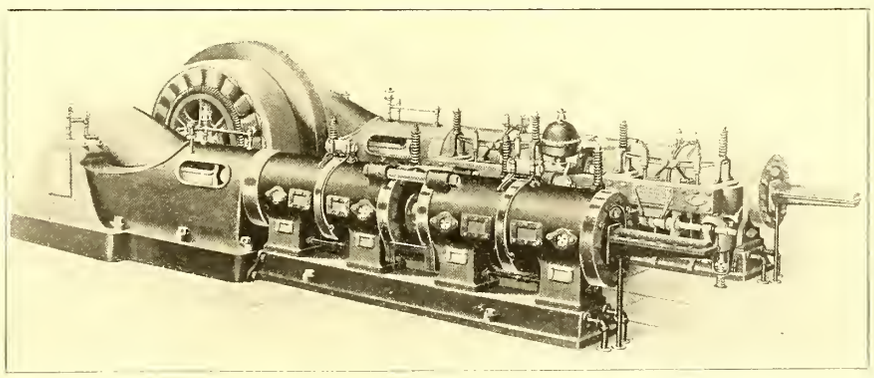
In general design the engine resembles a modern high-speed tandem compound steam engine in the arrangement of cylinders, frames, bed plates, bearings and fly-wheel, and this resemblance is extended to the matter of crank effort. Each revolution is accompanied by two impulses, namely, at each successive in-stroke and out-stroke. The engine operates, therefore, upon the four-stroke cycle, involving distinct periods of admission, compression, explosion, expansion and exhaust, and at the same time making provision for positive scavenging, the importance of which in securing a pure working mixture is conclusively shown by comparing the thermal values of natural and blast furnace gases. The former yields approximately 1000 B. T. U. per cubic foot, the latter only 100. While the comparative weakness of blast furnace gas is partly due to the absence of the highly calorific CH_4 or marsh gas, it is mainly attributable to the presence of CO and N, both inert gases resulting from previous combustion.

Engines employing the two-stroke cycle rely upon a special piston movement or a blast air from an auxiliary pump, directed in such a manner as to force out the remaining burned gases, thus clearing the way for the incoming pure mixture. This latter method, it is now claimed, results in a dilution of the incoming mixture, and variations in the calorific value of the explosive mixture, which, for a gas of given constituency, should be maintained constant. In this new engine the return stroke of the pistons effectually performs this function, and the charge of explosive mixture is then drawn in, undiluted either by products of combustion or by scavenging air.

In direct distinction from the use of an explosive mixture varying in richness according to the load, the Westinghouse design employs a mixture of unvarying quality, which is initially proportioned according to the nature of gas used, but once determined remains constant under all conditions of load. As the load upon the engine increases or decreases a correspondingly greater or lesser quantity of mixture is admitted to the cylinders, thus utilizing at all times an explosive mixture of maximum strength, resulting in higher thermal efficiency and economy of fuel. In support of this method it is pointed out that European builders of the highest standing are abandoning the variable for the constant mixture method of governing.

However, the construction of the engine departs materially from the accepted European design and embodies many established features of modern steam engine practice, being similar to a horizontal steam engine suitably strengthened in proportion to the increased maximum pressure resulting from the rapid combustion of the highly compressed gases. The design of cylinders, pistons and valves, of course, departs materially from steam engine practice. The cylinders are double walled, with the outer walls split peripherally to permit independent expansion and contraction without placing the cylinder casting under stress. The two cylinders are united at the top by heavy tie-rods, engaging peripheral bosses, and at the bottom by a stout cast-iron distance piece. The rear section of the bed-plate which supports the two cylinders is cored hollow with a central dividing wall, and serves as a reservoir for incoming and outgoing circulating water. All connections are piped directly to these reservoirs, thus reducing the piping about the engine. Through the bed-plate extend the four vertical exhaust pipes, which connect immediately below with an exhaust main. The exhaust passages leading from the valve chambers are cast integral with the cylinders, upon their under sides, and are water cooled.

At the ends of each cylinder are horizontal side ports, resembling straight steam ports, which communicate with removable combustion chambers. The cylinders are closed by water jacketed heads, those located between the two cylinders being split diametrically for facility in inspection of the interior, and the two halves united with a ground fit, no packing being necessary. This feature obviates the necessity for completely dismantling the engine for inspection.



(Copyright by the Westinghouse Machine Company.)

FIG. 2.—DOUBLE-CRANK HORIZONTAL GAS ENGINE, 1500 HP

The combustion chambers are independent castings, with plain machined faces, circular valve-liner seats and cored out passages for circulating water. Both admission and exhaust valves, which are of the standard poppet type, operate vertically and with opposite throw. They open by cam movement, and are held to their seats by spring pressure. The central space, closed by the admission valve above and the exhaust valve

below, communicate directly with the cylinder port before mentioned; the exhaust space with the exhaust passages on the under sides of the cylinders; the admission space with the supply pipe. This supply pipe is a rectangular cast-iron main, extending along the entire front and provided with openings opposite each admission valve. It receives its supply from the

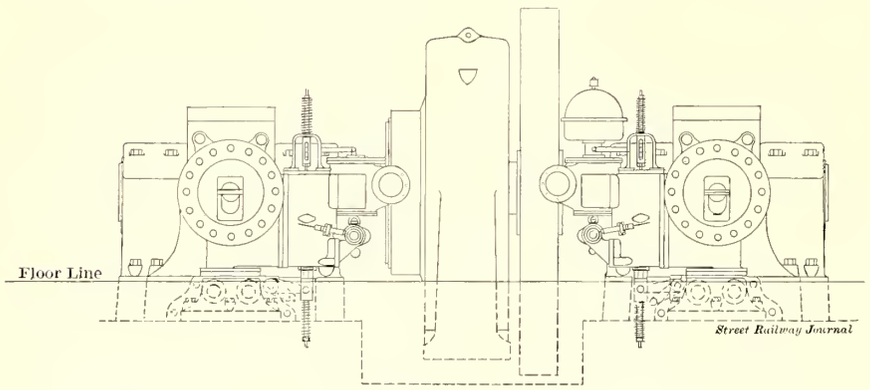


FIG. 4.—END SECTION OF 1500-HP HORIZONTAL GAS ENGINE

governor chamber, located midway between the two ends, which in turn communicating with a mixing chamber supplied on the one hand with gas and on the other with air, through suitable valves. These two valves are shown in Fig. 1, and are provided with graduated indices, so that the exact proportions of gas and air may at all times be visible and under the control of the attendant. Another feature is the provision for interchangeable parts. Each valve, together with its spindle and seating spring, is independently mounted, and by simply removing the bolts from the bonnet the entire valve, seat and liner may be drawn out for inspection or replacement. Similarly, the igniters, which are of the "make and break" electrical contact type, are mounted in a removable plug extending into the combustion chamber through the side walls.

The valve gear is of the standard cam and roller pattern, employed in the Westinghouse vertical engines, and is driven by a helical gear, engaging a similar split gear bolted around the main shaft.

Cooling water for circulating through the pistons enters a cavity on the cross-head by means of a flexible pipe connection provided with special swinging joints. It then flows through the hollow piston rod to the front and rear piston, through which it circulates, finally emerging through a bronze tail-rod extending through the rear head, there emptying into a cast-iron jacket communicating with the hot-water return pipe. Similarly, cold water is conducted through suitable pipes to the cylinder jackets, thence to the jackets surrounding the exhaust valves and ports, and finally to the return pipe, emerging at a sufficiently high temperature for use in heating and drying coils and radiators. Proper temperature relations between pistons and cylinders is thus secured at all times, while allowing close piston fits to be employed without danger of excessive friction or rupture. This point may be more readily appreciated from the fact that a cold piston clearance of approximately 1-16 in. is necessary in moderate-sized engines not fitted with water-cooled pistons. The pistons are constructed in two parts, with packing rings and babbitted bearing surfaces. They are secured in position on the rods by internal nuts, and present plain convex surface to the burning gases. Piston rods are of forged steel, with bored water ducts. The packing for both piston rod and tail-rod is of metallic ring type.

The engine is started by compressed air pumped into a steel reservoir during a previous run before shutting down. For this purpose a special disengaging gear is provided which isolates the rear cylinder, and on admitting the compressed air allows this cylinder to operate as an air motor until the regular combustion cycle is taken up in the forward cylinder. The rear cylinder may then be thrown into normal action.

Oiling is accomplished by steam engine appliances, such as sight-feed cups, cylinder pumps and oil rings for crank pins.

The engine is governed by a sensitive fly-ball governor of the standard design, protected by a circular housing. It operates a vertical piston valve supplying a fuel mixture of constant quality, but in quantities proportionate to the load.

The single crank engine is at present manufactured in sizes ranging from 250 hp to 750 hp, and the double crank from 750 hp to 1500 hp. In the latter cranks are placed at 90 degs. angularity, giving four impulses per revolution, and securing a crank effort corresponding to that of a cross-compound double-acting steam engine.

It is of interest to note that several installations of this type of engine are in progress. The company has completed its investigations and tests, and there are now several units in commercial service.

FIRST ELECTRIC RAILWAY IN NORTH DAKOTA

The Fargo & Moorehead Street Railway Company will build 9½ miles of line the coming season, extending from Fargo, N. D., across the Red River to Moorehead, Minn., and there will also be some additional track in these two cities. A contract has been given to the Electrical Installation Company, of Chicago, for a road, including rolling stock and power house. There will be six cars and a power house of 200-kw capacity.

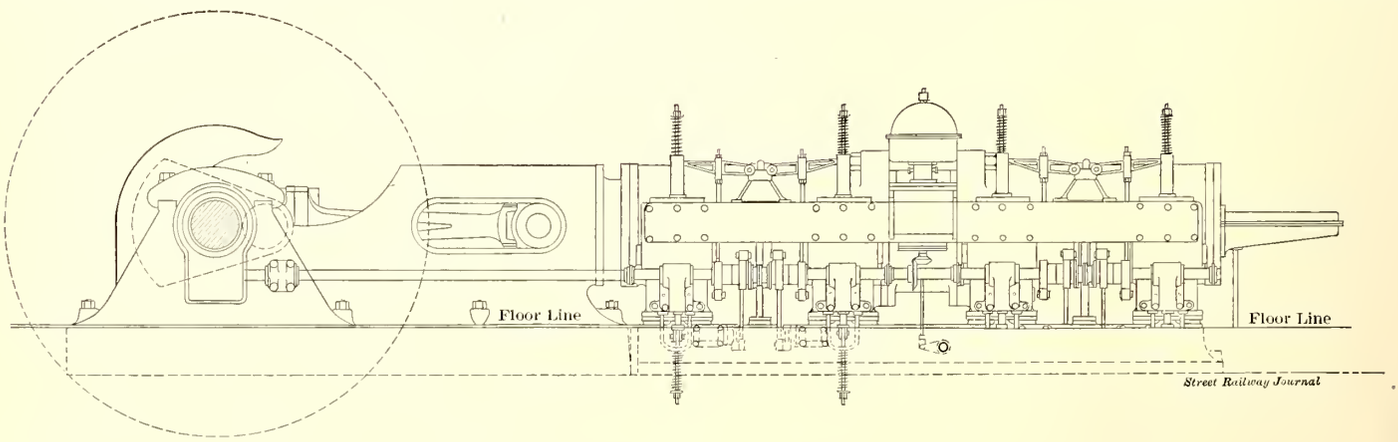


FIG. 3.—LONGITUDINAL SECTION OF 150-HP DOUBLE-CRANK HORIZONTAL GAS ENGINE

The officers are Scranton and Wilkesbarre (Pa.) capitalists. F. V. Von Storch, Scranton, is president; M. E. McDonald, Scranton, vice-president; Frank Larned, Wilkesbarre, treasurer; George H. Rice, Scranton, secretary; George H. Moffatt Fargo, N. D., manager and chief engineer.

RAPID TRANSIT COMMISSION

A bill has been prepared for submission to the Legislature, at Albany, providing for a complete reorganization of the Rapid Transit Commission along radically different lines from those on which the present body is formed.

It provides for the appointment of members of the Rapid Transit Commission by the Mayor, thus changing it from a State to a municipal commission. It permits the Commission to separate the functions of construction, maintenance and operation in the work on future rapid transit extensions. "If, in its discretion, the public interest shall justify the provision, the construction of such railway or railways shall be separate and apart from its or their equipment, maintenance and operation, or the construction and equipment shall be separate and apart from its maintenance and operation, or the equipment shall be separate and apart from the construction, and from the operation and maintenance of such railway or railways." It further provides for the repeal of the tax exemption clause, making this clause inapplicable to all future extensions of the rapid transit roads.

The bill in detail provides that the Commission shall comprise six members and the Mayor and Comptroller. The appointee shall serve for a term of six years, the present Commissioners to serve until Jan. 1 next. Of the six appointive members, two shall serve for two, four and six years respectively, to be determined by lot.

The bill further provides that in the month of November prior to the expiration of the terms of members of the Commission, the Mayor shall appoint their successors for a term of six years, which provision would permit Mayor Low to name the new Rapid Transit Commission whether or not he is re-elected next fall.

Municipal ownership is provided for thus:

"The Board of Rapid Transit Railroad Commissioners may, in its discretion, if the public interest shall justify the provision, provide for the operation and maintenance of such railway or railways by the city as shall be constructed for and at the expense of the city."

This measure is being urged by Comptroller Grout, and it is intimated that it does not meet the approval of the Mayor and the Republican organization, and will, therefore, be defeated, but the Mayor is pledged to some form of reorganization, and it is possible that the present scheme may be modified to meet his views. The principal objection to the bill in its present form is the method of appointment, and this is based purely upon political grounds.

MUNICIPAL MEASURES

In a well-considered review of the present traffic facilities in New York and the recommendations accompanying the report of the State Board of Railroad Commissioners, the "Sun" criticises the attitude of the municipality toward the transportation corporations, saying:

Theoretically, to bite off one's nose is an impossibility; yet practically New York has accomplished it in respect to its own facilities for transportation. Grudging the dollar that would have flowed into the coffers of the street car companies, the city has deliberately sacrificed millions of dollars' worth of convenience and benefit to the general public. An era of common sense of the kind displayed by the State Railroad Commission may work wonders.

To-day, probably no city in the world is in sorer straits in proportion to its needs and possibilities for money and improvements. Our inadequacies press on every hand and in every department of the city governmen . The constitutional limitation of our debt renders us almost helpless. Yet the present barriers to growth could be swept away and everything now in sight of our ambitions made attainable if we should abandon the narrow-minded and socialistic scheme of municipal ownership of the underground roads and arrange for their transfer to private enterprise in the old-fashioned way.

If that should be done, New York would be able again to proceed to the building of works that are legitimately part of the city's province to build with the free hand that comes from the fat purse.

PROPOSED ELECTRIC RAILWAY ALONG THE HUDSON

A great deal of local interest has been displayed in the movement to build electric railroads along the east bank of the Hudson River to connect New York city with Albany. The first step in this direction was the building of the Albany & Hudson third-rail road, extending from Albany to Hudson, a distance of 30 miles, but below that point the law prohibits the construction of railroads on the New York and Albany post road, declaring that road to be a public highway forever. This law has greatly hindered the construction of connecting railroads, but since 1896 bills have been passed permitting the construction of railroads on it in that part of New York City within Westchester County, in the town of Cortland and in the village of Ossining. A bill introduced recently by Senator McClelland removes this prohibition to a further extent, and is another step in the direction of a trunk line of electric railroads. This measure authorizes the building of electric railroads on the Albany post road in the villages of Hastings-on-the-Hudson, Dobbs Ferry and Irvington. The Senate committee to which this measure was referred has amended the bill by excluding Irvington from its provisions, in deference to the wishes of the wealthy estate owners along that part of the Hudson.

CHICAGO FRANCHISE MATTERS

The local transportation committee of the Chicago City Council and representatives of the street railways have been in continued conference during the last week. It has been decided by both parties that in order to make more rapid progress the Council committee should formulate some definite ordinance, as the preliminary discussions have now been carried out to such a length that little more can be gained by them.

On Monday, however, negotiations between the city and the traction companies were abruptly terminated because of inability to agree upon a method of determining the value of claims under the ninety-nine-year act, passed over a veto in 1865. In the discussion of this law the companies offered to waive their rights if the city would enter into an agreement whereby an arbitrating body could be selected to settle, once and for all time, their validity, and, if valid, the amount to be paid for surrender.

The companies also declared they would bind themselves to a contract which would definitely indicate that "the ninety-nine-year act is dead" should the time taken by the arbitrators or judges of these claims extend over the entire period of the franchise grant.

The companies wished it to be understood they sought to dispose of all debatable claims at one fell swoop, but asked the committee not to deem such claims invalid until the arbitrating body should so declare. The municipal authorities did not feel at liberty to accept this arrangement, although it was generally conceded by those engaged on the problem that the present is the best time to settle this and all other disputed points.

The committee went into executive session and decided to stand upon its counter proposal of last week, which declared the committee would take these claims into consideration, but only in connection with the question of compensation.

The traction attorneys, after consultation, suggested an adjournment, and this was taken without fixing a date for renewing consideration of the question.

FINANCIAL INTELLIGENCE

The Money Market

Wall Street, Feb. 18, 1903.

The leading question in the money market this week has been whether or not gold exports were about to be resumed. A further advance in sterling exchange carried the rate to the highest of the season and to a level approximating closely to what has been considered a profitable one for specie shipments. Still, no signs of any such movement have yet appeared, and, in the opinion of many authorities, no attempt will be made yet awhile to send out gold to Europe. In previous articles we have already adverted to the change in our credit relations during the last six months which has come about through the sweeping reduction of debts owed by our bankers abroad. We have also asserted, what is the judgment of prominent banking officials, that the volume of our foreign obligations is very much smaller than it has been at any time during the past year and a half, and that it is not far, indeed, from the point of total extinction. The practical result of this change is, of course, to greatly enhance our credit in the eyes of foreign capitalists and to give local bankers increasing power to prevent gold exports by negotiating fresh loans whenever they choose. Apparently the view that no gold will go out at the present time is based upon knowledge that such loans will be applied for in case they are needed to keep sterling exchange below the export point. Moreover, money continues relatively easy abroad, and additional evidences are being constantly furnished of foreign buying of our railroad securities, the latest being the announcement that two-thirds of the $10,000,000 new Erie bond issue has been subscribed for in London and Amsterdam. All this, of course, goes to assure the continuance of the easy conditions in the local money market. The domestic movements of bank funds, however, are taking the direction customary at this season, which is toward a rather rapid depletion of surplus reserves. Last Saturday another loss of $3,000,000 was reported by the New York banks, resulting chiefly from a further increase of $11,000,000 in loans. This might be somewhat disquieting were it not that expanding loan accounts and either stationary or declining cash reserves are normal features at this time of year. Following precedent, surplus resources may be expected to fall off until the middle of March, when they will turn upward again and keep on gaining until July. Higher money rates may prevail in the latter half of next month and the first part of April, but the rise will be only temporary. For the present, sixty-day money is lending at 4 to 4¼ and six-months' money at 4½ per cent. Call money is supplied in abundance at 2¾ and 3 per cent.

The Stock Market

The general share list rests upon about the same level as it did a week ago. On several occasions attempts have been made to depress prices, the principal one occurring last Friday, when the unexpected news of the new Erie bond flotation caused some unfavorable comment in speculative circles. But in all instances where declines have occurred it has been found that no stocks have pressed for sale, and quick recoveries have followed. In consequence, speculative opinion has rather been strengthened in its former conviction that circumstances favor a rise more than they do a decline in prices. It is the continued absence of the outside public from the market which keeps this underlying cheerfulness from expressing itself more openly. There evidently is not sufficient buying power to produce an active forward movement at this time. The latent bullishness seems more likely to reflect itself, as it has done during the past week, in advances in selected stocks, more particularly those where the market supply is comparatively narrow. In this category come many of the industrial specialties, such as Sugar, Copper, Smelters, and Rubber Goods, and among the railroad shares such issues as Wabash and other of the so-called Gould securities. Outside factors remain for the most part highly favorable. The Street is particularly interested in the railway net earnings statements for January, which are expected to show a considerable improvement as compared with the preceding months.

The local traction stocks are favored by the general speculative conditions described, inasmuch as their floating supply is relatively small. Metropolitan has picked up considerably during the week, and while much of the buying has probably been in the nature of covering of short contracts, some of the purchases undoubtedly have come from investors who believe that the security is cheap at going prices. Expectations that Manhattan would become more active on the cessation of trading in the "rights" have so far not been borne out. The buying of Brooklyn Rapid Transit every time the stock is offered at concessions attracts considerable attention. The inside party handling the stock in the market seems to be very confident in its position.

Philadelphia

The only feature of note during the week in Philadelphia was an advance in Union Traction from 46⅞ to 47¾, the highest reached in some time. A story that a large block of the stock had been purchased by some Pittsburg capitalists who have lately become interested in the property was generally believed in speculative circles. That the transactions, from whatever source they originated, which caused the rise, were of an investment rather than a speculative character seemed to be borne out by the fact that no accompanying advance occurred in Philadelphia Rapid Transit, the lessor company. These shares did not go above 15⅞. On the other hand, Philadelphia Traction shared in the strength of Union Traction, rising a half point, to 99. Other sales for the week were 100 Railways General at 4½ and scattering lots of Consolidated Traction of New Jersey at 65, Union Traction of Indiana at 51¾ and Norristown at 75⅝ and 75¼.

Chicago

The latest reports from Chicago are to the effect that the negotiations for the readjustment of the surface line interests are progressing slowly but satisfactorily, and that the two companies, the City Railway and the Union Traction, are acting in concert on all points. Meanwhile dealings in the shares affected have come to a standstill. City Railway sold down 5 points, to 225, Union Traction fell off from 11¼ to 10½, while West Chicago recovered to 86. Deposits of Lake Street Elevated securities under the reorganization undertaking are proceeding satisfactorily. It is said, however, that no definite plans for the future have yet been determined upon and that no public announcement will be made until everything is complete. Lake Street stock sold down from 7½ to 7 during the week. Metropolitan common is also off a point, to 35, and the preferred, "ex" the semi-annual dividend of 1½ per cent, is selling at 86. Traffic of this company thus far in February is reported to be gaining at the rate of 12 to 14 per cent over last year. South Side shares have been particularly strong at an advance from 109 to 111.

Other Traction Securities

In Boston, there was little change until Monday, when Massachusetts Electric common developed more life than it has shown in some time past and advanced from 35½ to 36¾. The purchases were evidently of a speculative character. The preferred stock did not take part in the advance, simply holding at 92. Nothing to speak of was done in Boston Elevated, which changed hands between 150½ and 151. West End issues held their gain of the previous week, the common rising at one time to 97 and the preferred to 116. The feature of the week in Baltimore was the continued demand for United Railway 4 per cent bonds, which advanced to the unusually high figure of 97. The incomes were also strong, touching 69, but the common stock, after selling at 13⅞, dropped back to 13¼. The preferred, which is very seldom dealt in, sold for a small lot at 33. Other Baltimore sales comprised Nashville 5 per cent trust certificates at 107, Charleston Street Railway 5's at 106, Charleston Consolidated Street Railway 5's from 96⅝ to 97, City Passenger (Baltimore) 5's at 107½, Anacostia & Potomac 5's at 100, City and Suburban (Baltimore) 5's at 113½ and City and Suburban (Washington) 5's at 100. The sales of traction securities on the New York curb for the week included about 500 shares of St. Louis Transit at an advance from 28⅛ to 30, Interborough Rapid Transit (60 per cent paid) at 112¼ and 112, Washington Traction 4's at 80⅜, New Orleans 4½'s at 79½, Brooklyn Rapid Transit 4's at 86, Nassau Electric 4's at 82⅞, San Francisco 4's (with interest) at 81½ and 81⅞ and United Railways of St. Louis 4's from 84½ to 85.

Iron and Steel

The Iron Age, in its usual monthly compilation of blast furnace statistics, notes a considerable falling off in production of pig iron during January. The weekly output, it seems, was on an

average 10,000 tons less than for December. This will, of course, increase the tendency toward hardening of prices all along the line. Activity is observed in basic pig irons, and more business is also doing in foundry irons, with a special inclination toward the imported material, because of the comparative promptness in its delivery. Large contracts have been taken during the week in the foundry trade and in the pipe trade. Imports of foreign steel billets are on the increase. Finished products continue firm, with a good volume of business. Prices are on the basis of $22 for Bessemer pig, $30 for Bessemer steel and $28 for rails.

Security Quotations

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

	Closing Bid	
	Feb. 10	Feb. 17
American Railways Company	51½	51½
Aurora, Elgin & Chicago	a38	a36
Boston Elevated	150½	150½
Brooklyn R. T.	69¼	70¼
Chicago City	225	220
Chicago Union Tr. (common)	10¾	10
Chicago Union Tr. (preferred)	45	44
Cleveland Electric	85	86
Columbus (common)	70	—
Columbus (preferred)	104	104
Consolidated Traction of N. J.	65	64¾
Consolidated Traction of N. J. 5s	107½	108
Detroit United	89¼	88¾
Electric People's Traction (Philadelphia) 4s	98	98
Elgin, Aurora & Southern	a52¼	50¼
Lake Shore Electric	14	14
Lake Street Elevated	7⅛	7⅛
Manhattan Railway	144⅞	143⅞
Massachusetts Electric Cos. (common)	35¾	36½
Massachusetts Electric Cos. (preferred)	92½	92¾
Metropolitan Elevated, Chicago (common)	35	35
Metropolitan Elevated, Chicago (preferred)	87½	*85½
Metropolitan Street	137¾	139½
New Orleans Railways (common)	14⅛	14½
New Orleans Railways (preferred)	43	40
North American	116	115
Northern Ohio Traction & Light	19⅛	20¼
Northwestern Elevated, Chicago (common)	31½	—
Philadelphia Rapid Transit	16	15½
Philadelphia Traction	98⅜	98¾
St. Louis Transit (common)	28½	29⅞
South Side Elevated (Chicago)	109	110
Syracuse Rapid Transit	—	a32
Syracuse Rapid Transit (preferred)	—	a80
Third Ave.	125	125
Toledo Railway & Light	35⅞	a36⅛
Twin City, Minneapolis (common)	120⅜	121⅛
United Railways, St. Louis (preferred)	80	—
United Railways, St. Louis, 4s	84⅜	84¾
United Traction (Philadelphia)	46⅞	47⅝

a Asked.

Metals

Quotations for the leading metals are as follows: Copper, lake, 12¾ cents, tin 29 cents, lead 4⅛ cents and spelter 5 cents.

ANNUAL MEETING OF THE CHICAGO CITY RAILWAY

The annual meeting of the stockholders of the Chicago City Railway Company was held Tuesday, Feb. 17. It transpired at the meeting that W. B. Walker had retired from the board some time ago and that A. W. Goodrich had taken his place. With this change the retiring board of directors was re-elected by a vote of upward of 158,000 shares, as follows: S. W. Allerton, L. A. Young, D. G. Hamilton, Joseph Leiter, Arthur Orr, George T. Smith and A. W. Goodrich. Later the directors elected the following officers, George T. Smith taking W. D. Walker's place: D. G. Hamilton, president; Joseph Leiter, vice-president; George T. Smith, second vice-president; C. N. Duffy, secretary and auditor; T. C. Pennington, treasurer; Robert McCulloch, general manager.

The year was the best ever experienced by the company, the earnings exceeding those of 1901, which was the best up to that time. Gross earnings in 1902 were $6,413,182, as compared with $5,900,271 in 1901, an increase of $512,910. The net earnings applicable to stock were $1,896,677, or 10.54 per cent on the capital of $18,000,000, as compared with $1,747,159, or 11.09 per cent, on the average capital of $15,750,000. Following are the income figures, with comparisons:

	1902	1901
Passenger receipts	$6,367,358	$5,856,386
Receipts from other sources	45,823	43,884
Total earnings	$6,413,181	$5,900,271
Operating expenses, taxes and reserves	$4,336,504	$3,869,173
Depreciation	180,000	180,000
Total deductions	$4,516,504	$4,049,173
Net income	$1,896,677	$1,851,098
Dividends	1,620,000	1,620,000
Surplus for the year	$276,677	$127,159

OPERATING STATISTICS

Following are some operating statistics:

Percentage of operating expenses, taxes and reserves to gross earnings (increase 2.04 per cent)	67.62%
Percentage of operating expenses, taxes and reserves to passenger receipts (increase 2.04 per cent)	68.11%
Passenger receipts per day (increase $1,399)	$17,444

Mileage—	Increase
Electric (increase in 1902, 5.81 miles)	183.96
Cable	34.75
All	218.71

Car Miles Run—		Increase
Electric	18,333,862	1,606,322
Cable	14,244,190	434,570
Horse	93,882	*12,208
All	32,671,934	2,028,684
Passengers Carried—		
Fare passengers	128,097,799	10,233,809
Transfer passengers	55,793,562	6,377,829
Fare and transfer passengers	183,891,361	16,611,638
Percentage of transfer passengers to fare passengers		43.56
Percentage of transfer passengers to fare and transfer passengers		30.34

* Decrease.

President Hamilton, in presenting the report, said in part:

"Still further pursuing the policy of the management, to best subserve the wants of the public, large sums have been expended in thoroughly maintaining the road and equipment, which are in good condition, as well as increasing the temporary power capacity in order to meet the traffic demands. The great increase in car mileage (2,028,684 miles), to facilitate the frequency of service, while it has furnished more accommodations to the public, has been the prolific source of increased expense.

"The operating expenses have been further increased by the replacement and renewal of worn-out pavement; by the rebuilding of over 1 mile of discarded double track, one track with grooved rails and one with T-rail, and by the repaving of that part of the street reserved to the company with new granite blocks, according to city specifications, and by the reconstruction of 8 miles of track on several streets.

"In addition to these items of maintenance, a large expenditure has been made for betterments and additions, as well as to prepare for the installation of the proposed new railway, the construction of which a franchise may warrant.

"The new car house has been completed. Large repair and machine shops have been erected; the construction of an additional 77 miles of underground electric duct conduits for feed wire has been finished; additional land bought for the site of the new proposed power station; all of which additions and betterments are needed in anticipation of an ideal railway system.

"Since the last report the 125 large electric cars have been placed in service, and within a few days eighty will be added to the present equipment on the Halsted Street line, and 5.81 miles of track on new extensions have been built.

"A complete power plant, boilers, engines and electric apparatus of 2000-hp capacity has been installed at the corner of Twenty-First and Dearborn Streets, and during this month has been put into operation, to assist in handling the increased traffic of the electric lines; and yet, if the traffic increase still continues, there must be still further additions along that line.

"The management has used every endeavor to settle the franchise question during the year. It did not feel warranted, pending its settlement, to contract for apparatus and construction costing millions of dollars, but has exerted itself to render the best and most efficient service possible under present conditions."

PRINCETON LINE NOW OPERATING IN TRENTON

The New Jersey & Pennsylvania Traction Company ran a car of the Trenton, Lawrenceville & Princeton Railroad into Trenton, N. J., over its new North Willow Street extension on Saturday afternoon, Feb. 14, marking an epoch in the history of the city. It was the first electric car ever run upon the streets of Trenton, aside from those of the Trenton Street Railway Company. The ordinance for the extension of the Princeton line was passed by the City Council after considerable delay and has been detailed in the Street Railway Journal. The company gives more for the franchise to the city and the property owners than any other electric railway company in the State. The track on North Willow Street is laid with 96-lb. grooved rail, standard gage, on heavy chestnut ties and ballasted with concrete to a depth of 10 ins. Over the concrete will be laid vitrified brick. Between Willow Street and Ingham Street, a distance of about 1-3 mile, 80-lb. T-rail is used, and the road is laid upon a private right of way. A double track will extend down Willow Street to the Philadelphia & Reading Railroad tracks, from which point a single track will extend to Willow and West Hanover Streets and a double track (5 ft. 2 ins. and 4 ft. 8½ ins.) to the corner of Warren and Hanover Streets, one block from the City Hall, in the center of the city. Six tracks are crossed where the Reading Railroad is intersected. This crossing will be protected by the most approved safety devices, including derailing switches and signals. At the Pennsylvania Railroad crossing there is but a single track to pass over. The company's new office on North Willow Street and the car house at North Willow and Humboldt Streets will be ready for occupancy within the next month. The former is one and one-half stories high and will contain four rooms, while the latter will house about a dozen of the large 45-ft. cars now in use. The company is carrying from 3000 to 4000 passengers per day, operating two cars over the 12.5 miles of road every forty minutes from 6 a. m. to 1:10 a. m. the next morning. One-half hour is allowed for the 12.5 miles to Princeton, including the running over and through the streets in Trenton and Princeton.

LESSON TO LAWBREAKERS

A striking example of the good that results from the organization of the conservative forces of a community in support of law and order is furnished at Shreveport, La., where the street railway and lighting systems were recently tied up through a strike. The men resorted to violence immediately after the strike was declared, and the Mayor, as a precautionary measure, was compelled to order the suspension of street railway traffic and the shutting down of the lighting plant. Then the Mayor and the president of the Board of Trade, after a conference, decided on a vigorous policy. The grand jury was called upon to indict all lawbreakers, and the city judge, who is said to have dealt leniently with those arraigned before him for lawlessness, was requested to resign. Notice was also served upon those known to have been identified with acts disturbing the public peace to leave town at once. After these things had been done, a second mass meeting was called and a law and order league was organized. A large force of volunteer policemen was then sworn in, and under the protection of this body operations were resumed. These measures had the desired effect, as the force arrayed on the side of law and order was so overwhelming as to dispel at once all hope of successful resistance through violent measures on the part of the strikers. This is the second instance recently where citizens have been compelled to organize to protect life and property, and in each case the measures adopted have proved successful.

FORD FRANCHISE LAW

Former Senator Ford is conducting a vigorous campaign in behalf of the franchise tax measure which bears his name and which was declared invalid recently. In a recent public address on this subject in Brooklyn he went into the details of his original bill for the taxation of all franchises. "The franchise taxation law is to put all corporations holding public privileges on the same footing as any other realty holder," he said. "The same assessor who puts a tax on residence property was to tax that of the Brooklyn Rapid Transit Company or the Metropolitan Railway. This was amended, however, and in the amandment the question of the unconstitutionality of the law lies, if it lies at all. Governor Roosevelt and his advisers put up the amendment creating a State board of assessors, which was to assess the franchises. It was believed then, and it is still believed, that only that portion of the law is unconstitutional and that it will not affect the whole law. Although I pointed out all these things at the time, I was well aware that I could do nothing if I attempted an amendment. I tell you this, however, that the law will not be repealed; nor will it be superseded except by a better one. This law will, when in full operation and properly administered, pay 10 per cent of the taxes of this city and of the State, and it is, therefore, advisable that it be settled by the Court of Appeals as soon as possible. The street franchises of this city are worth at least $500,000,000 and ought to pay their share of the taxes."

COLONEL PROUT

A brief announcement was published in the last issue of the appointment of Colonel Henry Goslee Prout, formerly editor-in-chief of The Railroad Gazette, to his new position as first vice-president and general manager of the Union Switch & Signal Company. But in view of Colonel Prout's prominent position in the fields of railway engineering and editorial work further reference to both in these columns is both a duty and a pleasure.

COLONEL PROUT

Colonel Prout was born in New England. In the fall of 1863 he enlisted in a Massachusetts regiment, and with the Army of the Potomac he served through the Wilderness campaign. In 1865 he was mustered out and two years later entered the University of Michigan, where he was graduated with the degree of civil engineer. He had a few years' work on railroad surveys and construction and two summers were spent in making surveys in the Rocky Mountains. After this experience he entered the service of the Khedive of Egypt as a major of engineers, where he remained about four and a half years and reached the grade of colonel in the general staff. After the first year he went to the Soudan in command of an expedition to Kordofan and Darfour, and thence he was sent to the head of the Nile as Governor-General of the provinces of the Equator. Colonel Prout's work here was largely administrative. He had 3000 soldiers under him and was supreme over finance, civil and military affairs. After his return to America he was for more than a year signal engineer to the company out of which the Union Switch & Signal Company grew.

Colonel Prout was in business in the city of New York for a few years, and in March, 1887, became the editor of The Railroad Gazette. In this position he has gained an enviable reputation among the newspaper fraternity as well as among engineers for his professional skill as well as for his painstaking accuracy and high standard of journalism. During this period, also, his services were often sought in an advisory capacity in important engineering problems. In recognition of Colonel Prout's splendid work as an editor and journalist Yale University last year conferred on him the honorary degree of Master of Arts. Colonel Prout is not only a distinguished writer, but is much sought after as an after-dinner speaker and lecturer.

An accurate, clear-minded critic, quick to grasp the gist of things and to follow up a point with a sound reason and a convincing statement, he can accept criticism as gracefully as he offers it. His use of English is clear, accurate and simple, and as free from flourish and ostentation as is his personality. His technical ability is also of a high order, as he has the very happy faculty of quickly and fully grasping the details of engineering problems.

FRANCHISES IN NYACK

On Feb. 7 the Rockland Railroad Company was granted a "certificate of convenience and necessity" by the State Board of Railroad Commissioners of New York for the route applied for by this railroad, running from Upper Nyack, N. Y., southwardly through Nyack, South Nyack, Grandview and Piermont to Sparkill, N. Y., all in Rockland County, a total distance of about 7 miles. The Rockland Railroad Company is controlled by the same persons who own the New Jersey & Hudson River Railroad & Ferry Company, and it has the same officers as that company. It is understood that the consents of the abutting property owners for this route have also been secured and that the consent of the city authorities will be given.

At the same meeting of the New York Railroad Commissioners the application of the Rockland County Traction Company for practically the same route was refused.

REGULATION OF OIL CONSUMPTION IN CALIFORNIA

Both the producer and the consumer of petroleum in Southern California are up in arms against the passage by the State Legislature of the Ralston bill, which fixes a "flash test" for fuel oil and crude petroleum at 150 degs. Fahrenheit. While all oil men are in favor of and advocate the adoption of regulations to govern the storing and handling of crude oil, they are vigorously against the adoption of "fire" or "flash tests," on the ground that they do not consider such tests effective as a protection to property and life. Moreover, the passage of the proposed law would be prohibitive against the light or high-gravity fuel oils, it is claimed, thereby giving a free market to the heavy or low-gravity product. The Ralston bill provides:

No kerosene or coal oil shall be manufactured, sold, offered or exposed for sale, which will not stand a fire test of 120 degs. F., at barometric pressure of 29.92. The test by which the degree of fire test shall be made is the open Tagliabue electric cup, or one similar in construction and result. * * * It shall be a violation of the provision of this section if any statement hereby required is false in regard to the articles manufactured, sold or offered for sale in the case of kerosene or coal oil, if the marked fire test on the package or label is higher in degrees than the said article will actually stand under the test hereinbefore specified, and the person, firm or corporation violating any of these provisions, or any other provision of this act, is guilty of a misdemeanor.

Section —. All oil used in boilers as fuel for the purpose of making steam shall be crude petroleum, and shall stand a flash test of at least 150 degs. F. This section applies only to cities, and does not apply to boilers used at the wells for operating purposes or to railroad locomotives.

The present agitation over tests had its origin in the investigation that followed the recent explosion of the oil-burning steamer Progreso. Those who oppose the Ralston bill point out that the Treasury Department in this instance adopted no such radical measure as that proposed, but rather a reasonable requirement to the effect that supervising inspectors of hulls and boilers should make a personal examination of all oil-burning plants hereafter introduced on steam vessels before granting certificates. Furthermore, it is asserted, for more than twenty years crude oil has been used as fuel in California with perfect safety to life and property. The facts bear out this assertion, inasmuch as, prior to 1894, only the light-gravity oils were available for fuel purposes, for the discovery was not made until later that crude oil could be so employed.

Fifteen years ago an oil-burning ferryboat on San Francisco Bay blew up, whereupon the government inspectors promptly ordered the abandonment of oil for fuel. The insurance companies then refused to take risks where oil was used, but investigation soon exonerated crude oil. The cause of the explosion was found to have been due to a defective boiler. But the official investigations conducted by the Federal authorities and insurance companies proved more, viz., crude oil was found to be without danger as a fuel when handled with ordinary intelligence and caution. Thereupon the government once more countenanced the use of oil as fuel, and insurance companies have since accepted risks where oil is used on the same basis as coal. These are expert judgments.

In Los Angeles, all of the street railway companies are large consumers of oil for fuel, and they are lined up against the Ralston bill. They say the light oils are absolutely safe.

J. R. Atchison, superintendent of motive power of the Los Angeles Railway Company, who has had seventeen years' experience in handling the fuel oils of Southern California, regards high-grade oil not only more satisfactory, but less dangerous where a large quantity is used. "We are using about 500 barrels of oil daily at the plant now," says Mr. Atchison, "and we are handling oil all the way from 12 to 32 gravity. In the past six years we have not had an accident for which crude oil could be made responsible. I do not consider high-gravity oil dangerous, and believe that oil up to 26 or 28 gravity is safer than the heavy product below 12 or 14. While it is true that the lighter oils contain more hydrogen gas and less asphaltum than the heavier crude, the light oil flows freely, while it is necessary to heat the heavy crude to make it move lively. The heating process causes the gases to arise, and at that time there is far more danger from explosion than in handling the lighter oil in its normal condition. In all my experience there has never been an accident that could not be traced to carelessness."

E. P. Clark, president of the Los Angeles-Pacific Railway Company, who has been the consumer of some of the highest-gravity oil ever used for fuel, says there is no danger in using light oil. "Why," he states, "when we first began to burn oil for fuel we insisted in our contract that the gravity be at least 23 degs. and on up to 26 degs.; if any less were delivered we promptly refused to pay the price."

That the question of "flash test" may be thoroughly understood the following analytical statement made by Paul W. Prutzmen is given: "The flash point of an oil is rather loosely defined as the temperature at which it will give off an inflammable vapor. It may be of interest to point out how and why an oil gives off inflammable vapor, how this vapor may become a source of danger and how such danger may be obviated. In the first place, oils do not burn, though their vapor does. That is to say, a portion at least of the oil must be changed to vapor or gas before ignition can take place, but combustion once started will furnish (generally) enough heat to convert more of the liquid to a gaseous condition, so that burning may go on without the aid of any outside heat. For instance, if a lighted match be plunged into a cup of gasoline the oil will at once burst into flame, because gasoline is so volatile that evaporation (that is, from liquid to gas) is continually going on. But if instead of gasoline we take a good grade of kerosene the match would be extinguished, for the reason that the kerosene requires a higher heat to convert it into vapor. If instead of a match we used a gas jet and kept the flame in one place on the surface of the kerosene, this spot would soon be heated sufficiently to vaporize the oil, which would then take fire and would probably continue burning. If in the place of kerosene we used a heavy lubricating oil we should probably have some difficulty in lighting it, even with a gas flame, and if we succeeded in lighting it the flame would go out almost as soon as the source of heat were removed."

SALES OF STEAM TURBINES

A recent list of the users of Westinghouse steam turbines, published by Westinghouse, Church, Kerr & Co., shows that 4000 kw of turbine machinery are now in successful operation and 75,000 kw have been contracted for. Prominent among railway plants who have secured or ordered turbines are those of the Metropolitan Railway Company and the Metropolitan District Railway, of London, aggregating 50,500 kw. The former plant will employ three 3500-kw units and the latter eight 5000-kw units, the largest turbine machinery on record. Two American railway installations are those of the Cleveland, Elyria & Western Railway Company and the Consolidated Railways & Lighting Company, of Wilmington, N. C., each of which will generate alternating-current power at a central station, employing transmission lines and rotary converter sub-stations along the right of way.

Several prominent lighting installations comprise: The Hartford Electric Light Company, two 750-kw units, replacing the engine-driven units (1500 kw already in service); Western Pennsylvania Railways & Lighting Company, Pittsburg, Pa., three 1000-kw units for supplying the entire district between McKeesport and Connellsville; Columbus (O.) municipal plant, three 400-kw units; Roslyn (L. I.) Light & Power Company, 800 kw; Citizens' Light, Heat & Power Company, Johnstown, Pa., three 400-kw units; the Rapid Transit Subway, New York, three 1250-kw units, supplying power for lighting the entire subway, the forty-seven underground stations and the immense power plant at Fifty-Ninth Street, Manhattan; Portsmouth (O.) Railway & Lighting Company, three 400-kw units, and the Rockland Light & Power Company, Nyack, N. Y., 400 kw. A number of these plants furnish considerable amounts of electric power to manufacturing establishments employing motor-driven machinery. Other installations, employed exclusively for industrial power establishments, include: The DeBeers Consolidated Mines, Kimberly, South Africa, two 1000-kw units for lighting and operating mine machinery; Westinghouse Electric & Manufacturing Company, Pittsburg, Pa., two 750-kw units for shop power; the B. F. Goodrich Company, Akron, O., one 750-kw unit for shop power (400 kw already in operation); Saco & Pettee Machine Shops, Biddeford, Me., two 400-kw units for operating shops; S. D. Warren & Co., Cumberland Mills, Me., 400 kw for shop power, relaying steam and water plant, and the Yale & Towne Manufacturing Company, Stamford, Conn., 400-kw unit, duplicating the turbine equipment already in operation. A recent installation for the Goshen & Indiana Traction Company comprises five 400-kw units. The entire station will be operated from turbine machinery, and current will be used for light and power work.

DISAPPEARANCE OF RAILWAY MAN

The disappearance of James M. Johnson, a former employee of the La Crosse City Railway Company, has been reported by the superintendent of the system. His family is anxious to learn of his whereabouts. Neither his former employers nor his friends know of any reason why he should have cut himself off from all communication with his former associates.

LARGE CAR WORKS AT MANCHESTER, ENGLAND

The British Electric Car Company, whose works are situated at Trafford Park, Manchester, and whose offices are at Oxford Court, London, has just issued two large catalogues descriptive of some of the cars recently built at its new works and also some views of the shops themselves. The shops are laid out on the most modern lines, and a number of novel features have been introduced to facilitate the manufacture of cars. Thus, the views show that the car bodies are set up crossways in the shops. This enables any one car body to be moved without disturbing the others, the finished body being moved out on a dummy truck to the electric crane in the bay by which it is conveyed to the loading track. One catalogue shows a large number of different types of cars, including cars for Huddersfield, the London United Tramways, Aberdeen, Isle of Thanet, City & South London and other well-known roads, as well as a car known as the "B. E. Standard." This car has a 17-ft. body and measures 27 ft. 6 ins. over all and has a double deck. The company also builds several standard types of trucks, sprinklers and an illuminated destination sign of several types. The catalogues are very handsomely printed.

A trip through the company's shops recently showed about 150 cars on hand. Among the cities for which the company is filling orders are Aberdeen, Huddersfield, Trafford Park, Motherwell, Ilford, Alexandria (in Egypt) and Blackpool.

ELECTRICITY IN THE PARK AVENUE TUNNEL

There were introduced in the Assembly, Feb. 10, the bills agreed upon by the Board of Estimate and Apportionment of New York City and by the New York Central & Hudson River Railroad Company for the substitution of electricity for steam as motive power and for the other general improvements to the system.

One of the bills confers on the Board of Estimate and Apportionment the exclusive power to grant to the New York Central Railroad permission to put into effect its $25,000,000 terminal improvement plans. One of the more important provisions requires the substitution for steam below the Harlem River of either electricity or "any motive power other than steam, and which does not involve combustion in the motors themselves."

The two other bills sent by Mayor Low relate to the abolition of grade crossings in The Bronx and the digging of a tunnel under St. Mary's Park on the Port Morris branch of the Harlem Railroad. Mayor Low says in his letter:

"It is the intention of the company to use electricity, and the present plans contemplate the use of this motive power for a considerable distance beyond the city limits, both on the Hudson River and on the Harlem Railroad. A time limit of five years has been fixed, for the reason that the very great changes contemplated must be carried on without interrupting the ordinary business of the road. On the other hand, the company hopes to complete the work in much less time."

EACH GRADE CROSSING ON ITS OWN MERITS IN MICHIGAN

The Commissioner of Railroads of Michigan has granted permission to the Grand Rapids, Grand Haven & Muskegon Railway Company to make a grade crossing of its line with the tracks of the Pere Marquette Railroad Company on Fulton Street in the city of Grand Haven, such crossing to be protected by an interlocking system. Much interest attaches to this decision from the fact that an application for the approval of this same crossing was made to the former commissioner and was denied, that official taking the position that no grade crossing of an electric with a steam road should be allowed under any circumstances. In this case it was clearly shown that unless a grade crossing should be allowed the road could not be built into the city, the Common Council refusing to grant a franchise for other than a grade crossing, and the expense of an underground crossing, on account of the nearness of the river bridge, being prohibitive. The position taken by the present commissioner appears to be that, while recognizing the fact that all grade crossings are of necessity dangerous, and that the construction of additional crossings is to be avoided whenever possible, still each case must be considered upon its own merits, and where it appears that a separation of the grades is not reasonably practicable, grade crossings may be allowed. Since the building of this line passengers for Grand Haven have been compelled to transfer at the city limits and be carried into the city by a bus line.

AN IMPORTANT DECISION IN MASSACHUSETTS

In the Street Railway Journal for Feb. 14 brief mention was made of a decision handed down bly the Railroad Commissioners in which was denied the petition of the Lowell & Pelham Street Railway Company for a right to enter the city of Lowell over the tracks of the Boston & Northern Street Railway, with which it entered into an operating agreement about Oct. 1, 1902. The point raised in the suit is new, apparently leaving application to the Legislature as the only recourse, if the Lowell & Pelham Company persists in demanding entrance to Lowell over the lines of the Boston & Northern Company.

The reason of the decision, as stated in the rescript handed down by the Railroad Commissioners, is to the effect that they lack jurisdiction in the matter and cannot act until there is some expression from the legislative body of the government. The Commissioners say the two companies have entered into an agreement for the joint use of the tracks, but the Aldermen of the city of Lowell have taken no action and appear here as remonstrants, and from the context of the report of the Railroad Commissioners it would appear that they considered it necessary for the company to first go before the Aldermen of Lowell for the approval of this authority to run over the tracks of the Boston & Northern before the company should come before the commissioners. The Railroad Commissioners dismissed the petition for the lack of jurisdiction.

Months ago the Lowell & Pelham Company applied for a franchise in Lowell, but the franchise was never granted, for the reason that the company withdrew the petition and soon after entered into a private agreement with the Boston & Northern to run over its tracks.

The agreement was signed and the Lowell & Pelham Company proceeded to run its cars over the Boston & Northern Company's tracks from their terminus to Dracut. A few months ago the question of the right of this foreign road to enter into such an agreement and to occupy the streets was raised by a petition to the Aldermen. At this hearing the question was raised of the right of the Lowell & Pelham Company to operate in the city, with the result that the City Solicitor and the then acting Mayor were instructed to appear before the State board and oppose the approval of this agreement.

ANNUAL MEETING OF THE WASHINGTON, ALEXANDRIA & MT. VERNON RAILWAY COMPANY

At the last annual meeting of the Washington, Alexandria & Mt. Vernon Railway Company the following were elected directors: Samuel Rea, James S. Swartz, Frank K. Hipple, David C. Leech, Joseph Crawford, Clarence P. King, John Cassels, Frederick Mertens and G. E. Abbot. The officers elected were: Clarence P. King, president; Frank K. Hipple, secretary; J. K. Swartz, treasurer.

The business for 1902 was the largest in the history of the company, the report making the following showing:

Gross receipts	$217,659.75
Operating expenses, including insurance and taxes	140,239.63
Receipts over operating expenses	$77,420.12

After paying interest on bonds and rentals, the surplus earnings for the year were $44,920.16. A dividend of 2 per cent on the $500,000 of capital stock was paid and the balance placed to profit and loss account.

The gross receipts for January, 1903, were $16,146.72, as compared with $15,267.75 for January, 1902, showing an increase of $878.97.

IMPROVEMENTS AT CLEVELAND

Extensive improvements will be made to the Cleveland street railway systems during the coming season. It is stated that the Cleveland City Railway Company and the Cleveland Electric Railway Company, which control all the lines in the city, will expend $1,500,000 in betterments. About seventy new cars will be installed by the two companies. The majority of these have been ordered. The Cleveland City Railway Company will extend its Clifton Boulevard line to Rocky River and will also extend its West Madison Avenue line. It will also extend its Collinwood line to connect with those of the Cleveland Electric Railway Company. The latter is installing a new battery station at the Widermere car houses and another will be built at Newburg. Its line from East Cleveland to Euclid will be double-tracked and the Erie Street crosstown line will be extended.

STREET RAILWAY PATENTS

UNITED STATES PATENTS ISSUED FEB. 10, 1903.

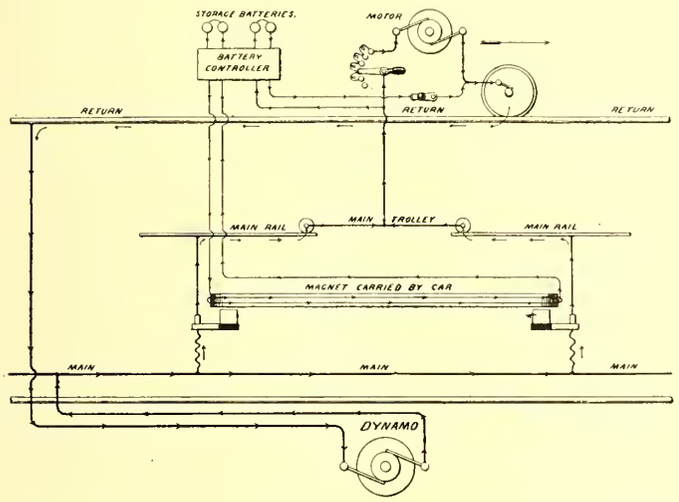
[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

719,983. Electric Railway; F. M. Ashley, Brooklyn, N. Y. App. filed Feb. 26, 1898. Each car has a storage battery which is charged by the main current, the current from the battery being used to operate the electro-magnetic switching devices.

719,984. Electric Railway; F. M. Ashley, Brooklyn, N. Y. App. filed Feb. 26, 1898. A battery on the car energizes a magnet, the magnet being of sufficient length to bridge two of the switching devices in the branch circuits to the working conductor to operate the same.

720,006. Automatic Street Car Switch; L. Devers, Dayton, O. App. filed Sept. 10, 1902. A plunger on the car platform is adapted to engage a lever in the roadbed to actuate the switch.

720,167. Brake-Shoe for Railway Brakes; J. Meehan, Covington, Ky. App. filed July 2, 1902. The shoe is constructed to wear upon that portion of the wheel least subject to the wear of the rail.



PATENT NO. 719,984

720,208. Mechanism for Removing Ice and Snow from the Conductors or Third Rail of Electric Railways; F. V. Winters, New York, N. Y. App. filed Aug. 5, 1902. Details of a spring-mounted ice-crushing wheel and plow.

720,256. Clamp; H. E. A. Kleinschmidt, Johnstown, Pa. App. filed April 22, 1902. Comprises two pivoted jaw members, one of which has its upper portion curved inwardly, a link or yoke pivoted to the other of said members and embracing the member having the inwardly curved portion and a set-screw carried by said link or yoke.

720,273. Electric Railway; T. E. Murray and J. Van Vleck, New York, N. Y. App. filed Nov. 22, 1901. The cars switch themselves onto their proper sidings at stations automatically, the current being cut off and the brakes applied at the proper time.

720,291. Railway Car; G. E. Smith, Pasadena, Cal. App. filed Nov. 25, 1901. A friction rail in the center of the track is engaged by traction wheels mounted on vertical axles, whereby the car may climb heavy grades and turn sharp curves at a high rate of speed.

720,333. Trolley and Brake for Aerial Railways; M. J. Doner, St. Louis, Mo. App. filed Aug. 18, 1902. The trolley and brake lever are connected by a rod so that the brakes are applied when the arm is lowered.

720,376. Safety Brake Apparatus for Motor Cars; C. F. Peel, Jr., New York, N. Y. App. filed Sept. 11, 1902. Means whereby the brake is automatically applied in case the motorman is incapacitated; also means for locking the controller and brake apparatus by the removal of the brake handle.

720,377. Emergency Car Brake; A. Perry, St. Louis, Mo. App. filed May 17, 1902. Consists of a spring strap adapted to move into contact with the car wheel by virtue of its tension when freed from resistance.

720,458. Cable Grip; S. S. McCain, California, Pa. App. filed Oct. 28, 1902. A cable grip designed to easily pass carrier sheaves at curves, crossings and similar places.

720,502. Car Fender; J. P. Thom, New Orleans, La. App. filed July 2, 1902. Details.

720,523. Switch Device; L. Horinko, New York, N. Y. App. filed Oct. 4, 1902. Relates to means for automatically throwing the switch from the car.

720,528. Bolster; H. T. Krakau, Cleveland, O. App. filed Oct. 14, 1901. A bolster made of end sections, an intermediate section, a tie-plate, and keys passing through lugs on tie-plate and end sections and connecting the same.

PERSONAL MENTION

MR. T. J. CARLING has resigned as president of the Macon Railway & Lighting Company, of Macon, Ga., and Mr. E. L. Bemiss, of Richmond, Va., has been elected as his successor.

MR. CHARLES T. YERKES, at a recent meeting of the London United Tramways Company, held Feb. 11, was elected president of that company. This is the result of the recent change in ownership of that company.

MR. W. A. HARDING, formerly master mechanic of the Calumet Electric Street Railway, of Chicago, is now on the Pacific coast, having recently become master mechanic of the Santa Barbara Consolidated Street Railway. Mr. Harding, as might be expected, was among the first to forward an application for membership to the American Railway Mechanical and Electrical Association, formed at Cleveland, Feb. 16.

MR. WILLIAM D. RAY, who has been with Westinghouse, Church, Kerr & Co. in engineering work connected with the electrical equipment of the Pennsylvania Railroad terminal tunnel in New York City, has returned to his former home, Detroit, to take charge of that office of the Westinghouse Traction Brake Company, 716 Union Trust building, a position for which he is admirably fitted by his previous extensive experience both in engineering and selling.

MR. GEORGE O. NAGLE, who has been manager for several years of the Savannah Electric Company, has recently resigned from that position to fill an important place in the office of Stone & Webster, who control the Savannah property, as well as many other railway and lighting plants throughout the country. Mr. Nagle's headquarters will be at the main office of the company in Boston. Mr. Nagle, who was formerly superintendent of the Chicago City Railways, has been very successful in his management of the Savannah property, where he has had charge of both the lighting and railway work. Before leaving Savannah, in recognition of Mr. Nagle's services, he was extended a farewell dinner by a number of his Savannah friends. During the dinner he was presented with a handsome Masonic emblem containing nine diamonds, as well as a dress suit case and equipment from a number of his newspaper friends. Mr. Nagle will be succeeded by Mr. Clinton B. Kidder, who has been assistant manager of the company. Mr. Kidder will be assisted in the operation of the street railway system by Mr. J. H. Oakley.

MR. WALTER H. ABBOTT, heretofore consulting engineer for the Cleveland, Elyria & Western Railway, of Cleveland, has been appointed consulting engineer for all the properties of the Pomeroy-Mandelbaum syndicate. The new office was created for Mr. Abbott, and in view of the remarkable development of the properties of this syndicate it is a very responsible one. Mr. Abbott is a graduate of the Chicago University and also completed the post-graduate course of the Ecole Internationale des Electricians of Paris. Previous to his connection with the Pomeroy-Mandelbaum syndicate he held responsible positions with the Ocean City Electric Railway & Power Company, of New Jersey; the Siemens-Halske Company, of Chicago, and the Stanley Electric Company, of Pittsfield, Mass. Mr. Abbott's headquarters will be in the Garfield building, Cleveland, and the position means the organization of an engineering corps, which in turn will cause the creation of a purchasing department here. At the present time the executive head of the syndicate is located in Cleveland, but the intermediate departments have not been definitely located and much of the purchasing has been done at the operating headquarters of the various companies.

NEWS OF THE WEEK

CONSTRUCTION NOTES

ANNISTON, ALA.—The Anniston Electric & Gas Company is to erect a new amusement building at Oxford Lake Park this spring. In this building will be housed an electric merry-go-round, bowling alleys and a refreshment stand.

LOS ANGELES, CAL.—The Los Angeles Traction Company has begun grading for its line from Los Angeles to Santa Monica.

SAN BERNARDINO, CAL.—The franchise applied for by Harry H. Duryea in the interest of the San Bernardino Valley Traction Company is to be sold at public auction on March 3.

LOS ANGELES, CAL.—The Pacific Electric Railway Company is making more extensions to its already large yards, and many new switch tracks are being installed. A 250-hp engine and a generator have just been added to the power-house equipment.

REDWOOD CITY, CAL.—The Board of Supervisors has granted W. J. Martin, of the San Francisco Land Company, a franchise to construct an electric railway from Holy Cross Cemetery to South San Francisco.

LOS ANGELES, CAL.—Contracts are being prepared for the work on the proposed line of the Los Angeles Traction Company to Hollywood. The right of way has been secured and most of the estimates have been made. The new line will be the shortest to Hollywood, and the time from the center of the city will be about twenty minutes. It is the avowed intention of the company to put on high-speed cars of the latest pattern, and some additions will have to be made to the power facilities of the company.

BAKERSFIELD, CAL.—John Burson, the promoter of the proposed electric railway from Ventura County to Bakersfield, is said to have completed arrangements for beginning the construction of the line at once. The plan is to begin work at Oxnard.

MONTEREY, CAL.—R. C. P. Smith has been granted a franchise for the construction of an electric railway here. Work must be begun within sixty days, and the line must be placed in operation within twelve months from the time construction work is begun.

HARTFORD, CONN.—The application of the Meriden & Middletown Traction Company for a charter has been presented in the Legislature. The preliminary capital of the company is to be $25,000, with the privilege to increase to $500,000. The plan of the company is to build a line to connect Middletown, Meriden, Berlin, Cromwell, Durham, Middlefield and Guilford. Among the incorporators of the company are: I. E. Palmer, W. W. Wilcox, of Middletown, and Francis Atwater, of Meriden.

NEW LONDON, CONN.—The East Lyme Street Railway Company, which has secured a special charter for an electric railway from New London to East Lyme, has organized with Richard C. Morris as president and treasurer and Calvin S. Davis as secretary. The capital stock of the company is $100,000, all of which has been subscribed. It is said that the plan of the company is to begin construction work immediately.

HARTFORD, CONN.—The Willimantic & Southbridge Street Railway Company has applied to the Legislature for permission to increase its capital stock to $200,000. The plan of the company is to build an electric railway to connect Williamantic, Conn., and Southbridge, Mass., passing through North Windham, Chaplin, Woodstock and Putnam.

HARTFORD, CONN.—The West Side Street Railway Company, of Stonington, is seeking a charter.

ROCKVILLE, CONN.—Surveys are being made by the Stafford Springs Street Railway Company for its proposed line through Rockville. The petition of the company for a franchise is before the Council.

MONTVILLE, CONN.—A survey has been made for the extension of the lines of the Montville Street Railway Company from the New London and Norwich turnpike to Oakdale.

ROCKVILLE, CONN.—The Rockville & Broad Brook Street Railway Company is to perfect its organization at once and complete plans for building the road. It is proposed to build from the lines of the Hartford, Manchester & Rockville Street Railway in Rockville to Ellington and Broad Brook. At the latter place connections will be made with the lines of the Springfield & Hartford Street Railway. The road will be 12 miles long. C. E. Harwood, of Rockville, is interested.

WOODBURY, CONN.—The application of the Woodbury & Waterbury Street Railway Company for incorporation has been presented to the Legislature. The plan of the company is to construct a line in Woodbury, Middlebury and Waterbury to connect with the Connecticut Railway & Lighting Company's lines. The incorporators of the company are: Floyd F. Hitchcock, Levi A. Curtiss, of Woodbury; Christian Stroebel, of Waterbury, and Frederick L. Averill, of Bradford. The capital stock will be $200,000.

DELAWARE CITY, DEL.—Right of way has been secured between Delaware City and Odessa for the proposed electric railway between Milford and Delaware City. H. L. Evans, president of the Wilmington & New Castle Railway Company, is said to be interested in the scheme.

WASHINGTON, D. C.—There has been introduced in the House a bill to permit the Anacostia, Surrsville & Brandywine Electric Railway Company to extend its lines into the District.

ST. AUGUSTINE, FLA.—The St. Augustine & South Beach Railway, operating about 5 miles of line connecting St. Augustine with the seaside resorts, has been sold under foreclosure to Judge J. W. Henderson and Dr. Horace Lindsley. It is said that the new owners plan to reconstruct the property and equip the line with electricity.

AUGUSTA, GA.—James U. Jackson, president of the Augusta & Aiken Railway & Electric Company, and his associates, are said to be planning to incorporate a company to build an electric railway between Augusta and Columbia.

ATHENS, GA.—Charles H. Lemon, representing an Ohio syndicate, has been in consultation with the local authorities in the interest of a scheme to build an electric railway to connect Atlanta, Decatur, Monroe, Walkinsville, Athens, Lexington, Washington, Appling and Augusta.

ROME, GA.—There has been outlined to the citizens by the City Electric Railway Company a plan whereby the local properties of the company will be improved and an extension of the company's lines built to Lindale. This plan contemplates an issue of $125,000 of stock and $100,000 of first mortgage bonds, to which local interests have been asked to subscribe a stated amount. The railway company owns the local lighting plant.

POCATELLO, IDAHO.—I. B. Perrine has applied for a street railway franchise.

BOISE, IDAHO.—Howard Sebree, of Caldwell, has applied for the right of way for the construction of an electric railway from Caldwell to Boise, a distance of 30 miles.

SYCAMORE, ILL.—The De Kalb-Sycamore Electric Railway Company plans to extend its lines to Belvidere, where connections will be made with the Belvidere-Rockford system.

SPRINGFIELD, ILL.—Former Attorney-General Akin, of Springfield, is reported to be interested in a plan to build an electric railway from Springfield to Riverton. By building from Springfield to Girard and Carlinville, as is reported to be the intention, connections could be made for St. Louis.

DECATUR, ILL.—H. W. Knight, in the interest of the proposed electric railway between Bloomington and Decatur, has applied for a franchise in Decatur. Mr. Knight says the entire right of way has been secured for the line.

OTTAWA, ILL.—The Ottawa, Marseilles & Morris Electric Railway Company is securing right of way for its propesed line. J. F. Moloney and J. J. Graham, of Ottawa, are reported interested.

QUINCY, ILL.—Citizens of Quincy are reported to have completed subscriptions for $207,000 of stock in the Quincy & Western Electric Railway. The plan of the company is to build two lines, one running north and tapping Hancock County points, the other running east to the Illinois River.

CHICAGO, ILL.—The Chicago, Riverside & La Grange Railroad Company has been chartered to build a railroad from Fortieth Avenue and West Twenty-Second Street to Forty-Sixth Avenue and West Twenty-Second Street. John T. Richards, George T. Pitkin, J. Scott Mathews, Robert S. Cook and Eugene Dupee, attorney, 140 Dearborn Street, Chicago, are named as the first board of directors.

MARION, IND.—C. H. Bundy, John E. Clark and Everett W. Trook have been granted a fifty-year franchise for the construction of an electric railway through Howard County. Messrs. Bundy, Clark and Trook are said to be interested in a plan to build between Kokomo and Marion.

LA PORTE, IND.—The syndicate engaged in dredging the Kankakee River is said to have decided to build an electric railway from Bloomington to Joliet. The company's plans have not yet been made public.

NEW HARMONY, IND.—The Mt. Vernon, New Harmony & Northeastern Traction Company is to be incorporated to build an electric railway from New Harmony through Princeton to Petersburg. Harry Kurtz is interested.

INDIANAPOLIS, IND.—The Indianapolis & Martinsville Rapid Transit Company is said to be considering the advisability of extending its lines from Plainfield to Greencastle.

RICHMOND, IND.—The Richmond Street & Interurban Railway Company has in contemplation the extension of its lines from Milton to Connersville. The company has secured a franchise from the County Commissioners and has asked the City Council of Connersville for a franchise.

INDIANAPOLIS, IND.—President McGowan, of the Indianapolis Traction & Terminal Company, is quoted as stating that all arrangements have been perfected for securing the property on which to erect the proposed terminal station for the lines of his company and the interurban companies operating into the city. The contract for erecting the new building is yet to be awarded, according to report. It is said that this contract will include razing the buildings now on the ground.

FRENCH LICK, IND.—A survey has been completed for the New Albany & French Lick Springs Valley Traction Company's line. The road will run through four countries, and will form an important line for a trunk line from Indianapolis to Louisville via Columbus.

LOGANSPORT, IND.—The Knox, Chicago & Northern Traction Company has been organized to build electric railway lines aggregating in length 140 miles. One line is to be built from Logansport through Winamac, Bass Lake, Knox and Laporte, and another line is to be built from Rochester through Culver, Bass Lake, Knox, Wanatah, Valparaiso and Hammond. Connections are to be made with one of the interurban lines to Chicago. J. C. Fletcher, of Knox, is president of the company.

MARSHALLTOWN, IA.—The Marshalltown Electric Street & Interurban Railway Company has been organized with a capital stock of $25,000 to build an electric railway in Marshalltown and from Marshalltown to Eldora, the county seat of Hardin County, and Grundy Center, the county seat of Grundy County. The directors of the company are: H. E. Sloan, H. P. Densel, Charles Glick, E. L. Will, George R. Estabrook, F. E. Glick and A. G. Glick, of Marshalltown.

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The Coming Convention at Saratoga

As announced elsewhere in this issue the executive committee of the American Street Railway Association, in session at Saratoga on Feb. 23, decided by the unanimous vote of all those present to hold the next convention at Saratoga Springs, Sept, 2, 3 and 4. There is no doubt that this is the wisest plan to pursue under the circumstances. It is true that in the past conventions have been held annually in some large city, and that a radical departure from all precedent will be made in going to Saratoga. There are many reasons, however, for making the change just at this time. As many must realize, the attendance at the annual conventions of the association has increased greatly during the last four or five years. The result is that it is now not only a serious task to find a city where the hotel accommodations are sufficient to accommodate comfortably all those who wish to attend, but the expense of entertaining such a large number has grown to large proportions. In the past this expense has been defrayed by the local traction company, and in recent years it has amounted to between $10,000 and $15,000. This is a serious drain on the treasury of even the largest railway companies and shows how conditions have altered since the entertainment of the association meant simply an invitation to a few railway presidents or managers from different parts of the country to meet and discuss questions of technical interest.

Saratoga is in many respects an ideal place for a convention of the kind which the American Street Railway Association holds yearly. In the first place, there is absolutely no question as to the extent and quality of the hotel accommodations available there for all who wish to attend the convention, and even for twice the number which usually gather at a street railway convention. Again, the place is an attractive one to visit, especially at the season selected for the next meeting, and is also well centralized, not only for a great majority of the delegates, but also for most of the manufacturers who have heavy apparatus to transport to the convention and for exhibition purposes. Moreover, Saratoga is used to conventions of this kind and knows how to take care of them. Several technical and many civic organizations hold conventions in Saratoga yearly, and the fact that they return there is indicative of the satisfactory treatment which they receive. The president of the Business Men's Association, the president of the village, and representatives of the hotel interests united in assuring the executive committee that they would do everything to make the September convention a success and of satisfactory treatment at that time. Hon. Addison B. Colvin, president of the Hudson Valley Railroad, which connects Saratoga with Troy and Albany on the south, and with Lake George on the north, has also courteously promised the association his active co-operation in making the convention a success.

The only possible drawback to Saratoga is the fact that there is no large hall suitable for the convention exhibits, and it may be said that this was practically the only factor in the minds of the executive committee against the selection of Saratoga. The Saratoga representatives, however, assured the committee that this important feature of the convention would be satisfactorily handled. The verandas of the Grand Union Hotel, which will be the headquarters of the association, are the largest probably of any hotel in the world, and from 8000 sq. ft. to 10,000 sq. ft. of space is available there. In addition, the court of the hotel is extremely spacious, and guarantees that every possible facility will be given exhibitors in placing their exhibits in position, and that all apparatus will be protected from the weather were secured from the representatives of Saratoga present before the final decision to meet at Saratoga was reached. While, perhaps, from a sentimental standpoint, the arrangement for exhibits may not seem quite as satisfactory as an enclosed hall would be, it has its advantages. The exhibits will all be in or adjoining the hotel where the convention is being held, and where they can easily be inspected by all the railway delegates in attendance, and there are not the same outside attractions as exist in a large city to take the attention of those present from this industrial feature of the convention.

The association made a departure also from established practice in fixing the date of the convention during the first week in September, although one previous convention, that at Boston in 1898, was also held at this same time. The reason for selecting this date was that it was practically the only one during which the full service from the hotel could be secured, as it marks the end of the summer season, and after this time a satisfactory hotel service could not be promised. We doubt

whether this date will prove as convenient to many of the members of the association as October, as the summer rush is usually not over until after Labor Day, which occurs this year on Sept. 7. Nevertheless, it was the only date really available, and it was the consensus of opinion of those present that it would not prove a serious inconvenience to most of the members. Taken as a whole, we see no reason why the traditions of the association that each succeeding convention is the most successful in its history should not be repeated in September, 1903.

Third-Rail Supports

The third-rail support, like the third-rail shoe, is unfortunate, because almost any device will give some results which approximate satisfaction. This has had the effect of making many third-rail installations very unsubstantial, and likely at some time because of their poor construction to cause serious accident in the form of tying up the line.

Many third-rail systems are built of scrap rail, with the insulators spaced so few and far between that the rail noticeably sags between supports, and the insulators themselves are constructed inadequately for securing the third rail in its place. In some instances the rail is held in position by little more than its own weight, the insulator ears, which are to do the duty of grasping the third rail, being so thin that they quickly corrode away. This may ultimately result in the dismounting of long sections of third rail, with a consequent short circuit and tie up.

It must not be forgotten that a third rail on its supports is bound to leak a certain amount, varying with the weather conditions, and that dirt is likely to accumulate on the insulator. Consequently we have the condition of a current passing through a joint in metals which was never intended to carry current, and this means electrolytic corrosion. It is a noticeable fact that third-rail insulator clamps deteriorate much more rapidly than ordinary iron work. This necessitates two things. First, the clamps must be made strong and of much more liberal dimension than would be necessary from a mechanical standpoint alone; and, second, they must be made adjustable so that they can be taken up as they rust away. The lag bolts securing the third rail to a tie or other support must be also liberally dimensioned for the same reason. A ½-in. lag bolt securing the third-rail insulator will rust out or corrode far more rapidly than the ½-in. spike holding down a service rail and driven into the same tie.

The sleet and snow problems which have so recently and formidably come to the notice of third-rail engineers will undoubtedly demand that heavier pressure be used on the third rail, either by heavy substantial cleaning devices or by the shoe itself. Ice adheres very strongly to the third rail, and pressure devices to remove it must be correspondingly heavy, in fact, sufficiently so to dismount readily a third rail installed in the careless manner already referred to. The overhead trolley had its season of insecurity in the early days, and good engineering construction has reduced the danger of accident to a minimum. It should seem that a repetition of history is unnecessary here. There are enough well installed third-rail systems in existence to preclude the necessity of installing any more that are unsatisfactory. The difference in cost is an amount so small that it need not enter into the consideration. The third-rail system is comparatively new, at least commercially, and its beneficial results on electric traction are only beginning to be appreciated. It would be a pity, therefore, that it should be prejudiced by poor construction when the troubles that have arisen have been so thoroughly practically demonstrated and ought to be known to every third-rail engineer.

Strikes and Remedies

The present season has been unusually prolific of strikes on street railway systems, with the usual accompaniment of violence and rioting, abuse and mutual recrimination. And while, as usual, the question of wages has been rampant, that of formal recognition of the unions has been exceptionally prominent. Now, these two phases of the matter stand on entirely different planes, both as regards the parties concerned and the public, which is the chief sufferer by strikes on railways. In the ordinary line of strikes in manufacturing establishments the public is not inclined to take sides with either of the participants, but is disposed to invoke a plague on both their houses and to leave them to fight it out. But in a railway strike the public suffers from the deprivation of its customary means of transportation, and resents it as a personal injury, which, in fact, it is.

Strikes arise from a great variety of causes, good, bad and mostly indifferent, and each has in general to be settled upon its merits. In the case of a public service corporation, where the interests of the community are immediately and deeply touched, public influence ought to be and generally is brought to bear to effect a prompt and fair settlement of the existing differences. But what we wish here to point out is that as regards the rights and interests of the public, strikes for higher wages and strikes for recognition of the union must not be regarded as in the same category. The former is, of course, inconvenient and to be regretted, but the latter involves grave considerations of public safety and is of fundamental importance.

As to the mere matter of wages each community quickly comes to realize the rights of the issue and throws the weight of its influence to one side or the other, generally with effect. The question of generally adequate or inadequate wages is something which is within the knowledge and comprehension of any community. As a matter of fact the average wages paid to a regular motorman or conductor is nearly or quite as great an amount as the salary of the average minister of the Gospel, even supposing that he gets his salary paid promptly and in full. This may or may not correctly evaluate the judgment of the community as to the relative importance of these functionaries, but it is the condition which exists. On the whole, also, the pay of street railway men tends upward rather than downward, and inadequacies may fairly be supposed to be in a way to right itself. Many companies have voluntarily raised the pay of their employees, and still more have shown a disposition to meet fairly any question of pay which may arise. It is, of course, unfortunate if any strike arises over the wage question alone, and to the credit of both parties such strikes are becoming rather unusual. In most strikes the wage question is mixed with other issues, and on these latter the real disagreement occurs. The matter of hours of labor is one that often comes to the front, but it can generally be settled on a reasonable basis without protracted delays. Here, too, the common sense of the community is a powerful influence for good, which at once makes itself felt. Unless strikers estrange the public by acts of violence and unreasonable obduracy they can usually be assured of fair play, and, in our opinion, they generally get quite all the sympathy they deserve.

But the recognition of the union is a very different matter from those just considered. It may mean more or less, but it always means danger. If the issue were merely whether the officers of the road were or were not to deal with certain of their employees as representing the rest, little trouble would arise. A few fanatics might stick from sheer stubbornness at

even this, but on the whole it makes no difference whether motormen 465, 281 and 342 serve as a committee, elected in a mass-meeting or as a standing committee of the union. This is not, however, the real point at stake, but rather the recognition of the right of employees to interfere at will in the management of the road. In this respect the recognition of the union on a street railway differs essentially from a similar recognition on the part of a private corporation. In the latter case only the parties immediately involved are really concerned in the result, while in the former discipline is absolutely necessary to effective and safe public service, and the community should see to it that discipline is rigorously maintained. We hold that the officers of a public service corporation have no moral right to enter into any convention with their employees whereby the power to enforce effective discipline shall be eliminated. The corporation is the legal body which must be held responsible for the evil effects of loose discipline, and the community has a right to demand that it must hold the powers for the proper exercise of which it is responsible. The public probably does not care whether the employees of a street railway belong to a union or not, but it does care whether incompetent and irresponsible servants are entrusted with its safety. The principle here involved is the same that would come to the front if the working force of a steamship could strike for the reinstatement of a drunken engineer who chanced to be the secretary of their union. On the sea striking is mutiny, and is punished because it imperils the safety of the ship. On land the perils from acts of insubordination are less, and less strictness is necessary, but the point at issue is the same. Whatever relations may be established by mutual consent between the employer and the union those relations must not implicitly or explicitly infringe the power of the company to hold its men rigidly in the line of duty.

The Logic of Give and Take

This season the voice of the kicker seems to be raised in the land with unusual frequency. Street railways have been assaulted on all sorts of grounds, good, bad and indifferent, until the manager wonders, when he goes down to his office, what new attack the day will bring forth. Questions of service seem most in evidence, with fares a good second, while that mysterious and intangible thing—congestion—is always with us. Now, there is one phase of the good service question which we propose to discuss, as it plays an important part in the accommodations possible in a given community. All the suburbs of a city, big or little, expect to receive first-class service back and forth at the price of a single fare. Generally they are in a fair way to get it, but how often, in case of difficulty, are they willing to meet the street railway company half way? It is a very common thing to find a single street railway line starting from its urban center and passing successively through several distinct municipalities or towns, but it is very unusual to find each of these communities willing to join with the others in the provisions that make for good service. On the contrary it often happens that one of the nearer districts will interpose all sorts of obstructive measures to lines which are not exclusively devoted to its benefit. The community will howl for more cars with most delightful unanimity, but when a proposition is made to let through new tracks, which reach the outlying communities, the trouble begins.

In theory everybody wants more accommodations—in practice he wants them on the other fellow's street. As a result everybody is inconvenienced. We call to mind numerous instances in which an obstructive community, by severe limitations of speed or by refusal to grant necessary locations, has blocked rapid transit for itself and its neighbors for years. We have some sympathy with the residents on a fine, aristocratic street who wish to keep street railway tracks out of their way, but this is, or ought to be, a democratic country, and as a matter of fact the fine aristocratic street is the very one through which tracks can be run with the greatest convenience and safety. Do not the very people who thus object lead the van when it comes to protests against crowded cars, and denunciation of the street railways for accidents that happen in the crowded and narrow streets of the poorer quarters?

In suburban railway work one of the most important things is easy entrance by various routes to the city proper. If the outer suburbs are to be properly served there must be an increased number of tracks through the inner suburbs or congestion will certainly occur in spite of the best efforts on the part of the railway company to prevent it. Yet the inner suburbs are the very ones that most loudly protest when new locations are asked, and thereby force an abnormal number of cars upon a few lines of track. Traffic comes into a city as it were along the streets of a fan, and trouble begins as the handle is approached. If a street railway expert could start in afresh and lay out the suburban system with a free hand, he could in almost every instance effect immense improvements in the facilities for transportation in every part of the district served, but local authorities are constantly interposing to block the game.

Another fine instance of cold-blooded selfishness and attempted class legislation is to be found in the present agitation for higher legal speeds for automobiles. We have not kept, by any means, complete statistics on the subject, but from the information at hand we venture to say that in proportion to the number of vehicles automobiles cause ten times as many accidents as street cars, even at the present speeds. It is doubtless true that an automobile can be turned out of the way or stopped with a facility that is denied to street cars, but that only makes accidents the more inexcusable. So long as automobiles are relatively few and to a large extent private vehicles, street railways have few complaints to make, but would public automobiles be denied a rate of speed legalized for private ones?

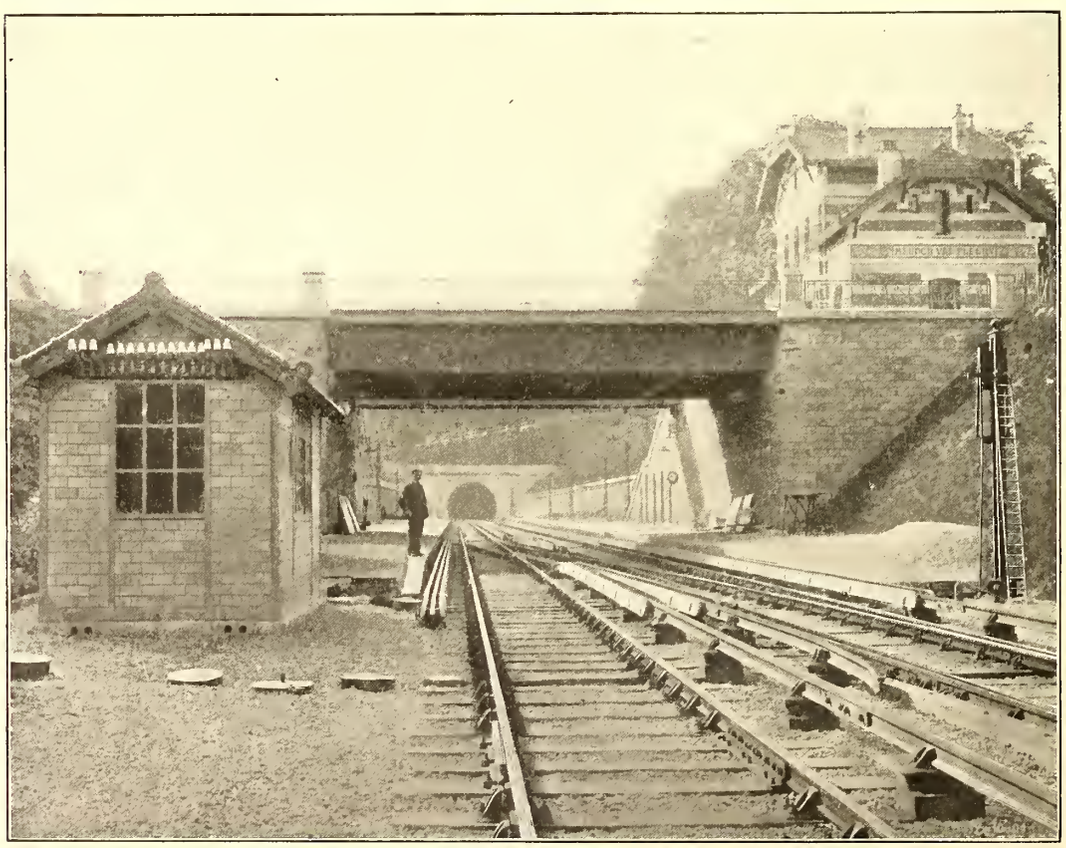
Suppose that the Suburban Automobile Company, Ltd., should be organized for general public service, as is by no means improbable in many cities. Would it be allowed practically unrestrained speed while the street railways were held down to the old limit? The efforts now being made tend in that direction, and if not checked they will certainly lead to disaster. Public safety must be considered whatever the nature of the vehicles that may endanger it, and sauce for the goose ought to be sauce for the gander as well. Until it has been proved that the alleged advantages of automobiles in the matter of safety have a real existence, in spite of the weight of evidence to the contrary, the speed of such vehicles should be rigorously held down to street car limits. An additional reason for such action is to be found in the fact that in a street car accident the responsibility can be quickly located, while the automobile frequently puts on speed and escapes, leaving its victim to be picked up by the ambulance. We have nothing against the automobile as such, but we want to see fair play.

The public expects, and rightfully, that street railway companies will do their best to give good and adequate service, but it ought to be ready to meet them half way, to lend a hand in overcoming the difficulties that may exist, and to assume an attitude of helpfulness instead of getting in the way of improvements. It should give as well as take, and display some of the altruistic tendencies that it is so ready to demand.

THE ELECTRIC LOCOMOTIVES ON THE WESTERN RAILWAY OF FRANCE

A short description was published in this paper about two months ago of the experiments which have been made during the past year on the Paris-Versailles division of the Western Railway of France, and also of the multiple-unit trains at present in use between Paris and Versailles. As the Paris terminal of this line is in the main Invalides station of the company, which is also a steam railroad station, it was only natural that the company should favor the operation of trains by electric locomotives rather than by the multiple-unit system, and should have endeavored to keep the character of the passenger cars of its electric trains as uniform as possible with those used on the steam trains. For this reason the original contract for the electrical equipment of the Versailles division was for locomotives and was given to the Société Anonyme de Locomotion Electrique, of Paris.

ELECTRIC LOCOMOTIVE AND TRAIN ON THE PARIS-VERSAILLES LINE



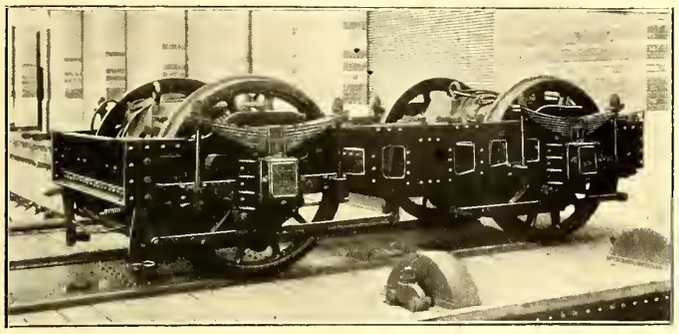
THIRD-RAIL CONSTRUCTION AT A WAY STATION

As stated in the previous articles these locomotives, of which ten were built, possessed a number of very novel features. Through the courtesy of the manufacturers this paper is enabled in this issue to present views and particulars of these machines.

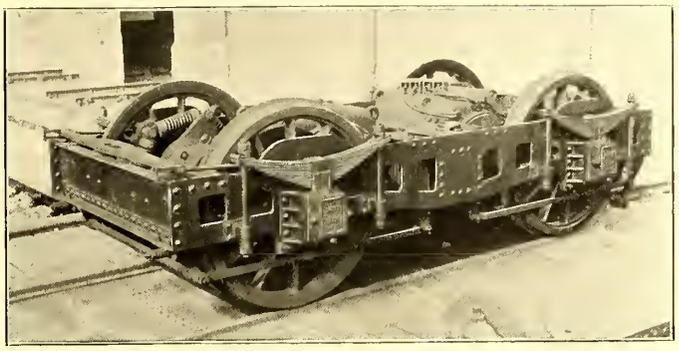
The general conditions on the Paris-Versailles line are as follows: The line is 18 km (11 miles) in length, with double track, and has a maximum grade of 1 per cent. On this grade the locomotives, supplied with direct-current at 550 volts, were to be powerful enough to draw at a speed of 50 km (31 miles) per hour a train of 200 tonnes (440,000 lbs.), or on a level track the same train at 100 km (62 miles) per hour.

In France the railway law compels all passenger trains to include one baggage car, which must be in front of the passenger cars. The Société Anonyme de Locomotion Electrique

adopted the idea of using the locomotive as a baggage car, in this way utilizing the weight of the baggage carried for traction. The ten locomotives have, therefore, been built with a central compartment for baggage, while each end was reserved for the motorman, so that the locomotive could be operated from either end. The car body between bumpers has a length of 13 m (42 ft. 7½ ins.), and is built of wood sheathed with iron. It is mounted on two double trucks, each with a wheel base of 2.6 m (8 ft. 6 ins.), and a distance between axles of 7 m (23 ft.). The wheels are 1.31 m (44 ins.) in diameter.

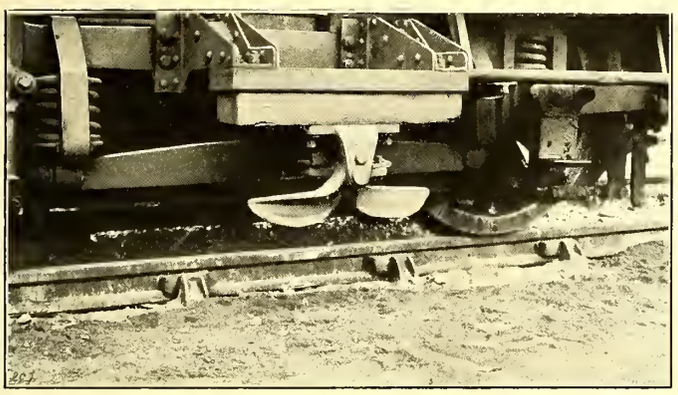


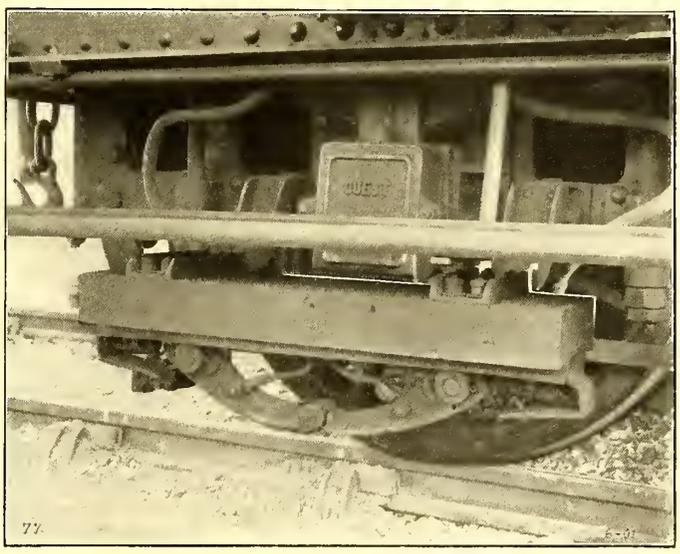
TRUCK WITH GEARLESS MOTORS



TRUCK WITH GEARED MOTORS

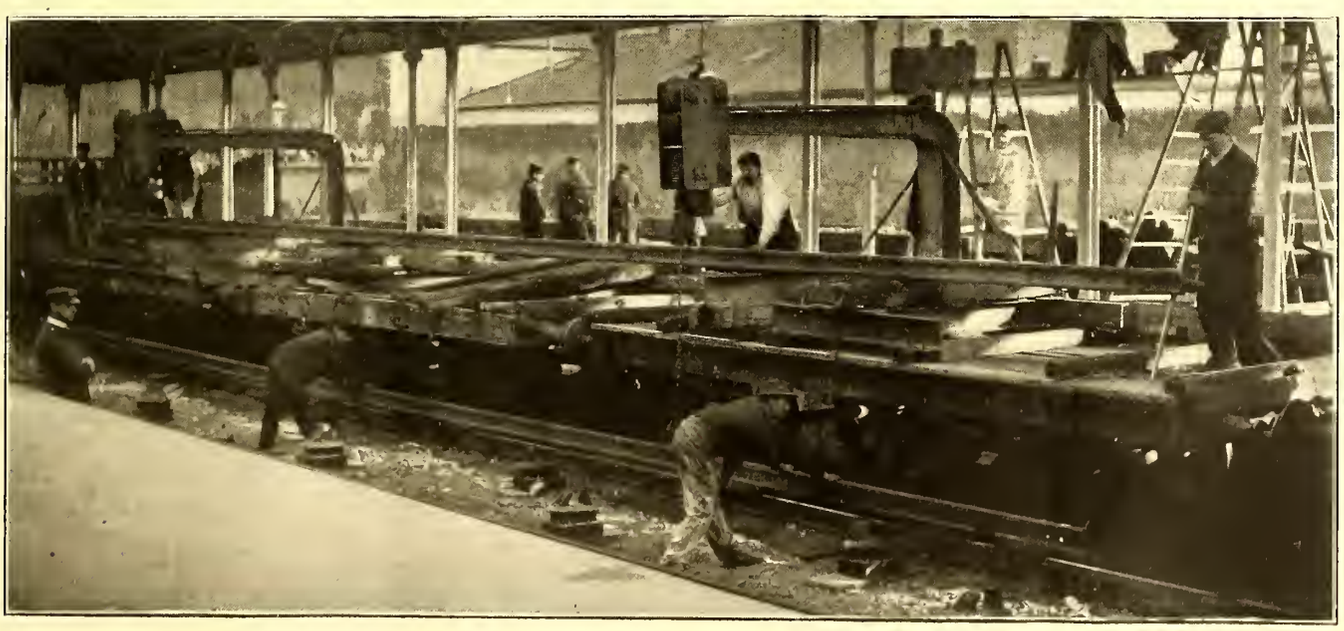
Six locomotives are equipped with gearless motors and four with single-reduction motors. In both cases four motors were used. The methods of mounting the motors, however, are interesting. One of the principal arguments brought against the use of electric locomotives on this line was the destruction which the dead-weight of the motors on the axles might cause to the track at the high speeds (for instance, 62 miles per hour) for which the locomotives were designed. The fact that street railway cars at low speeds do undoubtedly pound a track badly is well known, and it was not without considerable reason that the greater destructive effect of these heavy locomotives at the speed selected was viewed with considerable trepidation by the engineers. The company, therefore, decided flexibly to suspend all motors, whether used with or without gears. The mechanical arrangement adopted was as follows:





TWO TYPES OF THIRD-RAIL SHOES USED ON PARIS-VERSAILLES LINE

The gearless motors were mounted directly on a hollow



METHOD OF LAYING THIRD RAIL

shaft, the interior diameter of which was considerably larger than the axle, and which was slipped over the axle. Power is transmitted from the motor to each wheel through six coil springs, which are connected at each end respectively to a triangular plate crank at the ends of the hollow shaft and to three bosses cast on the wheels between the spokes. This method of securing elastic suspension of the motor has been adopted before in the case of gearless motors, but its application to geared motors as well is novel, so far as is known.

The gearless motors have six poles and have a normal effort of 600 kg per motor at the periphery of the wheels at a speed of 530 r. p. m., and a maximum effort of 1500 kg. The geared motors have four poles and a ratio of reduction of 1 to 3, and are mounted on a hollow shaft like the gearless motors. Both are operated on the series-parallel system.

The third-rail system, as employed, has already been described. The joints are bonded by two protected copper bonds at each joint, having a total cross section of 600 sq. mm. The rail itself is supported in iron chairs, which maintain the top of the third rail a distance of 600 mm (23½ ins.) from that of the service rail and 200 mm (8 ins.) above it. The chairs are similar in general style to those used in standard railroad construction in France, and are composed of a casting which embraces the base of the rail and extends half-way up the web. The rail is held in place in this chair by means of steel springs. The springs used on the third rail are, however, less strong than those used on ordinary track. The chairs are mounted on wooden insulators, to which they are held by lag screws. The base of the chair is made broad enough to extend on the top of the wooden insulator so as to shed the water from it. The third rail is protected at certain points where there is danger of accidental contact by two wooden guards and is painted red as a danger signal. The third rail itself weighs 46.250 kg per meter (92½ lbs. per yard).

SECTION OF THIRD RAIL AT CHAMPS DE-MARS STATION, SHOWING DOUBLE INCLINE, ALSO METHOD OF RETURN-CIRCUIT BONDING

The construction train for laying the third rail is illustrated in one of the accompanying engravings. Three ordinary gondola cars were coupled together to make the length necessary for transporting the 18-m rails. On each end car was a U-shaped crane. On the top member of this crane was the traveling hand-hoist illustrated in the cut. By means of these hoists the rails were lifted from the cars and lowered into position in the chairs.

The International Railway Company, of Buffalo, has adopted a novel form of service stripe for its men. Each year of service is shown by a small bar on the cuff of the coat, five-year periods being indicated by stars. The bars are less than an inch long and about a quarter of an inch wide, the stars being of corresponding dimensions. For example, an employee who has served, say, seven years, would have one star and two bars.

CAR DESPATCHING BY TELEPHONE IN BUFFALO

The International Railway Company, of Buffalo, N. Y., has recently approved plans for an extensive system of telephones to be installed on all of its city and interurban lines. This system will comprise some 250 individual instruments distributed throughout the system, as shown in the accompanying diagram of the circuits. Up to the present time the despatching has been done by a joint system of telephone and telegraph, although the latter instruments have been used almost entirely on the interurban lines. The general manager of the company, T. E. Mitten, has had considerable experience with the telephone as a despatching medium, and it has been decided, on account of his previous success with the system, to do away entirely with the telegraph instruments and in future depend upon the telephones exclusively. For example, the interurban lines from Buffalo through Lockport to Olcott Beach is a single-track line, 37 miles in length, and a telephone will be placed at every turn-out as well as in some cases between turn-outs. This will require twenty-five despatching telephones on this circuit alone, which means a telephone on an average of every mile and a half. Compared with the telegraph system, with which it would be necessary to have telegraph despatchers at every point where an instrument was placed, the great advantages of the telephone is immediately apparent.

The telephone instruments will be contained in specially designed boxes attached to the poles of the company. These instruments are of the combination receiver and transmitter type, in which the receiver and transmitter are connected by a handle so that the entire instrument is removed from the box when in use, the cord by which it is held being long enough to enable the employee using the 'phone to stand in a comfortable position while talking, no matter what his height may be. The box is just large enough to contain the instrument and cannot be closed unless the instrument has been returned to it. The cord while in use is under tension, so that in returning the instrument to the box the slack is taken up and it is impossible to get it entangled in any of the fixtures. The boxes are, of course, provided with an efficient inside spring lock, all the locks being similar, and all trainmen and other employees who may have occasion to use the instruments are provided with a key.

The accompanying diagram shows the general lay-out of the proposed system, although slight changes may be made in the details before it is installed. The system will be put in by the Bell Telephone Company of Buffalo, which will have entire charge of the maintenance of the lines and instruments. As will be seen from the diagram there are two switchboards in the main office of the company at Buffalo, a despatching board and a private branch exchange, or "commercial" board, as it will be designated. The despatching board connects with the interurban lines alone while the exchange connects directly with the city lines and all lines on the private system. Five trunk lines to the "Seneca" telephone exchange, in Buffalo, are shown in the diagram, but if these are found insufficient the telephone company will supply as many additional as are necessary. The circles shown on the diagonals of the octagon, which represents the railway's private branch exchange, indicate the various desk 'phones of the company's offices. The private branch exchange is an ordinary Bell telephone switchboard working on the common battery system and containing the usual complement of plugs, cam switches, etc. The despatching board will be placed over a large table upon which the despatching sheet can be placed for entries showing the day's run. During the day time there will be two operators, one at the exchange

and one at the despatching board, but at night but one operator will be necessary for both purposes. The circuits from the despatching board, as will be seen, are carried through directly to the exchange board, so that they can be operated from either position, and at night the single operator has to give his attention to but one board.

In the diagram the plain circles shown on the lines represent telephone stations that have no call bell, while the double circles show stations that can be called from the main office. There are two branch exchanges connected to the system and in charge of separate operators, one at Niagara Falls and one at Lockport. These exchanges are both connected by trunk lines to the Bell telephone exchange in their respective towns, and both are connected with the main office of the railway company by two telephone circuits. This gives practically, counting

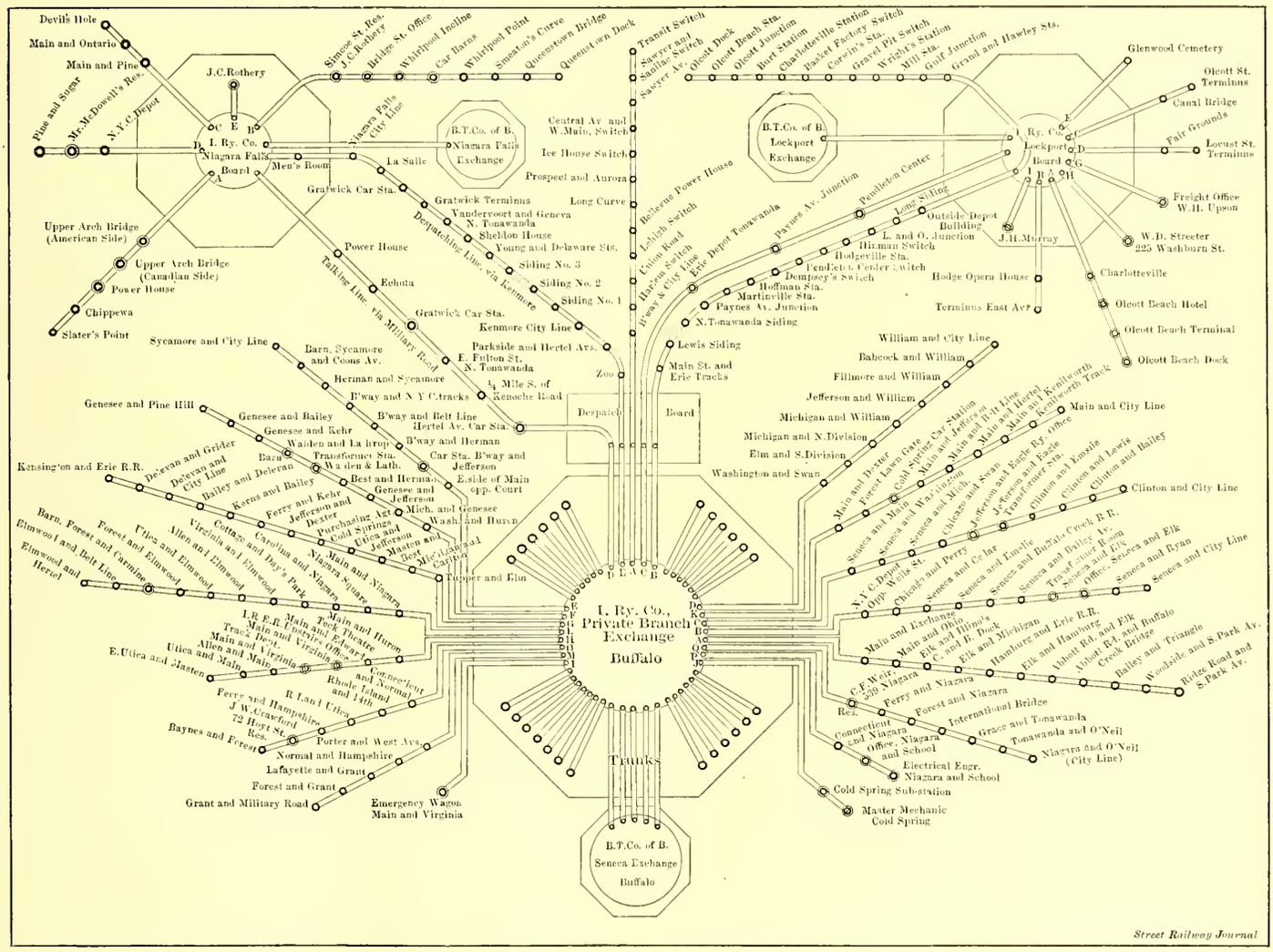


DIAGRAM OF BUFFALO TELEPHONE CIRCUITS

the connections through the Bell telephone trunks, three distinct circuits between the main office and the two branch exchanges.

The great advantage of having such a number of "one-way" telephones will be readily appreciated. No matter on what portion of the line a car may be the conductor is able, in case of accident either to his car equipment or from collision, to immediately transmit the details of the trouble to the despatcher or any other official of the company. In case of an accident to a passenger, pedestrian or driver, the conductor can in this way be immediately put in communication with the claim department, which thus not only gets the very earliest authentic statement of the case, but can have its investigators at the scene as soon or sooner than irresponsible or dishonest parties have attempted to obtain evidence to be used in damage claims against the railway. In many cases, furthermore, the company will undoubtedly be able to settle for a few dollars on the spot small injuries which might, if taken into court, cost the company many times their true value.

The system to be adopted in despatching interurban cars is as follows: The motorman goes to the telephone, which, as soon as removed from the hook places him in communication with the despatcher in the main office. He receives his order from the despatcher, repeats it to the conductor, who copies it in a manifolding book. The conductor then steps to the 'phone and repeats the order, note of which is made by the despatcher, who marks it "O. K." In this way each member of the crew has a copy of the order, and the despatcher has a record of it as well, so that should any trouble occur on the line the officials will be able to locate the guilty employee indisputably. The Lockport line, as stated above, has twenty-five despatching telephones, the Buffalo & Niagara Falls line has a double-track line 20 miles in length, and has fourteen despatching 'phones as well as a separate circuit for talking containing a few more. The Buffalo, Bellevue & Lancaster line is a single-track line, 14 miles in length, and has twelve despatching 'phones. The results obtained by the telephone system will be watched with considerable interest, as both city, suburban and interurban lines are united in the International Railway, thus affording an exceptional opportunity of testing telephone despatching on all classes of service.

The secretary of the American Institute of Electrical Engineers has just issued a new catalogue of members of the Institute. It contains 1763 names.

MULTIPLE-UNIT TRAINS FOR BUFFALO INTERURBAN SERVICE

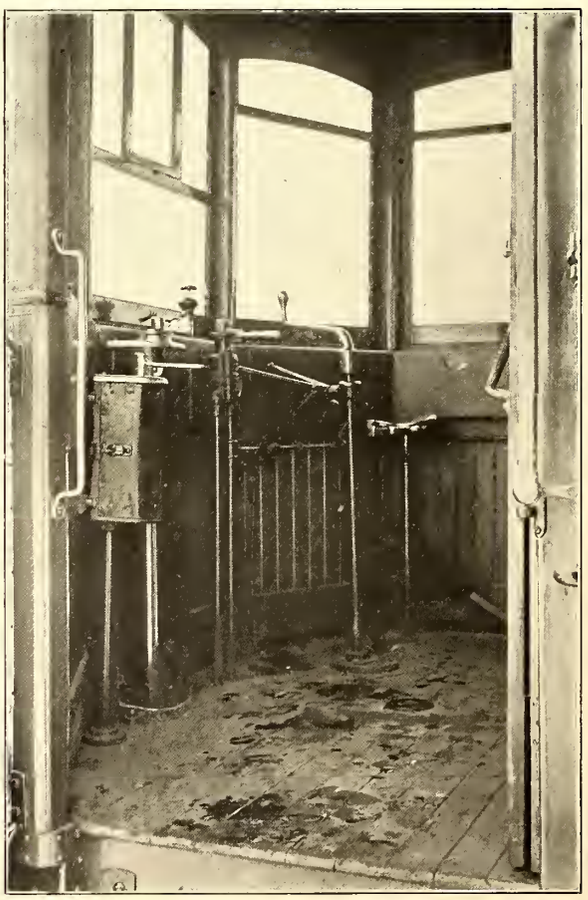
It is the intention of the International Railway Company to operate trains on its interurban lines next summer instead of the single cars, which are now used for this service. With this object in view the present interurban equipment is being changed to multiple-unit control, and trial runs have already been made with cars upon which the new system has been installed. The accompanying illustration shows a view of a two-car train which has been given several severe tests on the Lockport branch, and has proved so satisfactory in its operation that the equipping of the remaining interurban cars of this type is being pushed in the shops of the company as rapidly as possible. It is expected, therefore, that by early spring the entire interurban equipment may be operated in trains, if it is so desired. The electrical control system used is furnished by the General Electric Company, and is a modification of the multiple unit control as installed on the Manhattan (Elevated) Railway in New York, which has been described previously in these pages. This system, it will be remembered, consists of a master controller at each end of each car. The circuits controlled by this master controller operate by means of solenoids a series of contact makers or "contactors," which close and open the various motor circuits, thus making the different motor combinations required in the ordinary series-parallel control. By means of coupling cables between the cars the master control circuits are connected throughout the train, and the operation of any one of the master controllers energizes the sets of contactors of all the cars and places all the motors on the train in circuit under the same conditions.

MULTIPLE-UNIT TRAIN IN BUFFALO

The modification mentioned above consists of an auxiliary commutator switch, shown at the left of the master controller in the view of the car platform, which produces different combinations of the motors for a given position of the handle of the master controller. The service being a combined city and interurban one, this commutator has been introduced so that the motorman can operate his master controller in practically the same manner in both his city runs and his interurban runs, but giving him on his last point two distinct speeds. Designating the four motors of which the equipment consists as Nos. 1 to 4, when the commutating switch is on the slow position the series points of the controller give the four motors in series, and the parallel points give No. 1 and No. 3 in series, No. 2 and No. 4 in series and the two pairs in parallel. With the commutator switch handle in the fast position the series points give No. 1 and No. 3 in parallel, No. 2 and No. 4 in parallel and these two pairs in series. The parallel points of the master controller under these conditions give all four motors in parallel. In the Buffalo equipment a special handle may be provided, which prevents the controller from going beyond the first five or six notches in city work. If this device is used the commutating switch is, of course, not necessary, and the control is practically a rheostatic one, with two sets of paralleled motors in series. An inspector at the city line will change the controller handle and render it impossible for the motorman to operate his train at a dangerous speed. At present, however, the commutating switch is being thoroughly tested. There is a large cylinder cut-out switch placed under the seats within the car, which enables any set of motors to be cut out of circuit in case of accident, but this switch, of course, is entirely independent of the commutator switch referred to above.

The air-brake equipment of the cars has been supplied by the Christensen Engineering Company, of Milwaukee. The equipment consists of motor-driven compressors on each car, engineer's valves, brake cylinders, etc, and the special governor designed especially for multiple-unit control systems. With the exception of this governor the Christensen apparatus is of the standard type. The air-brake equipment operates in the same manner as the electrical control, that is, the motorman has each car of his train under complete control from the front platform of the first car, although the train may be broken up and the cars recoupled in any order desired.

An interesting feature in connection with the compressed-air service is the use of whistles on the trolley catcher. The Malloy trolley catcher is employed on all of the large cars. This device consists of an extremely strong spring contained in a long iron tube attached to the back platform. In case the trolley wheel leaves the wire and starts to fly up the cord is immediately gripped, the spring released and the trolley pole hauled down out of harm's way. In single car operation, of course, the motorman knows immediately that his power is off when the trolley wheel leaves the wire, but in train operation



INTERIOR OF VESTIBULE

an accident of this kind to one trolley wheel alone may not be noticed at the controller. For this reason a whistle, operated by compressed air, has been attached to each trolley catcher, and in case the spring of the trolley catcher is released, the whistle blows a continuous blast until attention is paid to it. Another device made necessary by the change in conditions resulting from train operation is what might be called a multiple-unit signal bell. It was not thought safe to operate the cars by means of the ordinary signal bells, passing the signal from one car to the next, as if the conductor of the forward car should be within his car it would be almost impossible to hear the bell in the vestibule of the car behind. Master Mechanic John Millar has designed an ingenious method of overcoming this difficulty. The clapper of the overhead signal bell is insulated and attached to one side of the electrical call-bell circuit of the forward car, the other side of the circuit being connected to a sliding pin, which is placed between the clapper and the bell. The circuit of the call bell in the forward car is, therefore, completed when the bell-cord of the rear car is pulled, and if the cord is held down a continuous ringing is produced in the forward car. Flexible cord conductors between the hoods of the cars carry this bell circuit. The circuits for the electrical control and air-brakes cross from dash to dash, as shown in the illustration of the two cars. The peculiar shaped article at the right of this picture, it may be stated, has nothing to do with the railway apparatus, but is one of the Buffalo city hydrants enclosed in straw and covered by an iron casing to prevent freezing.

General Manager T. E. Mitten has given a great deal of attention to the handling of large crowds. The excellent service given during the Pan-American Exposition will long be taken as an example of what can be done under extraordinary circumstances, but he is now devoting his energies to securing a more perfect service on his regular operation for both city and interurban lines. The running of multiple unit trains on the high-speed service next summer will greatly improve the operating facilities and will give a marked increase to the carrying capacities of these branches of the system.

ADVERTISING AT ROCKFORD

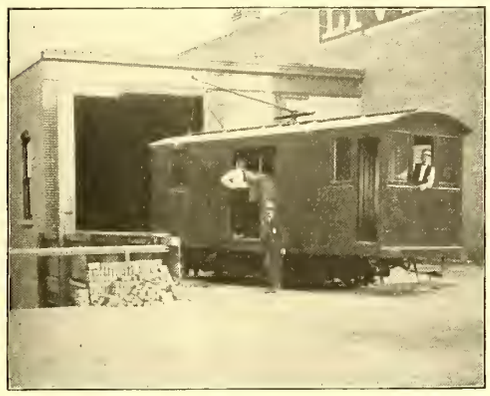
The Rockford & Interurban Railway, which is a consolidation of the city lines in Rockford and the interurban line between Rockford and Belvidere, is being well advertised through the efforts of J. H. Groneman, its passenger and express agent. This advertising matter covers not only resorts on the line but the express and parcel business.

It would be impossible to reproduce all of the circulars which have been issued by this company, but the following invitation to visit the principal park of the company will give an idea of the character of the literature published:

Where shall we go? How to get there? Anticipating these inquiries the passenger department of the Rockford & Belvidere Electric Railway Company have issued this small folder giving a part of such information and hope you will read it with care.

The picnic season is again before us, and anticipated with delight, enjoyment and keen relish by the toiler in the crowded city be they business or professional men, clerks, teachers or children at school—all looking forward to a trip in the country; a pleasure to the tired woman upon whom the demands of social life are unremitting—the mother wearied with her household duties.

Nature has scattered her gifts under the canopy of heaven and adjacent to the cities of Rockford and Belvidere, which can be reached by the Rockford & Belvidere Electric Railway line. It has become a difficult part to select a site for picnic and outing parties with good water, tables and ample seating capacity. But we think you will agree with us that we have found a convenient



SUPPLY CAR FOR PARK SERVICE

spot located midway between Rockford and Belvidere, with a fast electric car service. The Rockford & Belvidere Electric Railway Company is now in a position to offer the churches, Sunday-schools and lodges a picnic ground free of charge.

Many of you have often heard the remark, "Oh, if I could only get out in the woods for a day's recreation, how much I would enjoy myself, and would I not be benefited in health?"

Health, recreation and enjoyment, three of the essentials of life, all produced by an outing spent in Washington Park, reached by the Rockford & Belvidere Electric Railway Company.

Don't be selfish. Induce some of your near friends to add to their health and enjoyment and share with you in Nature's remedies for the depression of life's cares.

Information regarding special rates and cars for private outing parties, church and Sunday-school picnics, club and lodge gatherings, can be had by inquiring of Rockford & Belvidere Electric Railway Company.

Special arrangements can be made for outing parties, private parties, church picnics, club gatherings and lodge assemblies. Washington Park is the ideal place, and is easily reached by a delightful ride on the Rockford & Belvidere Electric Railway.

Special cars will run at any hour from any point to any desired place on the line of the Rockford & Belvidere Electric Railway.

The circular is illustrated by the three engravings accompany this article. In addition, the first of the year, calendars were issued advertising the passenger and express service. One of the half-tone engravings used on the calendar is of an express car leaving the Rockford depot.

VIEWS IN ROCKFORD PARKS, TAKEN FROM PARK CIRCULAR

THE PERFORMANCE OF THE DAYTON & TROY ELECTRIC RAILWAY POWER HOUSE

Although alternating-current transmission to rotary converter sub-stations is now becoming very common for the supply of electrical energy to interurban roads, there still remains a large number of moderate-sized interurban properties on which the installation of an alternating-current transmission system with rotary converter sub-stations would involve too great operating expenses as well as first cost. It is of practical interest, therefore, to inquire into the economy of direct-current power houses supplying boosters for feeding the distant portions of the line, because figures of this kind throw light on the question of where the booster system of feeding can best be used and where the alternating-current transmission is best adapted.

The power house of the Dayton & Troy Electric Railway Company, at Tippecanoe City, Ohio, may be cited as an example. Sargent & Lundy, who were the consulting engineers for this road, decided upon a direct-current power house with booster feed as most suitable to the length of line which this company had to operate, and the results of the operation of this power house seem to show the correctness of this view. For the month of October, 1902, the total output was 173,700-kw hours. The following table shows the total operating cost, and also the several items that go toward making up this amount. The operating figures in this article were furnished by H. P. Clegg, general manager of the company, and William E. Rolston, chief engineer:

PERFORMANCE OF PLANT FOR OCTOBER, 1902

	Total	Per kw-hour
Fuel	$914.45	$0.00526
Labor	435.00	.00250
Depreciation at $3.00 per day	93.00	.00053
Oil, water, waste, repairs and supplies	92.55	.00052
Total	$1,535.00	$0.00883

The supplies are figured at one-third of the amount spent in three months.

The fuel used during this month varied, because of the difficulty of getting enough coal from any one source, the regular coal contractor being unable to supply enough to keep the stations going. The fuel used during October was supplied from the following sources:

Hall's run of mine, 229 tons, at $1.95	$466.55
Hall's slack, 166 tons, at $1.05	273.90
Jackson mine run, 46 tons, at $3.00	138.00
Jackson nut and slack, 28 tons, at $2.00	56.00
Total fuel bill as shown before	$914.45

ASH IN COAL

The amount of ash from some of this coal is very large, because of the presence of slate, stone and fire-clay in the coal. The percentage of ash fuels is as follows:

	Per cent
Hall's run of mine	31
Hall's slack	52
Jackson run of mine	9
Jackson nut and slack	12

Considering the high price paid for some of the fuel and its low heating value, because of the high percentage of ash, the performance of the installation is certainly very good, and ranks well along with larger plants. Following are some further figures on the October, 1902, performance:

Cost per day of power-station operation	$49.51
Car mileage of three city cars in Piqua	16,740
Estimated kw-hours per car-mile of the above cars	1.5
Interurban car mileage, including freight	47,120
Kw-hours per interurban car-mile	3.15

The latter figure is based on the assumption that the estimate of 1.5-kw hours per car mile for the three city cars is correct.

Interurban cars are 49 ft. 5 ins. in length over all. These are Barney & Smith's cars, mounted on class J trucks of the same make, with 36-in. steel-tired wheels. Each car is equipped with four 75-hp Westinghouse No. 76 motors, with a gear ratio of 24 to 58. They are guaranteed to develop a tractive effort of not less than 200 lbs. on 36-in. wheels, at 40 miles per hour, with a rise in temperature not to exceed 60 degs. C. above the surrounding air. The three city cars in Piqua are equipped with two 25-hp motors each.

TYPICAL DAILY REPORTS

To show performance under various conditions the following figures are taken from power house reports of different dates:

June 6, 1902:

Total kw-hours	4,500
Total cost, power-house operation	$40.00
Total cost per kw-hour	.0088
Interurban cars in operation	5
Mileage of each car	345
Total car-miles	1,725
Kw-hours per car-mile	2.6
Number of hours operated	19
Average coal per hp-hour	4.5
Coal consumed	13 tons
Number of men employed	6
Coal used, Hall's run of mine	30 per cent ash

June 26, 1902:

Kw-hours	4,300
Total cost, power-house operation	$37.00
Total cost per kw-hour	.0086
Interurban cars in operation	5
Total car mileage	964 miles
Kw-hours per car-mile	4.3
Number of hours operated	20
Average coal per hp-hour	4.3 lbs.
Coal consumed	12 tons
Number of men employed	6
Coal used, Hall's run of mine	35 per cent ash

Four of the cars made a mileage of 216.

Sept. 25, 1902:

Kw-hours	7,800
Total cost, power-house operation	$55.00
Total cost per kw-hour	.007
Number of city cars in operation	14
Number of interurban cars in operation	10
Total number of cars in operation	24
Car mileage not known.	
Number of hours operated	20
Average coal per hp-hour	3.4
Coal consumed	18 tons
Number of men employed	7
Coal used, Hall's run of mine	35 per cent ash

This record was made during a fair, and an unusually large number of cars were operated. As mentioned, mileage records were not being kept. The report for this day shows what can be done under conditions of heavy loads, the cost for the day being the lowest per kilowatt-hour that has been noted. The report for the following day, Sept. 26, shows practically the same conditions and the same performance.

The following are samples of more recent daily reports:

Oct. 24, 1902:

Kw-hours	5,500
Total cost, power-house operation	$50.00
Total cost per kw-hour	.009
Interurban cars in operation	5
City cars in operation	3
Interurban car mileage	1,365 miles
City car mileage	540 miles
Total car-miles	1,905
City kw-hours per car-mile (estimated)	1.5
Interurban kw-hours per car-mile	3.4
Number of hours operated	20
Average coal per hp-hours	4.1 lbs.
Coal consumed	15 tons
Number of men employed	8
Coal used, Hall's run of mine	35 per cent ash

Interurban cars on the three longest runs made 400 miles each. As the city lines have not a separate wattmeter the city

cars were assumed to take 1.5-kw hours per car mile, and the balance of the output charged to the interurban cars. The same assumption is made in the following tables:

Oct. 25, 1902:

Kw-hours	5,900
Total cost, power-house operation	$55.00
Total cost per kw-hour	.0093
Interurban cars in operation	6
City cars in operation	3
Interurban car mileage	1,365
City car mileage	540
Total car mileage	2,005
Interurban kw-hours per car-mile	3.4
Estimated kw-hours per car-mile (estimated)	1.5
Number of hours operated	20
Average coal per hp-hour	3.9
Coal consumed	15 tons
Number of men employed	8
Coal used, Jackson nut and slack	12 per cent ash

Oct. 26, 1902:

Kw-hours	5,000
Total cost, power-house operation	$45.00
Total cost per kw-hour	.009
Interurban cars in operation	4
City cars in operation	3
Interurban car mileage	1,300
City car mileage	540
Total car mileage	1,840
Interurban kw-hours per car-mile	3.2
City kw-hours per car-mile (estimated)	1.5
Number of hours operated	20
Average coal per hp-hour	3.6
Coal consumed	12 tons
Number of men employed	8
Coal used, Jackson nut and slack	11 per cent ash

Three of the interurban cars made 400 miles each on this day. The fourth 100 miles.

Oct. 28, 1902:

Kw-hours	6,200
Total cost, power-house operation	$55.00
Total cost per kw-hour	.0089
Interurban cars in operation	6
City cars in operation	3
Mileage of interurban cars	1,465 miles
Mileage of city cars	540 miles
Total car mileage	2,005 miles
Interurban kw-hours per car-mile	3.7
City kw-hours per car-mile (estimated)	1.5
Number of hours operated	20
Average coal per hp-hour	4.3
Coal consumed	18 tons
Number of men employed	8
Coal used, Hall's run of mine	33 per cent ash

Nov. 10, 1902:

Kw-hours	6,000
Total cost, power-house operation	60.00
Total cost per kw-hour	.01
Interurban cars in operation	7
City cars in operation	3
Interurban car mileage	1,565 miles
City car mileage	540 miles
Total car mileage	2,105 miles
Interurban kw-hours per car-mile	3.3
City kw-hours per car-mile (estimated)	1.5
Number of hours operated	20
Average coal per hp-hour	3.28
Coal consumed	13.2 tons
Number of men employed	8
Coal used, Milton lump	2.1 per cent ash
Cost per ton	$3.40

EQUIPMENT

The power house is a brick structure, located near the Cleveland, Hamilton & Dayton Railroad and the Miami Canal. Water is taken from the latter for condensing purposes. A plan and a section through the power house are shown in the drawings reproduced herewith. The power house is equipped with two Buckeye cross-compound condensing engines, 18 ins. and 36 ins. x 36 ins., rated at 625 hp each. The accompanying half-tone shows the interior of the engine room. Each engine is directly connected to a 400-kw, 550-volt Westinghouse generator. For feeding the distant portions of the road there are two 100-kw Westinghouse series boosters, driven directly by motors on the same frames. The engine room is spanned by a Chisholm & Moore hand-power crane.

The boiler equipment consists of four Aultman & Taylor 310-hp water-tube boilers. The balance of the steam equipment consists of two 20-in. and 30-in. x 18-in. Dean Brothers jet condensers; two 7-in. and 4½-in. x 10-in. Stilwell-Bierce feed pumps; two 6-in. and 6-in. x 6-in. Stilwell-Bierce service pumps, one type J 500-hp Stilwell-Bierce heater. The stack is 8 ft. 4 ins., inside diameter, and 175 ft. high above the boiler room floor, and is made of steel with brick base.

GENERAL CHARACTER OF THE ROAD

The road was built in 1901 between Dayton and Troy, Ohio, a distance of 17 miles. Recently the electric line between Troy and Piqua and the city lines in Piqua were purchased, making the total length about 34 miles. The power house is situated at Tippecanoe City, Ohio., 13 miles north of Dayton.

A diagram of the arrangement and length of feeders between Dayton and Troy is shown herewith. This gives an accurate idea of the location of the power house with reference to the road. It will be noted that the longest feeder runs 10½ miles before beginning to feed the trolley line. Another feeder is 6 miles long before feeding into the trolley line. These two feeders are, of course, supplied through a booster. The newly-acquired line from Troy to Piqua is not shown on the diagram, but is fed through a booster. The rest of the road, 6 miles each way from the power house, is fed direct. The feeders are of aluminum.

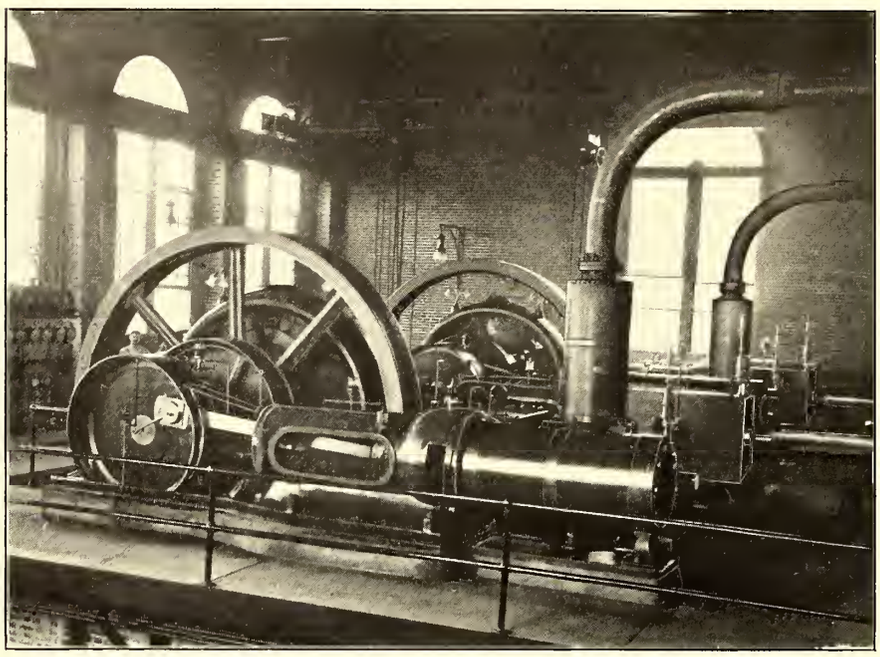
Of course, the loss in transmission with the use of boosters is large, but in a plant of this kind this loss amounts to less in dollars and cents than would the maintenance and losses incurred in rotary converter sub-stations fed by high-tension alternating current. Just what the line losses are in this case has not been determined, but the kilowatt-hours per car mile at the power house are not far from the requirements of interurban roads having similar equipment in the way of rolling stock, supplied through rotary converter sub-stations. The power required per car mile during the time covered by the reports was probably higher than it would be if the track between Troy and Piqua was not under reconstruction. This hindered the cars, as a large portion of the new work was not ballasted. It was necessary to run very slowly there and make up time on other portions of the road. Further than this, the overhead work was not all completed, and the line loss was higher than it would be normally.

To show what the power house is able to do in the way of carrying heavy loads, its performance during the Fair Week at Troy, from Sept. 22 to Sept. 26, is noteworthy. During this week the company had in operation its ten large interurban cars, six city cars borrowed from the Dayton line, and eight M. V. cars. This load was all carried with the two 400-kw generators. The ordinary load is now at about the point where two of the boilers handle it well.

SPECIAL TESTS

At the time of the acceptance of the power house some tests were carried on by Sargent & Lundy, as consulting engineers, both on the engine and the boiler performance. The engines were guaranteed, when working at rated capacity of 625 hp. to consume not more than 15½ lbs. of dry steam per indicated horse-power hour, at 140 lbs. boiler pressure and 26 ins. vacuum; engines working condensing. The dimensions of the engines have been given before. The steam consumption was determined by measuring the water fed to the boiler supplying the engines. The water was measured in two barrels placed on

a raised platform immediately above a tank, from which the boiler feed-pump drew its supply. Each barrel was fitted with a stand pipe, reaching to within 2 ins. or 3 ins. of the rim, passing up through the bottom. The barrels were filled alternately until the water began to overflow down the stand pipe. The boiler used to supply steam to the engines under test was



ENGINE ROOM IN POWER HOUSE

shut off, both on the water and steam piping, from the rest of the plant.

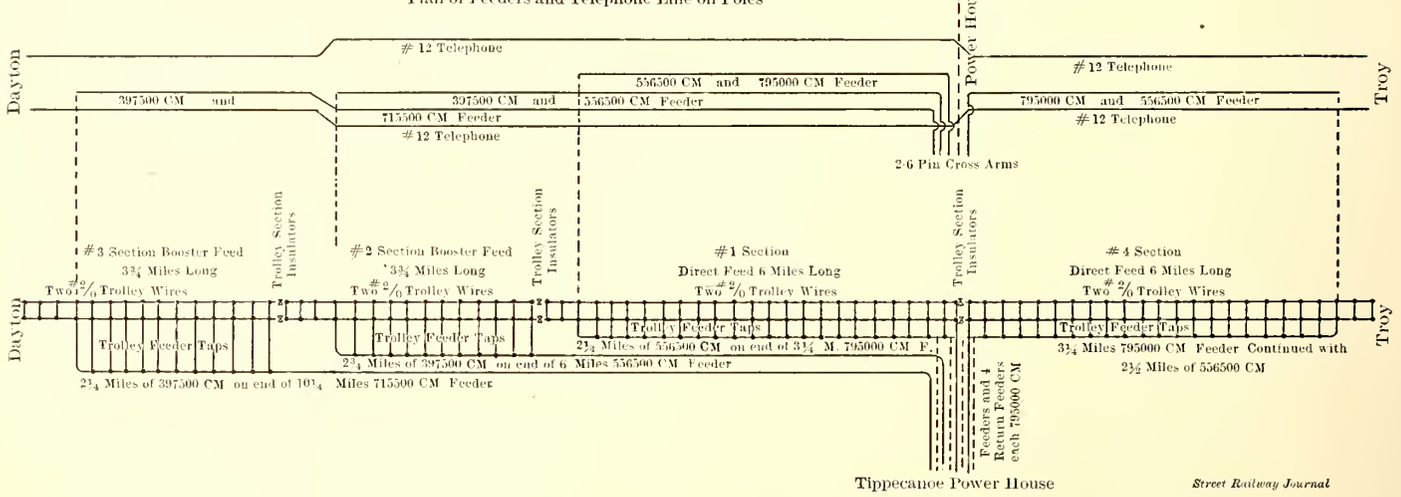
On the conclusion of the main test a careful test was made to determine the amount of leakage, if any, from the system. Steam was carried on the test boiler and also on the boiler supplying the regular load, as nearly as possible at the same pressure as that maintained during the test. After the ebullition had subsided within the test boiler, a reading was taken of the height of the water in its gage glass. This was repeated one hour afterwards, and there was no perceptible difference of level. One-eighth of an inch in the gage being approximately equivalent to 90 lbs. of water, it will be seen that no appreciable leakage was taking place.

The load during the main test was provided by working the generator through a water rheostat. Indicator cards were taken at intervals of fifteen minutes during the test. The quality of the steam was tested by calorimetric observations every fifteen minutes. The steam, before entering the throttle valve, passes through a separator. The water from the separator during this test was collected, weighed and credited to the engine. Ordinarily, this drip is passed through the reheater tubes. The steam to the reheater was supplied through the auxiliary header from the surface boilers. It is, therefore, to be added to the steam consumption as measured by the supply to the test boiler. The condensed reheater steam was weighed after leaving the reheater, and found to be 4.6 per cent of the total steam used by the engine during the test. Four Crosby indicators were used in taking the diagrams, the springs being tested before and after the main test. Several cards were taken for each spring, so as to eliminate accidental error. The duration of the test was five hours.

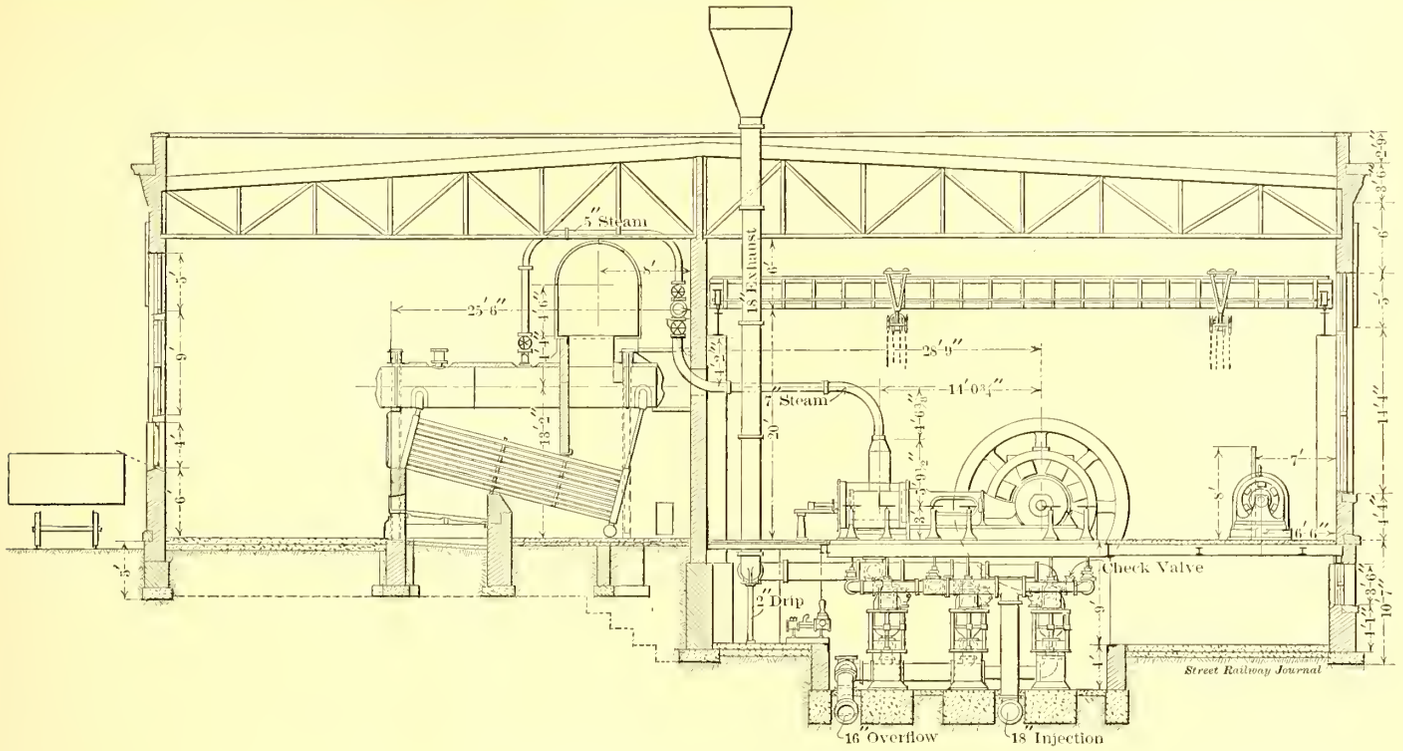
The average indicated horse-power was 639.2, and the steam consumption 14.14 lbs. per indicated horse-power. This brings the steam consumption within the makers' guarantee that it shall not exceed that of releasing-valve gear engines. During this test the efficiency from the cylinder to the switchboard was 80.9 per cent.

Two boiler tests were made. One was to ascertain the economy when burning Jackson run of mine coal and forcing the boiler above its rating. The other was to ascertain the economy obtained when burning Jackson screenings at the rated load of the boiler, namely, 300 boiler horse-power. The boilers were guaranteed to evaporate at nominal rating 10,350 lbs. of water per hour, at 212 degs. F., and while working at this rating to evaporate 7 lbs. of water per pound of coal. They were also guaranteed to have a capacity to evaporate 15,525 lbs. of water per hour, and while working at this capacity to evaporate 6¼ lbs. of water per pound of coal. The entrainment was to be not more than 2 per cent with boilers working at their rated capacity, or 3 per cent when working at maximum capacity. Guarantees were based upon a draft of ¾ ins. in the smoke flue at the top of the boilers, and the use of Ohio screenings containing 10,000 B. T. U. to 11,000 B. T. U. per pound of coal.

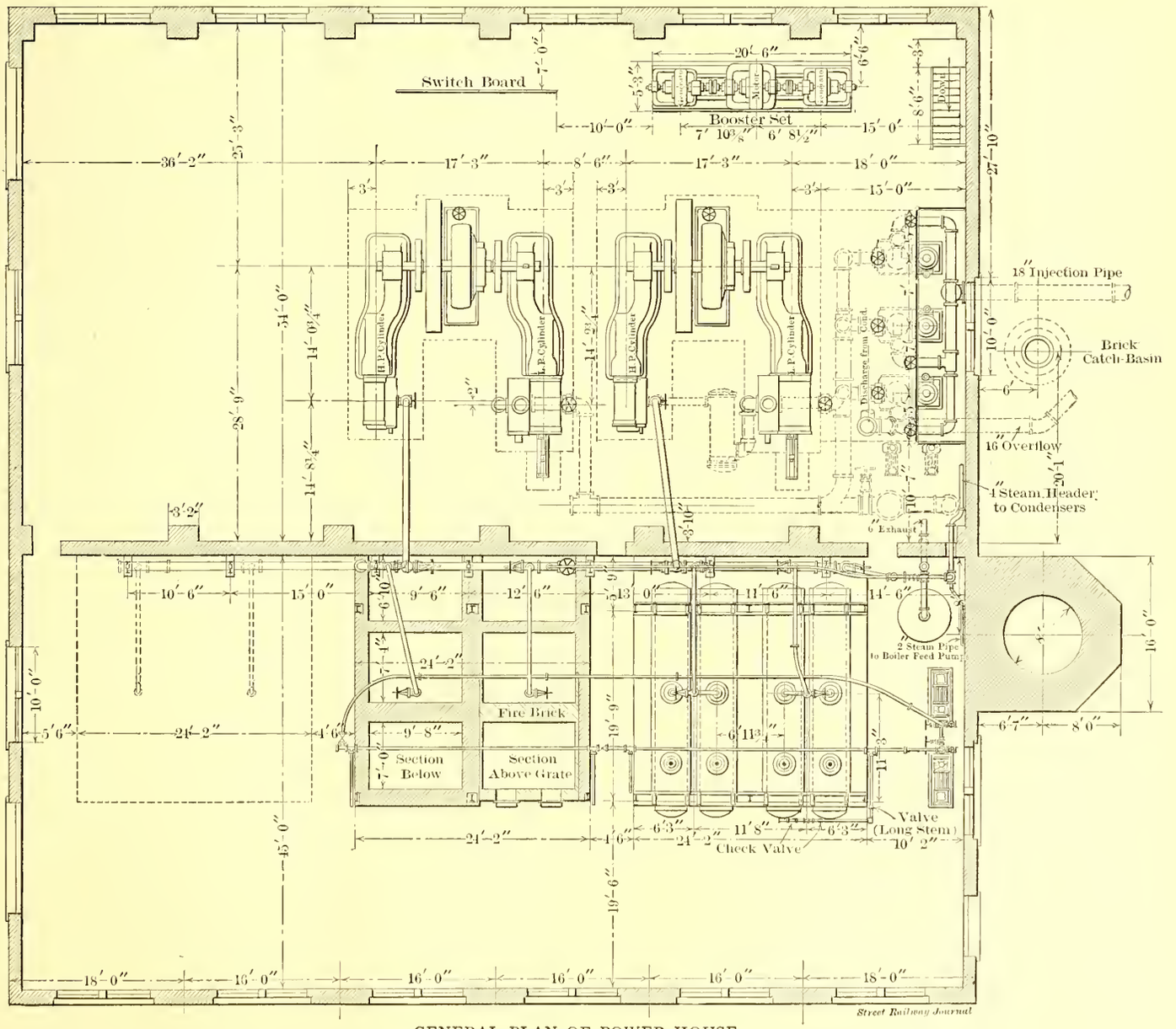
The load was provided by using steam on one of the engines, loaded by a water rheostat. Readings of steam pressure, draft value, temperature, calorimeter thermometers, feed temperature, level of water, etc., were taken every fifteen minutes. Coal



OUTLINE OF FEEDERS



SECTIONAL VIEW OF POWER HOUSE



GENERAL PLAN OF POWER HOUSE

was weighed on a Fairbanks scale, previously tested. A sample of coal was taken from every fifth barrowful on both tests, and after carefully cutting over and quartering down a known weight was placed on top of the boilers and dried for twelve hours to ascertain the surface moisture. Analysis of this dried sample by the Dearborn Drug & Chemical Company resulted as follows for the Jackson run of mine coal:

	Per cent
Moisture	3.60
Volatile combustible matter	38.25
Fixed carbon	43.25
Ash (dark fawn)	14.90
Heating value	11,966 B. T. U.

Analysis of Jackson screenings resulted as follows:

	Per cent
Moisture	3.92
Volatile combustible matter	37.80
Fixed carbon	38.07
Ash (dark fawn)	30.21
Heating value	9,325 B. T. U.

The latter coal did not contain the heating value specified by the boiler contracts.

In making the boiler tests the boiler feed-water was measured in the same way as for the engine tests. The capacity test failed to show what the maximum capacity of the boilers might be, because of the fact that the firemen had been in the habit of working the boilers considerably under their rating, and were without the experience necessary to run the boiler at its maximum capacity for the length of time required for the test. Steam pressure was consequently somewhat irregular, falling during the cleaning of the fires. During this test 12,920 lbs. of water were evaporated per hour, or an overload of 24.83 per cent. Under these conditions the boiler showed an economy of 6.70 lbs. of water per pound of coal, or 7.4 per cent above the guaranteed economy at 50 per cent above rated capacity; from which it would appear that under more favorable conditions for firing the boiler would come up to the guarantee. The coal in this test made considerable clinker, which adhered closely to the grate bars and necessitated frequent slicing. The fires burned about three hours per cleaning. The draft was good, averaging .84 in. for the whole test.

Previous experience with the class of Ohio screenings available for the test showed that it was practically impossible to carry an overload on the boiler when burning this coal, and a capacity test with it was, therefore, not made.

In the economy test the boiler was worked at the average capacity of 303-hp throughout the run, and Jackson screenings were used. It evaporated at this load 6.70 lbs. of water per pound of coal from and at 212 degs. F. The coal was so dirty that it was necessary to clean fires about every 2 1-3 hours, which was a severe detriment to economical working, as they were being cleaned for practically 9 per cent of the duration of the test. The amount of ash and refuse on this test was 45 per cent of the total coal fired. Considerable combustible matter was lost by the necessity for frequent slicing. A sample of the ash analyzed afterwards showed 22.90 per cent of combustible matter remaining in the ash. The coal gave 88.8 per cent of the thermal value required by the boiler contract. It was, therefore, calculated from the result of this test that the boiler performance would have been 7.47 lbs. of water per pound of coal with a coal containing the necessary amount of heat units. It will be noticed that the run of mine coal enabled the boiler to be forced to practically 25 per cent above rating, with about 30 per cent less cleanings than the slack, and gave at the same time as good economy.

A collision occurred Feb. 25 on the line of the Peoria & Pekin Terminal Railway, by which one man was killed and eight injured. The wreck was due to a fog, which prevented the motorman seeing the signals.

A DECADE OF INTERURBAN ELECTRIC RAILWAYS

BY LOUIS BELL, PH. D.

It is now a full ten years since the electric railway, reaching beyond the confines of simple tramway practice, began to fulfil its destiny of revolutionizing rapid transit. How momentous has been the work of the swiftly passing intervening years, the multitude of splendid interurban roads now in operation bears witness. While street railways were limited to animal motive power, high speed was an impossibility, and lacking high speed long distances were impracticable. The ultimate factor in determining lines of traffic is time, and the horse railroad, even at its best, and with every advantage in delivering its passengers at or near to their objective points would not for a moment compete with even a poorly equipped steam road. With the advent of electricity a new field of activity was opened, for cars operated at fairly high speeds along streets and public roads were able to land their passengers at their destinations more promptly than a steam road, possessing, to be sure, greater speed, but confined to a roadway far less accessible.

The electric interurban road came into existence by a process of natural evolution from the extension in tramway practice rendered possible by greater speed, and by a truly Darwinian process of variation and survival of the fittest it has progressed from variety to sub-species, from sub-species to species, and unless we fail to read aright its future, it lacks little of establishing itself in generic rank. The horse has taken a million years or so to work out its destiny from Eohippus to Equas, but electric traction has in fifteen years passed from the grunting little motor, that spat fire on the Richmond hills, to the flying electric train that reels off the miles to the tune of forty in the hour.

The changes that have been wrought are threefold in kind. The motors themselves have been brought to a point that once seemed almost beyond hope; the rolling stock has passed definitively from tramway to railway type; and finally the organism as a whole has ceased to belong in the germs of street railways, and has entered upon a career peculiar to itself, although closely allied to that of railways in general.

The change in the motors has been extraordinary. Not only is the street railway motor of to-day a vastly more reliable, better designed, and more powerful machine than ten years ago, but it represents a radically different type of construction. It was in 1892 that the ironclad waterproof motor with gears running in oil came fairly to the front and gave a feeling of security that was a profound relief. Then real progress began, and with the intramural line of 1893 electric traction began the divergent growth that has led to the art as we have it. The series parallel control once cast into outer darkness and then replevined from the scrap heap by persistent effort gave the key to high-speed working and interurban traction passed from hope into accomplishment. A year or two more and the development of power transmission and the introduction of the rotary converter gave added impetus to long-distance work by the increased facility in obtaining power. Then came the third-rail, and the multiple-unit system of control, and the modern system began to assume something of its present aspect.

Meanwhile the rolling stock had kept up with the pace. Glancing to-day at the ancient cars marooned in vacant lots and doing humble duty as owl lunch carts, it seems hardly possible that the conversion of such as they into electric could ever have been seriously attempted. The very first step in business-like electric traction was the complete reformation of the running gear, and following that, of the car bodies themselves. When an attempt was made at running old single-truck cars on interurban service trouble followed hot-footed. In fact, if memory serves us aright, it took one or two serious accidents, following

repeated warnings, to enforce the lesson that at high-speed double-truck cars were absolutely necessary. With the long and heavy cars solider track construction was imperative, and so it has come about that the track of a modern interurban electric road is even more substantial than is usual on steam railroads. Thirty-two and 40-lb. rail soon had its day, to be followed by rails of double the weight, supported on a roadbed built to match, and the electrical part of the permanent way progressed with even pace. Bonds grew from No. 6 to No. 00, and feed wire from No. 1 to 500,000 c. m. cable.

But, more than all this, the methods of operation in heavy interurban service have undergone a change. There is a vast difference between running horse cars on a single track and driving 40-ft. cars at 30 miles per hour. You cannot say whoa to a pair of 50-hp motors and bring them to a halt when danger impends. Hand-brakes become almost useless in an emergency, and power brakes have steadily, but all too slowly, forced their way into use. The increasing size and speed of cars designed for large work has made running through public roads a procedure of dubious wisdom and one of the most noticeable changes of recent years has been an increasing tendency to operate interurban roads over private rights of way. Similarly some rational system of block signaling and of train despatching has come to be, not a useful adjunct, but a necessary precaution to insure reasonable safety. Happily, with these increasing expenses and responsibilities has come a volume of traffic that verges on the impossible. An ordinary steam road cannot for a moment hold its own with a modern interurban line, and every time they come into competition the result is a foregone conclusion. Hence, as a rule, the interurban lines have prospered to an extraordinary extent, and have amply justified their right to the field that they have made their own. Their effect on the growth of American cities has been little short of prodigious, for where the rails go, there goes population and prosperity.

But what does all this mean? What is to be the future of interurban lines and their relation to the community? Are they to continue their prodigious growth along substantially the present lines, or is the eternal law of change and variation still to act as it has acted in the past. We do not see how there is any escape from the conclusion that the processes of evolution and differentiation will continue, perhaps even with increased rapidity.

Already there is beginning to be evident a tendency for urban and interurban practice to grow apart. The running gear of the two, one designed for moderate speeds over tram rail, the other for high speeds over a true railway track and roadbed, cannot easily be brought to a common basis. If long distances are to be attempted the working voltage must be carried rather higher than is desirable for urban conditions. And for a broader distinction the cars and equipment most suitable for doing the larger interurban work are not suited for safe and easy running through public streets. In fact the time has now come when we must make distinctions between interurban roads—must divide the germs into two species. There are and will continue to be many roads doing interurban business which are simply normal extensions of urban system along which population is steadily springing up, uniting the terminal cities in a practically continuous suburban district. In due process of time these roads, which run for the most part over public streets and roads, should naturally tend to take on the characteristics of urban systems, and to adopt equipment and methods suitable to roads running in frequented thoroughfares.

On the other hand, there is a large and increasing class of roads which is steadily tending in exactly the opposite direction—growing toward railway instead of tramway conditions. The future of these lines is the evolution of a system of high-speed electric railways displacing and crowding to the wall the minor class of steam roads.

Between these two groups of roads there are many individuals occupying still a debatable and uncertain ground. They are the product of their environment and represent the "transition types" familiar to the naturalist. They must work out their own salvation, each in its own fashion.

But the fundamental issue is that the modern interurban road has come to the parting of the ways. It cannot long continue to hold an untenable mean between two radically divergent positions. If its legitimate functions are those of a thoroughly first-class tramway system there is its future, and it must logically accept the limitations that lie in the line of its duty and prosperity. One cannot with impunity long continue to run fast and heavy cars on short headway through public streets. An attempt to do so will inevitably lead to disaster, and to a day of reckoning. The best that can be done is to plan an equipment that will afford a safe compromise within conservative limits, erring, if at all, on the side of caution. There is no excuse for mincing words about this matter, and it is in nowise a misfortune for a road to be so situated that evolution points to an urban future. So long as an interurban road operates wholly or mainly over public streets, it must face squarely the limitations that come from the common use of such streets, and there is no hope trying to evade the issue. There is room for great individual skill in meeting it squarely and successfully, and we believe that the same keen ability that has shown itself capable of building up so great a business will not fail when it comes to meeting another phase of the growth that has brought so much of prosperity to the roads and the public.

The other class of electric roads—those that are to-day doing substantially railway work, and largely over their own rights of way, stand in a different category. Their aims, duties and responsibilities are those that belong to railways in general. In fact, they are ordinary railways in all save motive power and they must recognize the fact. To judge from the achievements of the present their future is a great and prodigiously useful one. They are not tramways in any sense of the word, and their work in the world is not tramway work. They will give a new meaning to rapid transit if they even approximately fulfil their present promise. But they must face their new responsibilities and take advantage of every lesson in safe and successful operation that fifty years of railroading has taught. They have some inherent advantages that are enormously important, and are due to win out if they make wise use of them.

The interurban roads of this country, to whichever class they belong, are a power for public good, and we think that the public fully realizes it. What we wish to enforce is the principle that one cannot reduce all means of transportation to a dead level of uniformity, and that a natural process of evolution has brought about differences in interurban practice so great that they can no longer successfully be reconciled. But these are signs of growth, not of degeneration, and the future will be greater than the past.

MUNICIPAL OWNERSHIP

The national convention on Municipal Ownership and Public Franchises held its first meeting at the Reform Club, in New York, on Feb. 25. The opening session was devoted largely to consideration of the subject of transportation, and several papers were presented on this feature of municipal service by prominent students of these problems. The programme, which has already appeared in these columns, was followed. Charles T. Yerkes, Robert P. Porter and Robert Donald contributed papers on this subject, but they were not present to read them in person. C. R. Bellamy, of Liverpool, gave his impressions of municipal management of electric railways, based upon his experience in Great Britain and his observations on the Continent, and he presented some interesting statistics in support of his contention that in England, at least, the conditions were favorable to city railway control.

PLANS FOR EXTENSION ON NEW YORK SUBWAY AND "L" SYSTEMS

The Rapid Transit Commissioners of New York have under consideration an elaborate and comprehensive report by their chief engineer, William Barclay Parsons, upon an extension of the present "L" system in Manhattan and The Bronx, and additional subways so arranged that they can be operated together, and when practical the cars of one road be run on the other's line for one fare. There is also a proposal to include the New York Central and Pennsylvania companies in the general scheme, so that their tunnels will, in fact, contribute to the facilities for handling local and suburban traffic.

The principal features of the Parsons plan, as outlined in his letter to the Board last week, may be summarized as follows:

The building of 130 miles of subway and elevated single track, at an expense of between $45,000,000 and $50,000,000, about one-half of which will fall on the city.

A new three-track subway line for Lexington Avenue, with a junction with the present subway at Fortieth Street and Park Avenue.

The removal of the New York Central's tracks from the surface of West Side streets and the building of a new four-track elevated structure along the North River water-front for passengers and freight.

Arrangement with the New York Central for its local trains to run in the rapid transit subways.

A new subway from South Ferry through Church Street, Wooster Street or Greene Street, University Place and Broadway to Forty-Second Street, connecting with the main line.

Two new elevated tracks on the Second Avenue line from the Harlem River to Chatham Square and thence on a double-decked structure to the City Hall.

An extension of the Sixth Avenue elevated line along Christopher Street to Greenwich Street.

An extension of The Bronx rapid transit lines to Wakefield and Mount Vernon.

A branch subway line along the Southern Boulevard and westerly in 180th Street.

A subway under Thirty-Second Street from Broadway to Seventh Avenue, to afford distribution of passengers using the Pennsylvania tunnel.

A new third track on the Third Avenue elevated road from Harlem to Ninth Street.

A new third track on the Ninth Avenue elevated road from Fourteenth Street to Cortlandt Street.

A new branch of the elevated road from Fifty-Third Street to Tenth Avenue, to Fifty-Fifth Street, thence by new subway under Amsterdam Avenue to a connection with the subway proper at Seventy-Second Street.

The Board has consistently kept in mind throughout its entire work the central idea of providing a comprehensive system of rapid transit for the entire city, and the recent acquirement of the "L" roads of Manhattan by the interests controlling the subway property contributed in large measure to making it possible at this time to present the plans under consideration. A map showing the proposed extensions and their relations to present "L" system and the subways now under construction is presented herewith. In this map the several lines are indicated as follows:

Heavy dotted lines indicate proposed extensions of the Rapid Transit (subway) system.

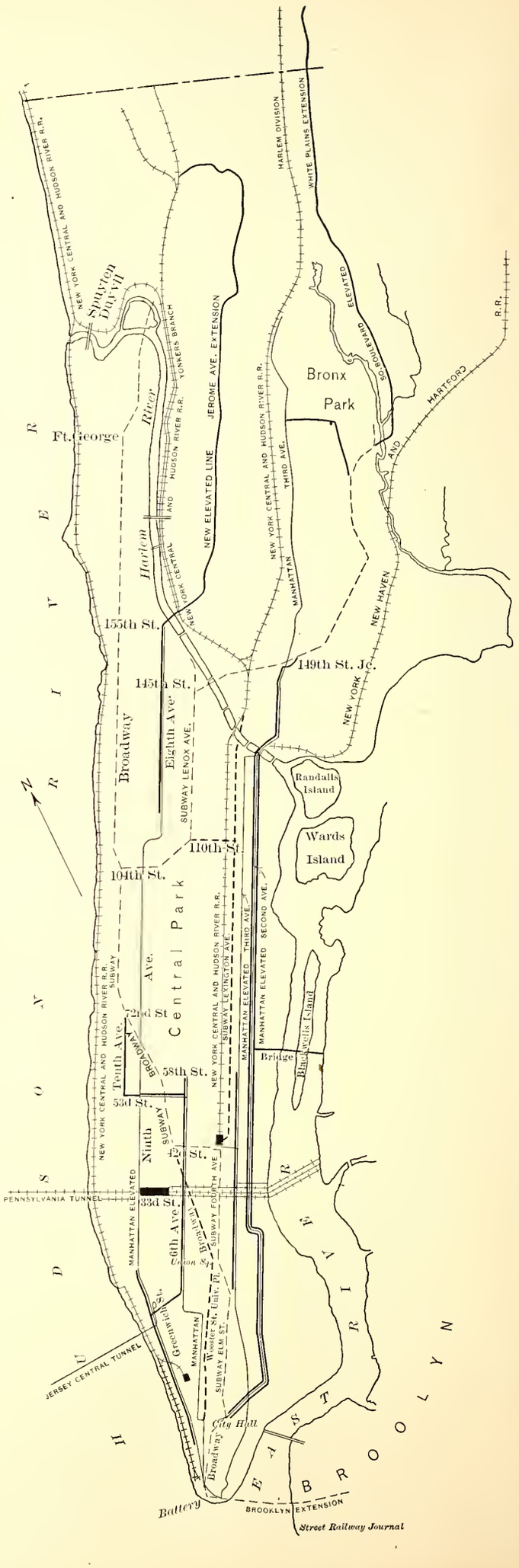
Light dotted lines indicate present franchises of the Rapid Transit (subway) system.

Heavy solid lines indicate proposed extensions of the Manhattan Elevated system.

Light solid lines indicate present tracks of the Manhattan Elevated system.

Heavy crossed lines indicate proposed extensions of the New York Central system.

Light crossed lines indicate existing trunk-line tracks, or those for which franchises have been granted.



MAP SHOWING PROPOSED EXTENSIONS IN NEW YORK CITY

The present plans, it will be noticed, deal entirely with Manhattan, The Bronx and Queens, but there are additional provisions for Brooklyn and Richmond, which will be submitted later, and will form a harmonious part of the general layout. A public hearing on the proposed extensions was ordered.

In order to be carried out, the plans advocated by Mr. Parsons must, besides being endorsed by the Rapid Transit Board, have the consent of the Aldermen and the Board of Estimate. So far as the city's financial ability to carry out the plan went, Mr. Grout said, there need be no doubt, as after July 1 the debt limit will be increased enough to warrant expending the amount named by Mr. Parsons and considerably more. Members of the Board said yesterday that there need be no delay in beginning on the tunnel extensions, and it was said that contracts would probably be let and work actually begun on these before the end of the Mayor's term. Mr. Parsons's report says:

SUBWAY EXTENSIONS

When the bids for the Brooklyn extension were opened it will be recollected that Mr. Belmont, as president of the Rapid Transit Subway Construction Company, offered to build a line from Forty-Second Street to Fourteenth Street at considerably below the estimated cost. Such a line would, however, but transfer the point of congestion from Forty-Second Street to Fourteenth Street, and I therefore propose that this line be extended to the lower end of Manhattan Island at South Ferry, following University Place, Wooster Street and Church Street, and thus furnish two additional tracks south of the postoffice.

From this line at Broadway a subway under Thirty-Second Street to Seventh Avenue should be built so as to bring the new Pennsylvania terminus to a connection with the subway and elevated railway for the purpose of local distribution of passengers.

In like manner I propose to make a junction, as our general plan originally contemplated, at about Fortieth Street and Park Avenue, and carry the new line with three tracks beneath the Grand Central Station to Lexington Avenue, and then along and under that thoroughfare to The Bronx, making a connection with the New York Central and New Haven Railroads at Mott Haven.

Although the line passes beneath the yard of the New York Central between Forty-Second Street and Forty-Fifth Street, property not subject to condemnation, nevertheless, I believe that satisfactory arrangements can be made for the easement. A branch from this line can be carried westward under 110th Street to Lenox Avenue, thus providing a connection between the east and west lines north of Central Park, as the Forty-Second Street subway line provides one south of the park.

On the extreme easterly end the line in The Bronx should be extended from West Farms along the east side of Bronx Park, unless the park authorities prefer a direct route through the park in order to reach Wakefield and Mount Vernon, two rapidly growing sections of the city now without rapid transit facilities.

A branch should also be laid out continuing along the Southern Boulevard and then westerly on 180th Street, thus reaching a section of The Bronx not served by any line.

A connection between the Bronx Park line and the Manhattan Elevated should also be made from Brook Avenue along Westchester Avenue to Third Avenue.

MANHATTAN ELEVATED EXTENSIONS

The additional lines, and especially those in subway, will require some years to complete, and during this time it is absolutely essential that immediate relief measures be provided. For reasons not necessary to discuss the Manhattan Elevated Railway Company has never accepted former suggestions of the Board to provide such additional facilities as the Board deemed advisable. Recently, however, the management of this property has passed under the control of the Interborough Rapid Transit Company, and I am informed by Mr. Belmont that he will gladly and liberally meet the views of the Board and extend the Manhattan lines, and so connect them with the subway system that both systems may be operated as a unit, with through trains at a single fare. Such an arrangement would at once confer a great benefit upon the local traveling public, as presenting the quickest means of securing immediate relief.

To this end I suggest the following alterations in the Manhattan structure and method of operation:

Second Avenue Division—Add two tracks from the Harlem River to Chatham Square, carrying the two new tracks over the Chatham Square junction and over the Park Row line to City Hall.

Third Avenue Division—Extend the third track from Fifty-Ninth Street to Ninth Street, so as to make it continuous from the Harlem River to the latter point.

Suburban Division—Add a third track from south of the Harlem River to Westchester Avenue.

When these lines are completed a rearrangement in operation can be made advantageously. The Third Avenue Division is the main system for local business on the East Side. To-day this local business is greatly interfered with by running The Bronx trains over the same structure, and in like manner The Bronx facilities are much restricted by the impossibility of running more trains over the Third Avenue structure. By converting the Second Avenue Division into a four-track structure, and by extending it to the City Hall, an immeasurably better service will at once be provided for the East Side of the city. Bronx passengers will then be carried direct on a continuously running express structure, while local passengers from points south of Harlem will be carried by trains stopping at or starting from the river, and thus not come in contact with the through passengers. In like manner, by connecting the Rapid Transit Westchester Avenue line with the Suburban line at 149th Street, through trains can be run from points south of Bronx Park, or Wakefield, or Mount Vernon, by a direct line to all points south of the Harlem River, including South Ferry and City Hall, in through trains and for a single fare. This would save passengers from the northeastern portion of The Bronx 1¾ miles of their journey, which would otherwise be involved if they were carried to the west side of the city and back by the present subway.

The saving in time would be even greater than the mileage would indicate, as the express service for such passengers would begin at 149th Street and Third Avenue, instead of 110th Street and Lenox Avenue. The subway proper would then begin at 149th Street and Third Avenue, and furnish the people living in the center of The Bronx with fresh trains, transfers to which could be given at 149th Street for the small proportion of travel that might desire to go from Bronx Park to the west side of Central Park. This would also permit the present Lenox Avenue line to become what it should be, namely, a line for purely local Harlem travel, so that the residents of the Harlem district would be sure of finding seats.

Sixth Avenue Division—In order to furnish special trains for the retail shopping district lying north of Fourteenth Street, and in order to furnish a connection to the terminus of the New York & New Jersey Tunnel at Greenwich Street and Christopher Street, I would propose an extension of the Sixth Avenue Division along Christopher Street to Greenwich Street, connecting with the Sixth Avenue Division at the north end of the Eighth Street station, and thence lay a third track on the Sixth Avenue structure northward. By this means many northbound trains could run "local" through the wholesale dry goods district, as a gathering ground, and, having become filled by the time they reach Eighth Street, could then pass on to the third track and run "express" to Harlem. The relief thus provided to the local track north of Eighth Street would permit trains to start from Christopher Street and run "local" through the retail district.

Ninth Avenue Division—I recommend:

(1) The extension of the third track from Fourteenth Street south to Cortlandt Street, so that the express service may begin from the latter point.

(2) A branch from the main structure at Fifty-Third Street running westerly along Fifty-Third Street to Tenth Avenue, northerly along Tenth Avenue to Fifty-Fifth Street, where, owing to the topography, the elevated structure can be depressed into subway and so carried under Amsterdam Avenue to a connection with the subway at Seventy-Second Street. This connection can be built rapidly, and would serve in connection with the third track extension to Cortlandt Street, as an immediate means of carrying the traffic assembling in the upper limits of the subway direct to South Ferry, thus giving some measure of relief pending the completion of the subway to the same point.

(3) The extension of the third track from 116th Street north to 155th Street, making a continuous third track from Cortlandt Street to the Harlem River.

(4) Make an arrangement with the Putnam Division of the New York Central Railroad by which the present bridge across the Harlem River can be reconstructed into a three-track structure, and then extend the Eighth Avenue line across the Harlem River with the three tracks and by a short tunnel through the high ground on the east bank of the Harlem River to Jerome Avenue, thence northerly along Jerome Avenue to Woodlawn, and thence westerly in the neighborhood of Mosholu Avenue to a connection with the Putnam Division in Van Cortlandt Park. This line will furnish, in the quickest and most direct manner, good service for what constitutes the largest inhabitable area of the old city of New York, which is to-day without rapid transit facilities. When the construction of the Lenox Avenue and Broadway lines south from the Harlem River is completed, the Eighth Avenue elevated will be relieved of a large amount of local travel, thus permitting the additional burden of the Jerome Avenue extension to be successfully carried.

If the consent of the railroads with terminals at Forty-Second Street can be had, connections should be made at as many points as possible with the subway and elevated lines. The points where such connections can be made are with the suburban elevated at Fordham; with the proposed Jerome Avenue extension at Van Cortlandt Park; with the subway at Kingsbridge; with the Manhattan Elevated at 155th Street, to both the main line and the Putnam Division of the New York Central; with the subway to the New York Central at the Harlem Ship Canal; with the Lexington Avenue subway to the New York Central, Harlem & New York and New Haven Railroads at Mott Haven; and all so arranged that local trains from nearby suburban points can be run direct over the rapid transit lines and thus avoid the congestion at the Grand Central Station or the delay in transferring from one railway to another.

NEW YORK CENTRAL WEST STREET VIADUCT

In addition to this, however, the New York Central Railroad Company now owns the railway along its own right of way from Spuyten Duyval to Fifty-Ninth Street, and thence on the surface of Eleventh Avenue, Tenth Avenue and other avenues and streets south to Houston Street and Beach Street. This line might easily be converted into a passenger line and furnish a great measure of rapid transit relief. The existence of the tracks on the street surface south of Fifty-Ninth Street is a great public burden, and should be removed if possible.

I would suggest that negotiations be taken up with this company looking to the removal of these surface tracks, and substituting in place thereof an elevated structure along the same route, or possibly along West Street, and which, if constructed so far south as Beach Street, might be continued south to Battery Place, and so provide not only a freight but also a passenger line along the water front. If this were done the line should be constructed with four tracks south of Fifty-Ninth Street, with the passenger tracks elevated above that point.

I suggest that a branch of the Second Avenue Elevated be constructed along Sixty-Fourth Street and over the Blackwell's Island Bridge to Long Island, and that a plaza be then arranged permitting the present surface lines now plying throughout that district to approach and deliver their passengers to the elevated, by which they can be carried by an express and local service to any point north or south in Manhattan, Brooklyn or Bronx.

COST UNDER $50,000,000

If the Board should carry out these suggestions the city will own a railway system complete in itself, covering 37½ miles in the Boroughs of Manhattan and The Bronx, with 100 miles of track, exclusive of side tracks. On the other hand, the plan proposes to afford the greatest measure of immediate relief by the only way in which such relief can be afforded, that is, by the expansion of existing facilities. Such expansion would be obtained by the use of private capital, without encroaching on the debt-incurring capacity of the city, but under such proper terms as would be laid down by the Board.

The equivalent amount of single track above mentioned is about 130 miles, and the expense of construction, liberally estimated, is between $45,000,000 and $50,000,000, about one-half of which will fall on the city.

All of these lines herein suggested should, if approved by the Board, be placed under construction as soon as the necessary consents can be obtained and the terms of the contract drawn up; and it is hoped that they will be sufficient to provide for the Boroughs of Manhattan and The Bronx for some years to come.

ADDITIONAL SUBWAYS DEMANDED

The Citizens' Union of New York, which is one of the public bodies that has been investigating the transportation problem, has made a report in which it says that the completion of another subway road would accelerate the up-building of unoccupied sections, and the enormous increase in taxable values created would largely contribute the means of constructing it. The report recommends that these changes should be secured at the present legislative session:

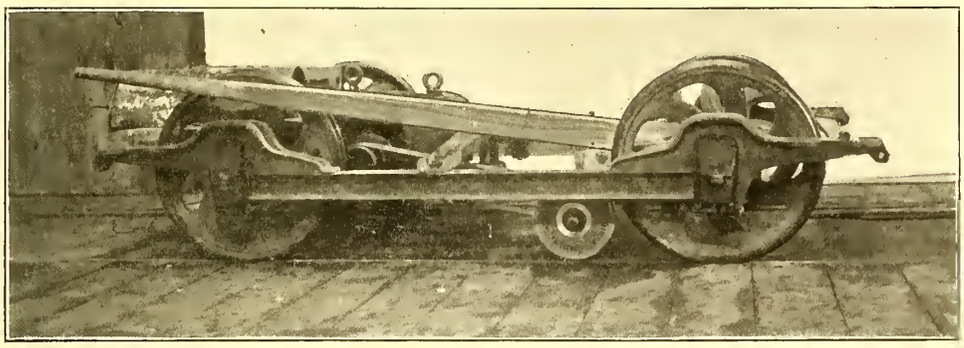
First. The Rapid Transit Act should be amended so as to permit the construction of the roads without at the same time compelling the letting of contracts for their operation.

Second. The city should have authority either to operate them itself, or to contract for their operation, for a period not exceeding ten years if equipped by the city, or not more than twenty years without such equipment.

The union contends that under the Rapid Transit Act the city definitely adopted the principle of municipal ownership, the properties created thereunder reverting to it with all equipment at the expiration of the lease period. Since the passage of the act, the report says, it has become apparent that subway systems are destined to be exceedingly profitable enterprises, and in all boroughs the city should control the additional transit facilities required to meet future demands. Before any extension of the existing subway is determined upon the adoption of a plan for a complete system of transit is urged, with a view to its independent control or operation, yet so related to existing lines as to secure the advantages of a universal exchange of transfers with them wherever practicable. It is further contended that fares should be fixed by the Rapid Transit Railroad Commission, with the approval of the Board of Estimate, at a figure that would provide, at least, for the interest on the construction bonds, a sinking fund for their redemption within a reasonable period, the cost of operation and other ordinary charges.

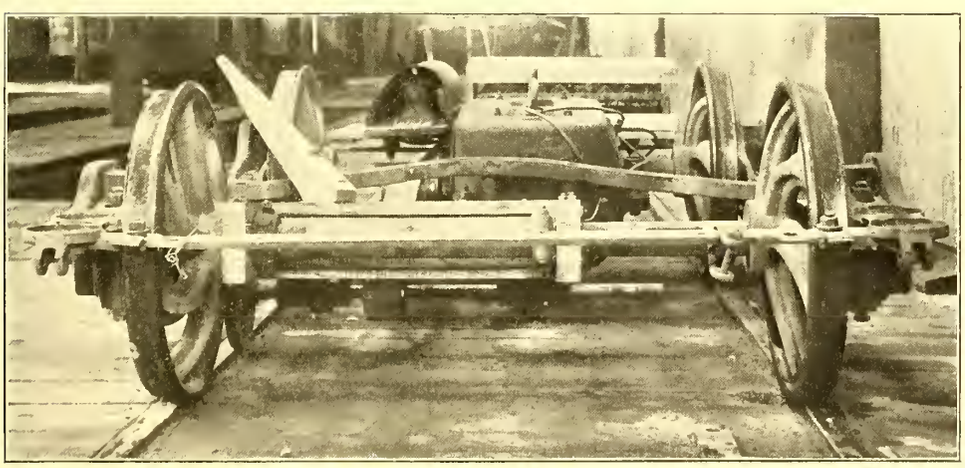
GRINDING SPECIAL WORK FOR INTERURBAN CAR WHEEL FLANGES

Nearly every city road, which had its curves and special work laid several years ago and now finds it necessary to admit interurban cars on its tracks, has found it necessary to provide larger grooves for the flanges of the interurban car wheels than were originally provided for the city cars. Even though the track in general may accommodate large interurban flanges there are likely to be several points where it is necessary either to lay new special work or to grind out the grooves in some way. In Aurora, Ill., the entrance of the cars of the Aurora, Elgin & Chicago high-speed electric line into the city made it necessary to enlarge the grooves in some special work in the heart of the city. These Aurora, Elgin & Chicago cars have standard M. C. B. treads and flanges. The tracks in Aurora belong to the Elgin, Aurora & Southern Traction Company, which, although it operates interurban lines, has no cars with flanges as large as those on the Aurora, Elgin & Chicago.



GRINDING SPECIAL WORK AT AURORA

To enlarge the grooves and the special work, a pneumatic tool is used for most of the work. A regular Christensen air-brake equipment furnishes the compressed air for the pneumatic tool. When, however, the hardened centers of the special work were reached an emery-wheel grinder was used. This grinder was mounted on an old truck, as seen in the accompanying engravings. A railway motor was suspended on one axle in the usual way, but belted to an emery wheel mounted on a frame between the axles. This emery wheel frame is made of timber, and swivels on one axle of the truck. A long lever from the frame enables one man to raise and lower the emery wheel and also control the motor. The controller of the motor is placed on its side at one end of the truck, near the rheostat. The emery wheel is of such a shape as to give just the right form of groove.



EQUIPMENT FOR ENLARGING GROOVES AND SPECIAL WORK

SARATOGA THE NEXT CONVENTION PLACE

A meeting of the executive committee of the American Street Railway Association was held at Worden's Hotel, Saratoga, N. Y., Feb. 23, at which it was unanimously resolved to hold the next annual convention in that city. It was also voted to hold the convention during the first week in September, and Wednesday, Thursday and Friday, Sept. 2, 3 and 4, were the days selected.

There was a good-sized attendance of the executive committee at Saratoga. Those present were: J. C. Hutchins, president; W. Caryl Ely, first vice-president; T. C. Penington, secretary and treasurer, and Messrs. Laffin, of Worcester; Radel, of Bridgeport, and Read, of Salt Lake City. Upon invitation of the committee T. J. Nicholl, vice-president and general manager of the Rochester Railway Company, was also in attendance. At the meeting of the committee the secretary stated that while the association had not received any invitations from any street railway company in any large city for the next convention, several other invitations were before the association. Among them was an invitation from a private party in New York, offering the use of the Grand Central Palace, under certain conditions; another somewhat similar invitation had been received from a number of manufacturing companies in Chicago, in regard to the Coliseum Building in that city; a third had been presented to the association from the Business Men's Association of Saratoga Springs, presenting the claims of that place for consideration. The meeting of the executive committee had been held in Saratoga because that had seemed the most desirable place for holding the next convention, all things considered.

The committee was then addressed by A. P. Knapp, village president; C. B. Thomas, president of the Saratoga Business Men's Association, and C. A. Douglass, representing the Grand Union Hotel. They called attention to the fact that Saratoga is rapidly becoming an important center for national conventions, that several large associations like the National Railway Mechanics and National Car Builders had held conventions in that city for a number of years, and that the city was unsurpassed by any in the country in the way of hotel facilities. Mr. Douglass, speaking for the Grand Union Hotel, stated that that hotel had accommodations for about 1700 guests, and that there were several other hotels nearly as large in Saratoga. He agreed, in the event of the selection of that hotel as the convention headquarters, to give the association, without charge, the use for the meetings of the ball room, seating 600, also to furnish the Accountants' Association and the American Railway Mechanical and Electrical Association with meeting rooms. These rooms will seat each from 60 persons to 90 persons. He also agreed that only regular prices would prevail, and that if the convention was held at Saratoga during the first week in September concerts would be given in the hotel grounds daily by Herbert's band of fifty pieces, conducted by Victor Herbert in person. This is the band which is retained at the Grand Union Hotel during the summer.

As these arrangements seemed satisfactory to the executive committee it was decided to accept them, provided proper arrangements could be made for caring for the exhibits. The secretary then presented the resignation as member of the executive committee of W. J. Hield, of Minneapolis. The resignation was accepted, and Mr. Nicholl, of Rochester, was elected to the vacancy caused by the resignation. A letter was also read from Mr. Vreeland, dated at Aiken, Ga., expressing regret at his inability, through sickness, to attend the meeting. The committee then made an inspection of the Grand Union Hotel and grounds, and finally accepted the proposition to hold the next convention there in September. It was found that the piazzas of this hotel, facing the court, are of ample width for accommodating all of the less bulky exhibits, and that the latter can be located in the court itself. The tracks of the Delaware & Hudson River Railroad are directly in the rear of the hotel, making trans-shipment easy, and electric power is available in any quantity desired from the circuits of the Hudson Valley Railroad Company. All exhibits placed in the court will be covered to protect them from the weather, and those on the piazza itself will also be screened in case of storm. Altogether the arrangement seemed most satisfactory, and the proximity of the exhibits to the hotel itself will undoubtedly prove a great convenience to those who wish to give especial attention to them.

The dining room in which the banquet will be held on Friday evening is 285 ft. long, and is amply large enough for the purposes of the association.

The president of the Hudson Valley Railroad Company, Mr. Addison B. Colvin, was unfortunately prevented from meeting the executive committee while it was in Saratoga. He extended a hearty invitation to the association to meet there next September, however, and promised an enjoyable entertainment to the ladies and all who should attend the coming convention.

After deciding upon the time and place of the next meeting the committee took up the subjects to be discussed at Saratoga, and the following topics were selected and assigned:

Steam Turbines.

Electrically Welded Joints.

The Evils of Maintenance and Champerty in Personal Injury Cases.

Train Orders and Train Signals on Interurban Roads.

Freight and Express on Electric Railways.

The Manufacture and Distribution of Alternating Currents for Large Cities.

Comparative Merits of Single and Double Truck Cars for Street Service.

The Right of Way. Is Not the Public Entitled to It in the Use of Streets?

The companies to whom these topics have been assigned will be announced as soon as acceptances on their parts have been received by the secretary.

The committee also decided to hold one morning session each day of the convention, and no sessions in the afternoon or evening. This will permit the entire afternoon of each day to be given up to excursions or an inspection of the exhibits. The excursions have not yet been absolutely determined upon, but are being arranged by Mr. Colvin, of the Hudson Valley line, and Mr. Thomas, of the local committee. It is understood that at least one excursion will be to visit the General Electric Works at Schenectady, and another will be to Mechanicsville, to inspect the large hydroelectric plant recently installed in that city.

It is also understood that the convention of the American Railway Mechanical and Electrical Association will be held on Tuesday, Sept. 1, and will occupy only one day. This will permit the delegates to that convention to attend also the sessions of the American Association.

In the evening a pleasant dinner was extended to the executive committee and to the technical newspaper men also in attendance at the meeting, by the representatives of the village of Saratoga, who had met the committee. The party, numbering fifteen, was driven in sleighs to a restaurant on Saratoga Lake, located about 4 miles from the center of the town. Those present besides the executive committee were A. P. Knapp, C. B. Thomas, C. A. Douglass, H. L. Waterbury, Dr. B. M. Varney and J. K. Walbridge, all of Saratoga; H. W. Blake, of New York, and D. Royse, of Chicago. The party passed a very enjoyable evening, and if the hospitality and good fellowship of President Knapp, of Saratoga, and his associates presages anything, it is that the delegates and others in attendance at the next convention at Saratoga will be given a most enjoyable time during their stay in that city.

The secretary will in due course issue the usual circulars in regard to hotels, exhibit space, etc.

STRIKE ON THE INDIANA RAILWAY

The strike on the lines of the Indiana Railway Company, operating in and between South Bend, Elkhart and Goshen, Ind., has now been on for about a month. Cars are being operated on the regular schedule, and there has been little disturbance recently, except that a gang of toughs set upon a motorman, one night at the end of one of the lines, and battered him so severely that he is in a critical condition. Although the cars are in operation the strikers have established such a boycott that there is very little passenger traffic. The cars are running nearly empty. The union labor element being strong in the towns through which this company operates, the local merchants are in great fear of giving offense to this class, and do not patronize the cars or allow their employees to do so, which, of course, materially cuts down the riding. The strike is apparently one devised purely for the personal gratification of labor agitators. General Manager J. McM. Smith stated last week to a Street Railway Journal representative that no man on the pay roll of the Indiana Railway Company had approached him regarding the settlement of the strike, or any grievances either just before or since the strike began. Some men who had been discharged for good reasons in December have attempted negotiations, and these men seem to have been the cause of the whole trouble. The only issue in the strike is the reinstatement of these men. It seems to be one of these cases where if the regular employees of the company would take matters in their own hands and not be led around by men who are too dishonest or unfaithful to keep regular positions with the company, there would be no trouble whatever. As the cars are being operated on regular schedule and everything is quiet, it seems to be only a question of how long the citizens of South Bend and neighboring towns will be willing to walk to accommodate labor agitators, who are not able to hold positions on their own merit, but must force their employment on the railway company by a strike of their former fellow employees.

The Fair Haven & Westville Railway Company has begun the work of remodeling and double-tracking its lines in and about the city of New Haven.

The most important of this work will be the extension and double-tracking of a second line from New Haven to West Haven by way of Congress Avenue. There will be about 6 miles of new trackage laid on this work.

The next work of importance is the double-tracking, straightening and regrading of the West Shore Division of the system between Savin Rock and Woodmont. This improvement will call for about 8 miles of rail. The company will also finish equipping some 3 miles of the end of its Derby extension. This road will be opened on July 4, if the Derby end of the line, which is being built by the Connecticut Railway & Lighting Company, is completed by that time.

EXPERIENCE IN THIRD-RAIL OPERATION

H. M. Brinckerhoff, general manager of the Metropolitan West Side Elevated Railway, of Chicago, delivered a lecture before the Chicago Electrical Association, the evening of Feb. 20, on the third-rail system for electric railways. The lecture was illustrated with stereopticon views of the third rail as used by Mr. Brinckerhoff's company.

Mr. Brinckerhoff referred with some amusement to articles which appeared in the New York daily papers about a year ago, when the first trains were run by electricity on the Manhattan Elevated, which would give the impression that the third rail was something very new and wonderful, whereas it had been working in regular service for years in Chicago. The Chicago elevated roads had not only done all the pioneer third-rail work in the United States, but it was significant that, in the equipment of the Manhattan Elevated Railway, of New York, all the skilled heads of departments involved in the practical work of making the change had been supplied by Chicago.

The first third-rail road in the United States was the Intramural Railway at the World's Fair in Chicago, 1893. The Liverpool Elevated in England was also equipped with a third rail about that time. The use of the third rail made possible the operation of heavy trains by electric motive power, because of the large area afforded by the heavy contact-shoe sliding on the third rail.

FUEL SAVING BY ELECTRIC TRACTION

It was shown by Mr. Brinckerhoff that the actual cost of fuel for the operation of the Chicago elevated roads by electricity was only one-third the amount per car-mile that it would be with steam. Part of this economy was, of course, due to the fact that Chicago was near the coal fields of Illinois and Indiana. In New York City, where the distance to the bituminous coal fields was greater, and to the anthracite fields less, there would not be as great a saving, because the difference between the cost of anthracite and of low-grade bituminous coal was less in New York City than in Chicago, and anthracite was cheaper per ton in New York than in Chicago.

TRAFFIC CONDITIONS WITH ELECTRICITY

As a practical example of the value of electric traction in the prompt movement of trains by virtue of rapid acceleration, Mr. Brinckerhoff stated that the present service around the Union Elevated Loop, of Chicago, would be absolutely impossible if the roads using the loop employed steam. Some traffic figures were given for the loop. During the month of January the loop accommodated 1523 trains in twenty-four hours, or an average of one train every fifty-three seconds for the whole day. This, of course, meant trains at much shorter intervals during the rush hours. During the rush-hour period trains average thirty-three seconds headway. During fifteen minutes of the evening rush forty-six trains passed each junction point. During fifteen minutes of the morning rush fifty-four trains passed each junction point. For one hour trains are operated on an average headway of nineteen seconds. Between 5 p. m. and 7 p. m. 54,000 passengers take trains on the Union Loop. Between 5:15 p. m and 6:15 p. m. 40,000 take trains on the Union Loop.

THE SLEET QUESTION

Much interest was manifested in the precautions taken to prevent the accumulation of sleet, and many questions were asked Mr. Brinckerhoff about this. The Metropolitan Elevated uses wire brushes in advance of each contact-shoe, and if the ice gets very thick, as happens about once in two years, a man is put on each motor car to hold a spud or hand scraper on the third rail in advance of the contact-shoe. Ordinary gardeners' spuds are used, being bought in quantities from the regular hardware dealers. The brushes, however, Mr. Brinckerhoff stated, would take care of any ordinary sleet. The Lake Street Elevated uses a scraper with several blades instead of a brush. This was devised by the former general superintendent of those roads, Frank Hedley. It is very efficient, but could not be used on the Metropolitan Elevated because of the wooden sections in the third rail, where the third rail is interrupted, and where it is necessary to have an incline for the contact-shoe to run up onto the level of the third rail. The incline approaches to the third rail at the special work on the Metropolitan are all made of wood, and a scraper would destroy them. While there is no doubt as to the efficiency of the Hedley scraper it more than is necessary for ordinary work.

In regard to the use of brine to prevent the accumulation of sleet the corrosion caused by the brine was very objectionable, mainly on account of its effects on the rail-bonds. It also had a tendency to coat over the insulators and cause leakage.

The feeders on the Metropolitan Elevated consist of iron rails run in boxes between the tracks. Recent third-rail construction had been done principally with a special rail having a low percentage of carbon, and consequently too soft to be fit for track rail work. By using a rail with a low percentage of carbon a conductivity of 1 to 7, as compared to copper, could be obtained, while with the ordinary composition of track rail the ratio of conductivity was only about 1 to 10.7.

THE DEAD MAN'S HANDLE

Feb. 12, 1903.

EDITORS STREET RAILWAY JOURNAL:

A certain practical question has come up in connection with the operation of the type-M controllers, made by the General Electric Company, for train control, and recommended also for all very heavy motor equipments where the use of a cylinder controller is inadvisable because of the heavy currents that must be broken at the controller. The controller handle of the master controller on the type-M control has what is commonly known as the "dead man's handle," which is a knob or button placed on top of the controller handle, which button must be depressed as long as current is on the motors. Whenever this button is released the current is cut off from the motors, without regard to the position of the controller handle at the time. The object of this, of course, is to shut off the current in case the motorman should drop dead at his post or become otherwise disabled. I think it is admitted by everyone that this provision made by the manufacturers to prevent accidents through the disabling of the motorman is a wise one. It has at various times been urged against the usual practice in electric traction as compared to steam locomotive practice, that the former places the entire control of the train in the hands of one man. This objection the "dead man's handle" overcomes. However, when we get this type-M control into practical operation on interurban lines where there are long runs without shutting off the current, there come at once complaints from some of the motormen that the holding down of this controller-handle button constantly is a nuisance, and adds to the daily wear and tear on a motorman more than is necessary. Now comes the question, whether the superintendent is justified in allowing the motorman to plug up this "dead man's handle" so that it will be inoperative, and so that the motorman can take his hand away from the controller while the current is turned on. Is the safety to passengers which is given by the "dead man's handle," when it is operative, of less value than the added comfort to the motorman when the "dead man's handle" is plugged up? I think the majority of superintendents do not want to add to the burdens of the motorman any more than is necessary. At the same time a road is not being run for the comfort of the motorman, especially when the safety of passengers is at stake. I think an exchange of opinions on this question right at this time, when the "dead man's handle" feature is being introduced, may be worth while.

SUPERINTENDENT.

ELECTRIC RAILWAY ENTERPRISE IN PORTO RICO

Mention has already been made of the plans for building an electric railway system in Porto Rico, and the awarding of the contract for this installation to the Vandegrift Construction Company, of Philadelphia. J. N. Vandegrift, vice-president of the company, who has just returned from the island, where he has been engaged in directing preliminary operations, announces that the route has been selected and the general plans adopted for the equipment.

The line of railway is 80 miles in length, extending from San Juan to the valley of the Rio Loiza, and thence through Caguas and Cayey, the former being in the center of the sugar and the latter in the heart of the tobacco and coffee belt. From Caguas to Coamo, a distance of about 18 miles, the line will be constructed with comparatively heavy grading, and the Cordillera will be crossed between these points, with a maximum ascending and descending grade of 4 per cent and a summit tunnel of about 1100 ft. in length. From Coamo the line passes Coamo Springs, with its famous thermal baths, where a pretentious hotel has obtained a popularity for many years throughout Spain and the West Indies. The line will be constructed from Juana Diaz to Ponce, a distance of about 8 miles, upon the side of the Military Road, and will also extend from the Plaza at Ponce to the Playa or Port of Ponce.

The roadbed throughout will be constructed on standard gage, with 70-lb. T-rails, connected by No. 0000 Protected copper bonds. Standard ties, spaced 2 ft. centers, will be used, partly of creosoted pine and partly native woods. The line will be ballasted throughout with rock.

There will be several small bridges of 20 ft. to 40 ft. spans, which will be constructed of steel girders, with masonry or concrete abutments, and one large bridge near San Juan, about 1500 ft. in length, which will be constructed of steel girders, with concrete steel tubular piers, supported by pile clusters.

The overhead construction will consist of standard flexible bracket construction, except where centers of streets in the towns along the line are occupied, and then span construction will be employed. A No. 0000 trolley wire will be used, in connection with a three-phase alternating-current transmission line.

Water-power will be utilized at two points in the interior of the island to generate electricity for railway, industrial and lighting purposes.

The power plant at Comerio Falls, on the Rio de la Plata, will develop about 3000 hp. The dam will be about 200 ft. in length and about 40 ft. in height, and will be connected with the turbines at the power station by a short canal and steel pen stocks, feeding directly twin turbine horizontal water-wheels, direct connected to two 400-kw generators, alternating at 400 volts. Step-up transformers will raise the voltage to 15,000 volts and 30,000 volts for the transmission lines, depending upon the distance of the railway section to be fed. An additional dam will be erected on the Rio Loiza, near Caguas, about 600 ft. in length and 30 ft. high, which, with the storage reservoir, will develop about 5000 hp. A canal about 900 ft. long will connect with pen stocks at the power station, which will contain similar turbine and electrical units to those described. This dam will be convex in plan, to resist the current of the river during the rainy season, and will embody the most substantial masonry construction, as will the power station and foundations. The latter will be of a concrete in a monolithic block for the five 1000-hp units proposed to be installed.

The cars will be of the modern interurban high-speed type, about 45 ft. in length, with center aisles, cross reversible seats, smoking compartments, parcel racks, toilet and all conveniences of steam coaches. The cars will be equipped with four 50-hp motors each, designed to maintain a maximum speed of 50 miles per hour, thus enabling the through run to be made between San Juan and Ponce in three and one-half hours. At least sixteen of these cars will be at present provided with two additional Pullman buffet cars for the rapidly increasing tourist travel which is developing in the island. The major part of the traffic will, of course, be freight business from the interior of the island, including sugar, coffee, tobacco and fruits to the coast ports at San Juan and Ponce, for foreign export as well as for local consumption in these two cities. It is proposed to install at present, for the handling of this business, fifteen large freight motor cars, and at least thirty standard flat cars and box cars, besides two electric locomotives. The line will serve 260,000 people, passing through the heaviest populated section of this densely populated island, which has about the same area and population as the State of Connecticut, and is, at present, without passenger transportation, except in coaches at the rate of 10 cents per mile, with freight transported by ox teams at an average charge of 30 cents to 75 cents per ton per mile. As the exports from Porto Rico during the last two years have been increasing at the rate of 50 per cent over those of the preceding year, the freight business is likely to be enormous. The region through which the road passes is one of the most fertile and productive sections of the globe; but has, for centuries, been retarded in its development by adverse political conditions and entire lack of modern transportation facilities. The products of the island besides sugar, tobacco and coffee are oranges, bananas, pineapples, cocoanuts and all known varieties of tropical fruits, and the culture of fruit and the planting of large groves of oranges is being rapidly pushed, now that free trade with the United States has been secured. The franchise to the Vandegrift Construction Company for this railway and industrial enterprise, including lighting and industrial power, allows three years for the completion of the work. The cost is estimated at $2,800,000.

HARVARD ENGINEERING SOCIETY

At the regular meeting of the Harvard Engineering Society, in Cambridge, Mass., on Thursday evening, Feb. 19, Chief Engineer Howard A. Carson, of the Boston Transit Commission, delivered a lecture upon the East Boston Tunnel, and showed stereopticon views of Boston Harbor, South Boston and East Boston, Fort Winthrop, the Cunard Docks and numerous views illustrating methods of tunnelling. A brief history of the development of the tunnel project and the work of the Boston Transit Commission was given, including the litigation which greatly delayed actual work on the tunnel. It was originally planned to run the tunnel beneath the harbor in such a way as to strike the existing subway at Hanover Street, and effect a physical connection with it at that point. The distance through to Scollay Square by this route was 1.4 miles. When the tunnel reached Lewis Street, on the East Boston side of the harbor, the route was changed, so that the tunnel now passes from Maverick Square by Lewis Street, across the harbor to Long Wharf, and thence up State Street and Court Street to Scollay Square. Last week the Boston Elevated Railway Company gave permission for the tunnel to pass under the existing subway. At first it was thought desirable to connect the tracks of both subway and tunnel at Scollay Square, but a closer study of the traffic problems brought out the conclusion that no advantage would be derived from such a course, on account of the present large traffic of the subway and the undesirability of adding more cars or trains to its already heavily burdened tracks. The grade from Maverick Square west is 5 per cent, as the law fixes the exit point and depth at the Harbor Commissioner's Line. The top of the tunnel is 5 ft. below the bottom dredging of the harbor, in order to escape anchors, and to be free from accident in case a vessel should sink over the tunnel itself. Under the harbor the grade is one-half of 1 per cent, with a 2½ per cent grade coming up under Long Wharf.

Stations are located at Maverick Square, Atlantic Avenue, corner of State Street, Congress Street at the old State House, and Scollay Square. Thus when the present transportation facilities are extended by the addition of the Washington Street Subway and the East Boston Tunnel, there will be not over a quarter of a mile walk between any office in the business center of Boston and the nearest subway or elevated station.

Mr. Carson then gave a brief sketch of the history of tunnel building since the time of Brunel, who finished the Thames tunnel in 1842, describing the improvements in method adopted by Cochran, Barlow and Greathead, the latter being the first to use screw-jacks for forcing the construction shield ahead. Among the tunnels which he mentioned were the City and South London, which was started in 1886, with tubes 10 ft. 2 ins. to 10 ft. 6 ins. inside, and 3½ miles long, and the Hudson River Tunnel of 1879, which was begun by Colonel Haskins, who used compressed air in its construction. He stated that the walls of the new East Boston Tunnel are of concrete, and that the Tremont Street subway in Boston was the first tunnel in the world to be built by running a roof shield inside the walls. He then closed his lecture by a description of tunnelling in connection with the Boston sewage system.

INNOVATION IN ELECTRIC RAILWAY SERVICE

There is now before the Massachusetts Legislature a bill which, if it becomes law, will establish an important precedent in future electric railway work in that State. The bill accompanies the petition of Frederick Winsor, John B. Paine, Chas. J. Paine, Jr., W. B. Chamberlin and H. C. Sweetser, asking to be incorporated as the Concord & Chelmsford Street Railway Company, to run from Concord to Carlisle and Chelmsford, there to connect with the Northern Street Railway for Lowell. The Middlesex School for Boys is located on the road from Concord to Lowell, via Carlisle and Chelmsford, and is about 3 miles from Concord Square. The only way in which those residing at the school can now reach the steam railroad stations, the town hall, churches, stores, postoffice and banks in Concord village is by carriages, barge transportation or walking, and all freight, merchandise and supplies for the school have to be teamed over the road. Mr. Winsor is head master of the school.

The village of Carlisle is also practically cut off from all connection with the outer world except by similar conveyances. Scattered along the line of the proposed street railway are numerous farms, and if the new company should secure the right to carry freight, which it asks, it would be a great relief to their owners, as it would enable them to reach the market more easily. All of the classes here referred to are extremely desirous that the road shall be built.

The promoters of the enterprise assert that electric street railways are now here to stay, and that the points for legislatures and municipal boards to consider now when charters and locations are asked for have narrowed down to the following: Are the terms of the proposed charter reasonable? Are the public interests properly safe-guarded? Do public convenience and necessity require the construction of this road? Are the proposed route and locations the best available? Will this road be built and operated?

The petition of the company which asks to be allowed to carry freight is not now as novel a proposition as it was in Massachusetts a few years ago. The steam railroads are naturally objecting to this feature through self-interest, but there seems to be no valid reason why this and other electric railways should not be granted the privilege under proper regulations. It would, of course, be unfair to the steam road to allow any electric road to take away a freight business which the former was already doing without imposing similar restrictions upon the latter. It has been pointed out, however, that a large class of people would be greatly benefited if the electric roads were allowed to carry freight; that is, farmers and market gardeners. There is no reason, for instance, why the farmers and market gardeners of Concord, Carlisle, Chelmsford and other Middlesex County towns and similar communities should have to team their products 20 miles or 30 miles to market two or three times a week, and some of them daily. There ought to be facilities for daily shipment on electric freight cars running close to their farms, and it is undoubtedly true that the near future will see such lines established.

The second important feature of the bill is the provision to give the proposed company permission to run over private land, which has been taken by right of eminent domain. Counsel of the steam roads of the State vigorously oppose this proposition, but the advocates of the bill urge it on the ground that private right of way is safer and cheaper than public highway. Furthermore, it is pointed out that permission to carry freight is now not an unusual request, and so far as the taking of private land by the right of eminent domain, a similar charter was granted to the New York & Berkshire Street Railway Company by the Legislature of 1902, and the bill was approved by former Governor Crane, who is famous the country over as a keen business man and able guardian of the people's interests. It is argued that certain property owners, over whose land the company wishes to run, are so strongly opposed to any electric railways being built near their premises that the taking of the land by right of eminent domain offers the only feasible means of securing a location for the tracks. The length of the proposed line is about 10 miles, and for the larger part the company wishes to run over private land. Public convenience and necessity require the construction of the proposed road and there is a strong probability of its being built.

NEW RAPID TRANSIT BILL

Senator Elsberg has introduced a New York City rapid transit bill, which, he declares, is not intended to affect existing rapid transit work or the provisions of the present law with respect to either the contract already made or the railroad now in process of construction. The proposed bill, however, gives broader powers to the Rapid Transit Commission with respect to the extension, obstruction and operation of rapid transit railroads in the future, but it is not aimed at the constitution or organization of the present Rapid Transit Commission.

Senator Elsberg explains that under the present law the railroads to be built and owned by the city must be handed over to private control, theoretically for not less than thirty-five years, practically for seventy-five years, as in the case of the road now under construction. This compulsory alienation of city control over its own railroads is eliminated by separating the construction contract from operation and leaving to the Commission all the power and authority it now possesses to lay out and construct new roads at the city's expense.

The bill adds to its powers in this regard by eliminating the provision of the present law, which requires a cash deposit of $1,000,000 from every contractor in addition to whatever bond the Commission may require. The whole matter of cash deposit is left to the discretion of the Commission. This will make possible the letting of contracts by sections and the saving in the future to the city of millions of dollars of construction work. The Board of Rapid Transit Railroad Commissioners is to have full control of all future roads and their appurtenances when constructed.

It may contract for the equipment at private expense and for operation, for a period not exceeding twenty years; or it may equip at the expense of the city and contract for operation for a period not exceeding ten years, with renewals in either case.

OFFICE CONFUSION

BY ACCOUNTANT

To one who has had the opportunity of visiting many street railway offices—accounting and operating—there comes the thought how these offices appear to other eyes than his own. And he also wonders how they appear to those who have built and arranged them as they are, or, in other words, to those who are responsible for the present condition under which the companies meet their public and their visitors from other localities.

At first thought it would seem that all railway offices would, of necessity, be more or less alike—that the nature of the business would make them so. But the actual facts prove that this is far from the fact. Individuality plays an important part, and it is not as far from the truth as it seems to say that the general condition of the company and property can, in a measure, be gaged by the condition of its general offices.

As an instance, not long ago the writer had occasion to visit the offices of an important railway company. After entering a large and splendid building, which was entirely devoted to the company's purposes, he could not find any sign or directory of the location of the different departments nor any one to give such information. So it became necessary to try doors—without signs upon them—until some one was found to assist in the location of the officer wanted. Now, this company is in a prosperous condition, but its operation is more or less "happy-go-lucky," and so is the office.

It seems that a company would always serve its own interest by thinking how the public is going to find its way around when bent on doing business with it in its own home.

The most pronounced discord in office arrangement is the habit of piling packages and books under desks, on the top of cupboards, on window sills and in other prominent places. These packages are usually of various sizes and always dusty, and they are nearly always subject to doubt as to what is in them. I call this a habit, because there is rarely much excuse for it. Every office has a place for filing records, sometimes not large enough, it is true, but it is safe to say that there is always a corner or other vacant spot into which shelves may be placed for the receipt of whatever it is necessary to save but is not valuable enough to file in the vault. Such open shelves are easily hung with roller shades or soft curtains to keep out the dust—the expense is small compared with the benefit derived.

Papers so filed should be carefully labeled. This is of as much importance as the labeling of a book upon its back, frequently more so.

This brings up the relative merits of filing papers in packages wrapped and labeled or in compact pasteboard boxes labeled on the ends. It is a subject for each company to decide as the element of expense enters into the question, but the special boxes have advantages in the matter of space filling and ease of handling which sometimes offset other expense.

I am also led to wonder, while on the subject, if the office manager has ever gone through his office and opened every drawer of desks and tables as a sort of inspection tour? There are matters always covered up, and the result of such an inspection will be a surprise, I assure you. Not so very long ago the writer made an examination of a property whose office was in such condition that little headway could be made until the office force took a half-day off and got the safe, vault and desks in something like order. I am convinced that this example is not a wide exception, but only in degree.

The first excuse for confusion is lack of time and lack of office help, but it is a rare case where the habit of proper filing takes more time and more help than the lack of it. The habit of confusion is a bad one, and usually, if not always, the office manager is the one at fault, for it is well understood that his ideas govern the methods of work. The habit of system and precision is easily formed, and in the end it saves money to the extent of ease in locating papers, and it is not unknown that a clean and well-regulated office is an asset of the office manager. I know of one instance where an orderly office—all else being equal—gained an invitation to join another company to an office man who, with the impetus gained from the new connection, coupled with his orderly habits, has since materially widened the space between himself and the man with whom he was compared.

It is not necessary to enlarge upon or discuss the relative merits of cleared flat-top desks and filled roll tops, for each may be clean or may be filled. Each has advantages of its own, but it is well to touch upon the subject that in plans for new offices consideration may be given it.

It should be borne in mind that the office is not simply a place in which to do the office work of the company; it is also the place where the public is received, and it is an important point of contact where courtesy and cleanliness will have much to do in solving or dissolving difficulties.

There is a well-known saying that a man entering an office in clean clothes, clean linen and with a business-like demeanor, will always receive more consideration than one whose linen is soiled, and whose face is dirty and unshaven. Can this not be applied in reverse order? I think it can.

Many companies at the present time prohibit smoking on the part of the office employees, for the reason that it is not only offensive in a closed room, but it is expensive in the point of companies' time consumed keeping the tobacco lighted and picking it up and laying it down. But the cuspidores for the chewers are just as large and numerous under your feet as ever.

From boyhood up to be "business like" is impressed upon the youngster as one of his best targets at which to shoot his new ideas, but later, in the anxiety to get results, office appearances are liable to be overlooked as part of the definition of business like.

May be it is not fair to compare the order of one's home with one's office, but it is worthy of some thought, and at any rate the office is the home of the company.

It may be said that these things do not have any effect upon the success of the company, but I have not touched upon the mental attitude of the clerks nor of the officers themselves while working in clean, orderly offices, as compared with those in confusion, nor upon the ultimate effect upon the work itself, the consideration of which will be answer enough.

There is no desire to scold in this article, but simply "to stir up by putting in remembrance" a condition which has grown up as a habit and been overlooked. Details are watched very carefully at the present time, and this is an important detail.

NEW POWER HOUSE AT DUBUQUE

Among the important improvements which will be made by the Union Electric Company, of Dubuque, Ia., the coming season is a new power house for railway and lighting purposes. There will be two 2500-volt three-phase alternating direct-connected units of 500-kw capacity, and two direct-current railway units of the same capacity. Sargent & Lundy, of Chicago, are making the plans for the new station. F. L. Dame, formerly of Tacoma, took charge of this property recently as general manager.

About $400,000 will be expended in improvements, including the new power house and also a car house and additions to park facilities, together with some new rails.

The Twin City Rapid Transit Company has closed a contract with the Christensen Engineering Company for 176 air brake equipments, which will completely equip all of the Twin City Rapid Transit Company's double-truck cars.

FINANCIAL INTELLIGENCE

The Money Market

WALL STREET, Feb. 28, 1903.

A general hardening of the rates for time money during the week is the natural outcome of the very rapid depletion in bank resources which has been in progress since the beginning of the month. Last Saturday's Clearing House statement showed that this process has by no means exhausted itself. An expansion of $13,000,000 in loans combined with a loss of over $3,700,000 in cash, brought down the surplus reserve to $9,000,000, which is not only well below the corresponding figure of last year and the year before, but is the lowest for the period in the last fourteen years. The reasons assigned for this condition are, first, that the interior markets have begun to draw freely upon their New York deposits, as they are accustomed to do at this season; and, second, that heavy borrowings are in progress outside the Stock Exchange, the purpose of which is not altogether clear. Either the financing of syndicate undertakings are the cause of these heavy demands or else loans are being shifted in quantity from Europe to this country, taking advantage of the ease in home money rates as compared with those abroad. Very likely it is neither one nor the other of these factors, but both of them in a certain degree, to which the recent loan increase is assignable. Obviously, however, a halt must very soon be called to this wholesale creation of new bank liabilities or the situation in the money market will become uncomfortable. Already the average of loans from sixty days to four months, which a fortnight ago was 4 per cent, has risen to 4½ per cent. The interior currency requirements, moreover, must be expected to continue for another month at least, and the outgo through the Treasury will more likely increase than diminish. If on top of this loans were to be extended at the pace of the last four weeks it would very quickly use up the remaining surplus reserve and bring about a more or less serious pinch in the market. We do not, however, expect to see this contingency actually realized. In the first place the rise in money rates that has already occurred has eased the exchange market sufficiently to preclude all idea of gold exports. Secondly, we are in a position now to draw exchange against anticipated credits abroad, that is to borrow from Europe, and this will act as a check upon our loan expansion if it does not produce some decrease of loans. Finally, the higher money market which is bound to accompany the low bank reserves will modify the cash withdrawals by other domestic centers and will postpone the collection of cash by the trust companies in compliance with the recent decision requiring them to keep reserves of their own. Surplus will probably continue to shrink for the next few weeks, and money rates will doubtless work higher, but the present resources on hand ought to suffice to tide over the interval before the season of increasing money supply and rising bank reserves in April, May and June.

The Stock Market

During the four business days which have intervened since the last of these articles nothing of importance has occurred to change the position of the general stock market. Prices as a rule have had a downward inclination, but there have been frequent interruptions in the shape of sharp recoveries and certain stocks have moved rather vigorously against the general tide. In this last-named category may be mentioned in particular Copper, Sugar, the Wabash issues, St. Louis and San Francisco and one or two securities of less note. In most of these instances special incentives have appeared which would account for their advance even in face of an unfavorable market position. But it is also clear from these individual advances, as well as from other indications, that the present market is pretty well under control of the cliques, and that the supply of stocks which might be dislodged by a decline is comparatively small. This being the case, good judges do not look to see any bear campaign make much headway. They admit that the chances are against any general rise for some little time, but they expect to see irregularity and inertia occasionally relieved by rapid movements in specialties, rather than any important weakness. The money market is now, and seems likely to be, the controlling influence in the speculation. When this difficulty is removed, as is hoped for, in four weeks or so, it will be time to consider the prospects for a reversal of the upward movement which outside financial and business conditions plainly justify.

Interest in the local traction stocks has centered around the "raid" upon Metropolitan shares, which met with some temporary success in the closing days of last week. The prompt denials of the sinister rumors which were circulated on that occasion has convinced everyone that the whole operation was nothing more than a bear manœuvre shrewdly planned and skilfully executed. There is certainly nothing in the published earnings of the Metropolitan Company which need have frightened genuine holders into selling. On the contrary, advantage was no doubt taken of the break to pick up some cheap stock. The pressure against Metropolitan also extended to Manhattan, which has been weaker than for some time past. The market for this stock has reflecting liquidation by speculators wishing to shift their capital into other quarters which seem to have better promise of activity. Brooklyn Rapid Transit showed more resistance than any of the others to the selling movement. Its action tends to inspire confidence in the ability as well as the intention of the inside interests to support the stock whenever circumstances require it.

Philadelphia

The rumor which was used to depress Metropolitan stock in New York was not without its effects upon the Philadelphia market, owing to the identity of interests between the traction properties of the two cities. Rapid Transit was the only one of the three leading issues, however, to show any weakness. The stock, which had risen to 15⅜ a week ago, broke sharply on Thursday to 14¾, and did not recover its lost ground. On the other hand, Philadelphia Traction held very steady at 99, and Union Traction at 47⅝. Accumulation of both of these stocks appears to be continuing. There were no other important transactions in the street railway securities during the weeek. Sales were reported in Railways General at 4½, Consolidated Traction of New Jersey at 65, and United Traction of Pittsburg preferred at 51, all of them unchanged from the last previous quotations.

Chicago

The latest gossip in connection with the Chicago traction deal is that J. P. Morgan & Company have been quietly picking up City Railway shares and have acquired a large block at private sale recently. This rumor finds as yet no confirmation, however, outside of speculative circles. A few lots of the stock have changed hands in the open market, some of it as low as 221, but the greater part at 225. Union Traction trust receipts, issued against deposits of the stock with the Protective Committee, were traded in for the first time this week, selling at 9¾ and 10. Union Traction common shares have been again rather heavy around 10. Desultory liquidation continues in Lake Street Elevated, with sales as low as 6¼ and only a fractional rally thereafter. Metropolitan issues, reflecting neglect more than pressure to sell, are weak, the common dropping to 34½, later recovering to 35⅛, and the preferred declining from 85½ to 84½. Northwestern stocks are also heavy, with scattering sales at 31 for the common and 70 for the preferred.

Other Traction Securities

What appears to be a fresh attempt to start speculation in the Massachusetts Electric stocks has proceeded with difficulty owing to the dullness of the general market. Nevertheless, the common got up at one time to 37¾, which is two points higher than it was two weeks ago, while the preferred rose from 92 to 92⅞. In both instances business was unusually active. Boston Elevated again did nothing, simply holding its own around 151. West End common sold at 97 and 96⅞, and the preferred at 115½ and 115. Profit-taking has been a feature in the United Railway securities on the Baltimore Exchange. Although the stock has hardly had any rise to speak of lately, it reacted from 14 to 13¼ on very light sales. The income bonds meanwhile fell off from 68¾ to 68½, and the general 4s from 97 to 96¾. Norfolk Railway 5s, after a long spell of inactivity, suddenly jumped up three points to 113. Nashville Railway shares sold at 4½, City Passenger (Baltimore) 5s at 108, Anacostia and Potomac 5s at 100, and Charleston Electric Railway 5s at 106. On the New York curb St. Louis Transit, after holding steady for a time at 30, broke suddenly on the sale of 300 shares to 28¾. Interborough Rapid Transit (50 per cent paid) sold down to 111 and then rallied to 111¾, while the full paid stock rose from 112 to 112½. American Light and Traction stocks

were in some demand, the common selling at 60 and the preferred from 95 to 96. San Francisco 4s, interest on, were comparatively steady around 81. Other sales for the week comprised: New Orleans preferred at 42 to 42½, the 4½ per cent bonds at 78½, Brooklyn City Railroad at 245½, Brooklyn Rapid Transit new 4s at 86, Nassau Electric 4s at 83½, St. Louis Transit 5s at 95 to 95½, United Railways of St. Louis 4s at 84¾, and Washington Traction 4s at 80.

Tractions were more active on the Cleveland Exchange last week. Sales numbered 2062 shares. The new Northern Ohio Traction & Light stock had a decided run, and sales numbered 1508 shares, advancing from 19½ to 24, with a small lot at 25. In view of the remarkable increase in earnings for this road, friends of the stock think it is due for a further advance. Cleveland Electric and Cleveland City were both weak with nothing to account for it. The former sold at 85 for 200 shares, the previous week's range being from 86½ to 88. A small lot of Cleveland City sold at 101¾, a decline from 105. The new Cleveland & Southwestern, which succeeds the Cleveland, Elyria & Western, established an initial quotation of 30, 100 shares selling at that figure. There were bids for more, but none offered. Two small lots of Lake Shore Electric common sold at 14 and 14½, and two small lots of Western Ohio receipts at 26¾ and 27.

On the Cincinnati Exchange tractions were unusually active. Sales numbered about 5500 shares of stock and about 250,000 worth of bonds. Cincinnati Street Railway sold to the extent of 1898 shares, ranging from 142 to 143. Cincinnati & Hambleton common sold for 1871 shares at from 44 to 44½. Cincinnati, Dayton & Toledo 5s had a pronounced run, and $191,000 worth changed hands at between 87½ and 88¾, the latter the closing figure. The Cincinnati, Dayton & Toledo stock sold to the extent of 372 shares, ranging from 38 to 39. Toledo Railway & Light Company sold to the extent of 797 shares, at from 35 to 36⅛. Columbus, Delaware & Marion 5s sold to the extent of $47,000 worth, all at 101.

Securities Quotations

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

	Closing Bid	
	Feb. 17	Feb. 24
American Railways Company	51½	51
Aurora, Elgin & Chicago	a36	a32
Boston Elevated	150½	150¾
Brooklyn R. T.	70¼	68¾
Chicago City	220	220
Chicago Union Tr. (common)	10	10
Chicago Union Tr. (preferred)	44	44
Cleveland Electric	86	84¼
Columbus (common)	—	70
Columbus (preferred)	104	105
Consolidated Traction of N. J.	64¾	64¾
Consolidated Traction of N. J. 5s	108	108¼
Detroit United	88¾	86
Electric People's Traction (Philadelphia) 4s	98	98
Elgin, Aurora & Southern	50¼	51½
Lake Shore Electric	14	—
Lake Street Elevated	7⅛	6¼
Manhattan Railway	143⅞	141⅞
Massachusetts Electric Cos. (common)	36½	36¼
Massachusetts Electric Cos. (preferred)	92¾	92
Metropolitan Elevated, Chicago (common)	35	34
Metropolitan Elevated, Chicago (preferred)	*85½	84½
Metropolitan Street	139½	137¼
New Orleans Railways (common)	14½	14½
New Orleans Railways (preferred)	40	42
North American	115	116
Northern Ohio Traction & Light	20¼	23¼
Northwestern Elevated, Chicago (common)	—	31
Philadelphia Rapid Transit	15½	14⅝
Philadelphia Traction	98¾	99
St. Louis Transit (common)	29⅞	29
South Side Elevated (Chicago)	110	109
Syracuse Rapid Transit	a32	a32
Syracuse Rapid Transit (preferred)	a80	a80
Third Avenue	125	124
Toledo Railway & Light	a36⅛	a36
Twin City, Minneapolis (common)	121⅛	119
United Railways, St. Louis (preferred)	—	—
United Railways, St. Louis, 4s	84¾	84¾
Union Traction (Philadelphia)	47⅝	47⅜

a Asked. * Ex-Div.

Iron and Steel

The tendency toward firmer prices in pig iron seems to have been emphasized, if anything, during the week. The bad weather has impeded the movment of railway traffic, still further intensifying the already serious freight blockade. This has reacted upon the iron market, increasing the difficulties of obtaining prompt delivery of raw material, restricting production of pig iron and stiffening prices. The Iron Age notes, however, that consumers are still clinging to the idea that they can obtain better terms for their second half-year requirements by waiting. Steel is quiet, with some inquiry for foreign billets, but no new business. Bars are active, and so is plate and structural material. In the last-named, builders have about given up all hope that they can obtain easier prices by delaying their purchases now. Quotations are unchanged on the basis of $22 to $23.50 for Bessemer pig iron, $30 to $31 for Bessemer steel, and $28 for steel rails.

Metals

Quotations for the leading metals are as follows: Copper, lake, 12.90 to 13 cents, tin 29½ cents, lead 4⅛ cents, and speiter 5 to 5.05 cents.

AMENDING THE PENNSYLVANIA RIPPER OF 1901

Senator Focht, one of those who put through the famous "rippers" in Pennsylvania in 1901, has introduced in the Legislature a bill to amend the elevated and underground railway act of June 7, 1901. The original act says that corporations may construct branches and extensions, but shall first file in the office of the Secretary of the Commonwealth a resolution of the board of directors approved by the stockholders giving the route of such branches and extensions. The part of the act is amended so as to provide that corporations incorporated under the act may construct branches and extensions, but that these shall first be filed in the office of the Secretary of the Commonwealth a resolution of the board of directors approved by the stockholders giving the route of such branches and extensions, and every company incorporated under the provisions of the act is authorized and empowered, with the consent of the local authorities of any city, borough or township within which said railway is located, to abandon any portion of its road without prejudice to its right to operate or complete and operate the remaining portion of its railway by appropriate action of its board of directors with the aproval of a majority of its stockholders. The amendment further provides that every company incorporated under this act shall have the right to use any part or all of the tracks of any other company incorporated under this act, provided the consent of such other is expressed by a resolution of its board of directors and ratified by a vote of a majority in value of the stockholders of the company. Such use may be exclusive or in conjunction with such other company as the said companies shall agree, and companies incorporated under the original act are to have the right to merge their several rights, privileges and franchises with other companies so incorporated whenever in the opinion of the directors and stockholders of such companies it shall be for their mutual interest. However, such merger is not to take place until a resolution to that effect has been adopted by the boards of directors of the respective companies. It is also provided that "whenever two or more roads shall be merged the commencement of work in good faith upon any part of the route of any of such merged roads shall be held to be a commencement upon all the merged lines or roads within the meaning of this act and a complance with the provisions hereof as to the time within which work must be commenced, provided, however, that the work shall be completed within five years upon all the said merged roads unless the time for such completion shall be extended by the proper local authorities of the city, borough or township within which the said roads are located."

NO STRIKE ON THE CHICAGO CITY RAILWAY

Danger of a strike of the employees of the Chicago City Railway Company has been removed by the action of the employees in deciding to submit their differences to a board of arbitration. The arbitrators are to be selected within a few days, and they will begin at once the work of taking testimony. A joint committee of the union appeared before General Manager McCulloch, of the company, on Feb. 20, and each of the committee was presented a written reply containing the arbitration offer. After a few hours of deliberation the employees decided to accept the offer.

NEWARK GRADE CROSSING ACCIDENT

A trolley car crowded with boys and girls on their way to school was wrecked at Newark, Feb. 19, on a grade crossing at the foot of the slight hill in Clifton Avenue. The rails were slippery and the motorman was unable to control the car. It crashed through the railroad safety gates that had been lowered, and out on the Delaware, Lackawanna & Western Railroad tracks in front of an eastbound express train. The trolley car struck the locomotive in front of the engineer's cab, and the train tore the car to pieces, killing eight of the young passengers and injuring twenty-six more, some seriously. One has since died from injuries.

The crossing where the accident occurred lies between two hills, over which the tracks of the North Jersey Street Railway Company run along Clifton Avenue. On the south of the railroad the hill rises at a grade of about 5 per cent for a distance of a little more than one block, or to a point a short distance beyond Orange Street. On the north the incline is about the same, but in that direction it rises for a little more than three blocks.

Trolley cars going north or south on the Clifton Avenue line are required to stop at the bottom of the hill before proceeding across the railroad tracks. Crossing gates are lowered at the approach of a train, but whether these gates are up or down, the stop must be made, according to the rules of the street car company, and the conductor must go ahead and see that the tracks are clear before the trolley car crosses. The slippery rails made all of these precautions worthless, as the motorman lost control of the car absolutely.

An investigation has been in progress since the accident, in which business men of the city and the officials have co-operated. A meeting was held before the Board of Works, at which Vice-President David Young, Superintendent Charles M. Shipman and Trackmaster A. W. Pratt, of the North Jersey Street Railroad Company, and ex-Chief Engineer McFarland, of the Delaware, Lackawanna & Western Railroad, appeared.

Mr. Young produced a contract signed in June, 1898, by Superintendent Reasoner, of the railroad company, in which it was agreed to co-operate with the trolley company in installing at the Clifton Avenue crossing a derailing device, to be locked automatically by electricity and operated in connection with the block signals of the steam road whenever a train approached within 1200 ft. of the crossing. That would make it impossible, according to Mr. Young, for a trolley car to go within 75 ft. of the tracks at this crossing until a train had passed, when the rails could be switched into place again. Mr. Young further stated that a similar system had been installed at the Bloomfield Avenue crossing of the Lackawanna and the trolley line, and had worked well since 1899. The switches for the system, Mr. Young continued, had been hauled to the Clifton Avenue crossing, but Chief Engineer McFarland had refused to co-operate with the trolley company, and the system never was installed. The switches finally were hauled away.

Mr. McFarland denied that he had ever heard of such an agreement, and said that the device described could not be operated successfully where there were trains passing every few minutes throughout the day.

"When a signal showing that a trolley car was approaching was seen by our engineers," Mr. McFarland is quoted as saying at the hearing, "they would heed it were the signals made not too frequently. But where they were there every few minutes, as at Clifton Avenue, the engineers soon would disregard the signals. They would simply say: 'Oh, that's only a trolley car; it will be across before I get there.' "

"Do you mean to say that your engineers would deliberately disregard a danger signal?" exclaimed Mayor Doremus, in amazement.

"Well, human nature is human nature," was the reply. "I don't believe in making the danger signal too common."

It was finally decided by the Board that the steam and trolley railroad officials should confer and report to the Board a plan for installing a derailing system at the crossing immediately.

When asked after the meeting regarding the statements that no evidence of sanding could be found on the rails on which the trolley car had slipped, Superintendent Shipman said:

"The forward part of the car was smashed to pieces, and I cannot say of my own knowledge whether there was any sand in the sand-box at that end or not, but I do know that the sand-box at the rear end of the car was two-thirds full of sand, for I myself filled my hat with sand from that box after the accident, to put on the rails to enable the assisting car to haul it away. All our sand is heat dried, and runs freely from the box. Furthermore, I want to contradict the report that the car was fitted only with a hand-brake. It was fitted with an electric brake of the latest pattern. There is not the slightest doubt but that the wheels of that car were locked and that it slid along as would a sled. No brake could stop it. Furthermore, we not only have sand in our cars, but in bad weather we have special men stationed at bad declivities like that at Clifton Avenue, whose business it is to keep the tracks sanded. We had a man there Thursday morning, and there was sand on the tracks."

On Feb. 24 the special committee appointed by the Board of Trade to investigate the cause of the trolley wreck submitted its report to the Grand Jury with an urgent request that immediate action be taken by that body. At a meeting of the Board of Trade a communication from a member of the committee was read, charging the company with negligence.

ANOTHER ACCIDENT AT ORANGE

A trolley car of the Orange & Passaic Valley Railway, laden with men and women on their way to work, crashed through the lowered gates of the Lackawanna Railroad at the Orange Station, and stopped with its fender under one of the cars of a train which was just about moving out of the Orange Station on Tuesday morning. The trolley car was going down a grade which is near the crossing, and the motorman, John Ober, who was discharged by Superintendent Ely immediately after the accident, lost control of the car, and in his haste forgot to use the sand-box.

Ober explains the accident by stating that there were a number of people in the car who were desirous of catching the train which was standing in the station, and he raced for it. When he tried to stop he found he could not. People in the car saw their peril, and there was an immediate panic and a wild scramble to get out of the car. Many received bruises and scratches in the stampede.

The wreckage at the smashed gate had barely been cleared away when along came another car of the same line down the hill, and the motorman of this car, too, lost control of the vehicle. There was no train on the crossing, but there was a milk wagon, and into this the car ran full tilt, partially wrecking it and knocking the horse down.

FAST RUN ON ELECTRIC ROAD

Car No. 53 of the Schenectady Railway Company, which is operated on the Albany Division of that company's system, made a remarkable showing in a recent trial run during the regular hours of traffic. A run from the Federal Building, in Albany, to the car houses in Schenectady, carrying several officials of the road, was made in 20 minutes and 22 seconds. Taking into consideration the time lost by running at the rate of 8 miles an hour within the city limits of Albany and Schenectady, as demanded by the ordinances of these two cities, it is estimated that the car must have made through the country section of the division over 2 miles a minute.

Since the time this test was made the car has demonstrated that the regular run between this city and Albany, carrying eighty people and more, can be made in less than 30 minutes. Much of the credit for this remarkable performance is attributed by the officials of the railway company to the installation of two new trucks built by the J. G. Brill Company, of Philadelphia, and known as No. 27-E-2. The exact time made on the run was 20 minutes and 22 seconds, and the distance covered was 15.01 miles, of which 2.49 miles were within the city limits of Albany, and 1.96 miles within the Schenectady limits. Three dead stops were made along the route. Four new motors have also been put in position under the car, furnishing 500 hp. All of the cars in the system are to be similarly equipped.

OFFICIAL FIGURES OF THE RAILWAYS OF CANADA

The annual report of the Department of Railways and Canals of Canada is in press. The report contains statistics of all the railways in the Dominion, and is to a great extent an index of Canada's growth. The report this year shows many marked increases, and below are given the official figures in regard to the electric railways of the Dominion: There are 558 miles of electric railway laid. The gross capital invested is $41,593,063, of which municipal and other aid composed $173,000. The number of miles in operation is 557. The gross earnings were $6,486,438; increase, $778,155; the working expenses, $3,802,855; increase, $367,692, leaving the net earnings $2,683,583; increase, $350,463. There were passengers carried, 137,681,402; increase, 16,744,746. Freight carried amounted to 266,182 tons; decrease, 21,744 tons. The car-mileage was 35,833,841.

FROM ROCHESTER TO GENEVA

Work on the Rochester & Eastern Rapid Railway, now under construction from Rochester through Canandaigua to Geneva, is being pushed just as rapidly as the present severe weather will permit, and the prediction is made that the road will be in operation between Rochester and Canandaigua early in July.

The roadbed between Rochester and Canandaigua has been entirely graded, and a portion of the track has been laid outside of the city limits. Active preparations are being made to complete the laying of track as soon as the ground is in condition in the spring. These preparations consist of the hauling and distribution of rails and ties along the line. With the exception of a short distance outside of Rochester and in the villages through which the line will pass, the road is being built on a private right of way. The original route along the public highway has been almost entirely abandoned. The route which has been substituted is shorter, straighter and more direct, there being but two sharp curves along the entire line.

The power station is being erected at Canandaigua, and is in an advanced stage of construction. The building proper is practically completed. The foundations for the machinery are completed, and the installation of the apparatus will be begun at once. In addition to the main station at Canandaigua, there will be three sub-stations. The contract for all the electrical apparatus for these stations is held by the Westinghouse Company. The equipment is to include two 650-kw 390-volt three-phase engine-type alternators, which will be direct connected to cross-compound engines running at 150 r. p. m.; seven 300-kw three-phase rotaries; four 500-kw and nine 200-kw oil-cooled transformers, arranged for stepping up the current to 16,500 volts, and two 37½-kw direct-current engine-type exciters operating at about 320 r. p. m.

The contract with the Westinghouse Company also includes switchboards, high-tension switches and lightning arresters for the main generating station, and three sub-stations. The Comstock-Haigh-Walker Company is building and equipping the road.

INCREASE IN WAGES OF EMPLOYEES OF THE MASSACHUSETTS ELECTRIC COMPANIES

The Massachusetts Electric Companies, controlling all the electric street car lines in Eastern Massachusetts outside of Boston, have granted the request of their employees for increased wages. The decision was announced Feb. 15. It affects 2522 conductors and motormen, who are divided into six classes, the average increase for all being 12.18 per cent, or $154,667, based on last year's pay rolls. The classification and increase is as follows:

In class No. 1, 26.25 per cent; an increase from nominal to 18 per cent.

In class No. 2, 15.42 per cent; an increase from nominal to 5 per cent.

In class No. 3, 18.36 per cent; an increase from nominal to 10 per cent.

In class No. 4, 18.52 per cent; an increase from nominal to 15 per cent.

In class No. 5, 11.10 per cent; an increase from nominal to 20 per cent.

In class No. 6, 9.55 per cent; an increase from nominal to 25 per cent.

Men in class No. 1 at present receive rates varying from 17 to 20 cents per hour. Twenty-three per cent of the total number of this class receive an increase varying from 11 to 18 per cent, and 50 per cent of them will within two months be advanced to class No. 2.

THE SITUATION AT WATERBURY

There is no change in the situation at Waterbury, Conn, where the employees of the local railway lines of the Connecticut Railway & Lighting Company are on strike. Cars are still operated under the protection of the police, but, despite this, acts of violence continue. For the most part the demonstration are confined to stone-throwing, but in the outlying districts plots to dynamite cars have been discovered. As a safeguard to passengers, the windows of some of the cars now in operation are covered with heavy wire netting. On Feb. 23 the motorman of a car was stoned by the occupants of the labor union 'bus, and was knocked senseless. A new feature of the strike developed Feb. 23, when six lamp trimmers, who trim the electric arc lamps which light the city, went out on strike. Power-station employees were called upon to do the work of these men, so the lighting service was not seriously affected.

SOLIDIFIED OIL

The term solidified oil has probably never before been applied to a lubricant, yet it is, however, an exact description of a lubricant now being placed on the market by the Bruck Solidified Oil Company, of Boston. It is distinguished from saponified oil or grease by the fact that, although it is solid, it contains absolutely no alkalics, acids, chemicals or water. It is a pure mineral oil, whose specific gravity before solidification is 23; fire test, 450 to 475, and viscosity, 375. The most remarkable property of this lubricant, however, is its ability to withstand heat and cold. It requires 250 degs. of heat to melt it into a liquid. After this heat is withdrawn, however, the oil immediately solidifies again. It has stood a temperature of 30 degs. below zero in actual service without showing any sign of freezing. It will not gum or congeal, but in service it remains in its original form until used up. In actual practical tests made under the supervision of the company on some of the leading electric railroads in the East, journal boxes packed with solidified oil have been left untouched for eleven months, the car running over 60,000 miles without replenishing or receiving any attention whatever. This statement is certified by letters from the leading roads in the East, and the company has gathered much valuable data upon the performance on these lines. The process by which the pure mineral oils used in the manufacture of this lubricant is solidified after being properly proportioned and mixed is the invention of J. N. Bruck, who has spent many years experimenting on this particular product. His object was to supply an oil which would be suitable for the lubrication of bearings on electrical machinery, especially motor and journal bearings on the rolling stock of electric roads. These bearings, being exposed to all kinds of weather and used under exacting conditions, are more liable to give trouble than bearings of other machinery or those less exposed. Ordinary oils and greases will congeal in cold weather and run in hot weather. Solidified oil, being practically immune from heat and cold, remaining always the same under all conditions, will never congeal nor run. It will lessen the chances of the bearings becoming overheated or the oil running out in hot weather, making the tread of the wheel slippery, hindering the operation of the brake-shoe when applied.

The application of solidified oil is simple and direct. It is applied in cups, in waste or through felt wicking. The oil applied in cups is heavy, and is especially adapted for motors. That applied in waste is used mostly for journals. After being packed in the journals it is guaranteed to last six months without touching or replenishing. A soft form of oil is also manufactured, which is applied by being fed through felt wicking. This form of solidified oil is probably the only known lubricant which will successfully feed through felt wicking or waste, especially in cold weather.

The immense advantage that an oil of this form and composition has over the ordinary oils and greases can readily be seen and appreciated. The manufacturer of this product is the Bruck Solidified Oil Company, of Boston, which has been incorporated with $50,000 capital stock. The officers are: President, Frederick Kendall; vice-president and manager, J. N. Bruck; assistant manager, F. C. Dennis; treasurer, J. T. Lennox; secretary, Andrew A. Highlands.

ANOTHER VICTORY FOR ELECTRIC RAILWAY

Another attempt by the New York Central Railroad to block the building of a proposed electric railway has resulted disastrously to the company, for the Appellate Division of the Supreme Court, in the action brought by the New York Central Company against the Auburn & Syracuse Electric Railroad Company, has decided in favor of the electric railway company. It appears that the Auburn & Syracuse Company was building its road in sections, extending it a piece at a time with the ultimate object of extending the line from Auburn to Syracuse. The Central brought an action asking for an injunction restraining the electric railway company from extending its road from Skaneateles to Syracuse, claiming that the electric railway company was circumventing the statute and under cover of the extension which is permitted by the statute, was to build a road over an entirely new line, and one not suggested in its original certificate of public necessity and convenience. The action was first brought before Justice Andrews, who dismissed the complaint on the ground that the road was being built in compliance with the statute. The Central took an appeal to the Appellate Division, and that court has now handed down a unanimous decision in favor of the electric railway company.

MOTORMEN AND CONDUCTORS

"How Street Car Men Live" was the subject of a lecture recently delivered by Robert Erskine Ely at the League for Political Education, in which he reviewed the wages, hours of work and difficulties of the employees of the trolley and elevated railways of New York. Among other things he said: "As a class, street car employees are not so well paid in comparison with wages earned in other occupations that their lot is desirable, although they are better off than teamsters and express drivers. By working seven days a week a conductor on the trolley car or elevated train or a motorman earns from $13 to $15. The income of these men, when they have reached the highest limit possible to them, is only about half the maximum income of the fireman or police patrolman." Mr. Ely and others who criticise the transportation companies fail to realize that the class of employees mentioned do not require any special training for the duties they perform; that they serve no protracted apprenticeship and are really unskilled laborers who enjoy better pay and easier work than their fellows, and have steady employment every week in the year while they behave themselves and resist the importunities of walking delegates and other mischief makers.

CAR HOUSE DESTROYED AT ST. LOUIS

The mammoth car sheds of the St. Louis & Suburban Railway Company at De Hodiamont were destroyed by fire Tuesday morning, Feb. 24. Sixty-seven cars were burned, entailing a loss placed at $150,000. The property was well insured. The sheds will be rebuilt at once, and although passenger service must necessarily suffer some, it is promised that full service will be resumed this week. Some 129 cars now being constructed for the company are expected to be completed within two weeks.

PERSONAL MENTION

MR. HOWARD E. AHRENS, president of the Kutztown & Fleetwood Street Railway Company, of Kutztown, Pa., succeeds Mr. G. H. Gerber as president of the Allentown & Reading Traction Company, and Mr. W. D. Mahn succeeds Mr. Ahrens as treasurer of the company. Mr. Gerber has also resigned as a director.

MR. M. C. AULENBACH, secretary and treasurer of the United Traction Company and the allied lines controlled by the United Power & Transportation Company, of Reading, Pa., has tendered his resignation, to take effect March 1. Mr. Aulenbach has been secretary and treasurer of the Reading system since the adoption of electricity as a motive power, over ten years ago. He perfected the system of accounting that has been adopted by the United Power & Transportation Company. Mr. Aulenbach's plans for the future are not fully matured, but he will take a much-needed vacation.

MR. C. R. BELLAMY, general manager of the Liverpool Corporation Tramways, reached New York Feb. 23 on the Etruria. Mr. Bellamy is one of the speakers at the national convention on municipal ownership and public franchises being held this week in New York, and to which reference has already been made in these columns. Mr. Bellamy is known as one of the most progressive tramway managers in England, and his system is the second largest in Great Britain. During his trip to this country Mr. Bellamy will improve the opportunity of visiting some of the typical American tramway installations. He is planing to return to Liverpool March 7.

MR. J. C. KENNEDY, connected with the Montreal Street Railway Company for twenty-one years, and for three years general superintendent of the montreal Street Railway Company, of Montreal, Que., has just resigned from that company. Mr. Kennedy began his street railway career as a conductor on the horse car line in Montreal twenty-six years ago, and since then he has been continuously in the employ of the Montreal Street Railway, with the exception of a period of five years, 1886 to 1891, when he served with the Twin City Rapid Transit Company, of Minneapolis. In his Montreal career Mr. Kennedy passed through the evolution of the service, and filled every position from a collector of fares to that of general superintendent, a post he was appointed to fill when Mr. McDonald resigned three years ago to go to Paris. Mr. Kennedy's successor is Mr. Luke Robinson, formerly superintendent of the Montreal Park & Island Railway.

STREET RAILWAY PATENTS

[This department is conducted by W. A. Rosenbaum, patent attorney, Room No. 1203-7 Nassau-Beekman Building, New York.]

UNITED STATES PATENTS ISSUED FEB. 17, 1903

720,612. Trolley Wheel; T. McWilliams, Kings Park, N. Y. App. filed April 12, 1902. A self-lubricating wheel in which the tread portion can be easily renewed.

720,633. Trolley; J. Spena, Lilly, Pa. App. filed Aug. 4, 1902. Relates to means for holding the wheel on the wire until the cord is pulled to release it.

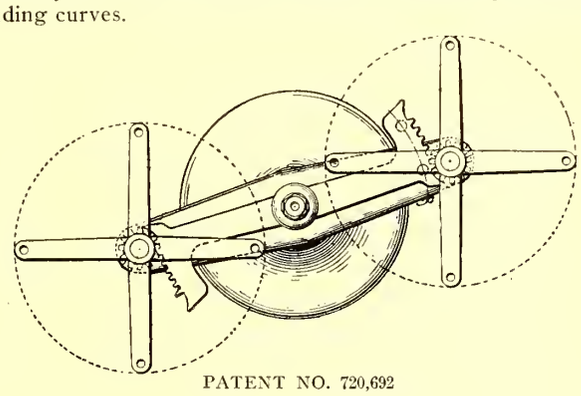
720,684. Electric Railway; G. L. Fowler, New York. App. filed July 18, 1900. Each side of a third rail is adapted for contact, and is protected by a sheet metal hood.

720,692. Revolving Twin Chairs; G. C. Hawkins, Boston, Mass. App. filed Jan. 31, 1902. Comprises two seats mounted to rotate about fixed axis on a standard, means connecting said seats whereby they rotate in unison, a locking device for said connecting the means, and means independent of the locking device to limit the turning movement of the seats.

720,704. Rail for Street Railroads; W. Kuske, Berlin, Germany. App. filed Oct. 3, 1902. The tread of the rail is grooved in its lower surface to fit over the upper edge of the web, whereby the tread of the rail may be renewed without tearing up the pavement.

720,809. Life Guard for Road Vehicles; A. Hudson, Gorton, Manchester, England. App. filed Oct. 20, 1902. Details.

720,879. Overhead Trolley; J. J. Bouchard, Bradford, Pa. App. filed Nov. 15, 1902. The trolley wheel is mounted upon a kind of universal joint which affords it freedom to alter its position when rounding curves.



PATENT NO. 720,692

720,917. Electric Brake; J. C. Henry, Denver, Col. App. filed April 1, 1901. A reversing switch having contacts to connect the motor in a local circuit with a braking magnet, and also provided with contacts to connect the motor with a power circuit to drive it in either direction.

720,942. Device for Removing Snow; J. A. Manion, Montreal, Canada. App. filed April 19, 1902. A scraper or scoop is pivotally mounted in advance of the car in combination with an elevator, whereby the snow is carried to the top of the car and there deposited in a chute adapted to discharge over the side into receiving cars.

720,951. Electric Brake; F. C. Newell, Wilkinsburg, Pa. App. filed April 18, 1901. Consists in means whereby the same contact points on the controller may be used for braking as for running, while at the same time the controller handle is adapted to be moved in opposite directions from its "off" or neutral position for regulating the current in the running and breaking circuits, respectively.

720,978. Electric Vehicle Brake; C. J. Specht and C. R. Kreuger, New York, N. Y. App. filed June 7, 1902. The brake-shoe is hollow and contains electrimagnets, thereby transforming the shoe into a magnet.

721,000. Street Railway Switch; W. J. Bell, Los Angeles, Cal. App. filed July 25, 1902. The switch tongue and switch-throwing rail are normally coupled together to move simultaneously means for electrically uncoupling the tongue and rail from the car when the latter is to be switched from the main track.

721,129. Railway Crossing; C. A. Moreno, St. Louis, Mo. App. filed Nov. 10, 1902. Provides for the insertion of a block of wood in the crossing block, thereby forming a substantial noiseless crossing.

721,131. Bolster; J. C. Wands, St. Louis, Mo. App. filed Dec. 18, 1902. Consists of a commercially rolled compression member of channel beam form, a tension member with perforations in its end portions, and a head-block formed of a plurality of sections adapted to interlock with each other and with said tension member.

NEWS OF THE WEEK

CONSTRUCTION NOTES

HUNTSVILLE, ALA.—It is said that the Huntsville Railway, Light & Power Company has decided to extend its lines to McCalley Grove, 2 miles west of Huntsville, and that a summer pavilion will be built there.

TUSCUMBIA, ALA.—Colonel R. H. Wilhoyte, of Sheffield, has been granted a franchise for the construction of an electric railway here. Colonel Wilhoyte and his associates who are interested in the Sheffield Company, recently incorporated, have in contemplation the construction of an electric railway from Sheffield to Florence. Colonel Wilhoyte has already negotiated the purchase of the water works at Sheffield and secured electric light franchises in Sheffield and Florence.

WALNUT RIDGE, ARK.—Engineers are said to be at work estimating the cost of building an electric railway between Hoxie and Walnut Ridge.

LITTLE ROCK, ARK.—A site has been selected for the new power house of the Little Rock Traction & Electric Company, and the work of building the plant is to be begun soon. New machinery will be installed in the plant, nothing being taken from the present power house except some auxiliary apparatus installed in that plant during the past six months.

HARRISON, ARK.—The Arkansas Traction Company has been incorporated, with a capital stock of $500,000, to build an electric railway from Harrison to Keener, in Boone County, thence to Lead Hill and other cities, including Dodd City, Marion County. About 30 miles of line will be built. The charter of the company permits the company to generate electricity for commercial purposes. The officers and directors of the company are: Thomas Helin, of Harrison, president; R. M. Fellows, of Harrison, secretary and treasurer; C. Irving Page, of Rochester, N. Y., vice-president.

LOS ANGELES, CAL.—Notwithstanding considerable opposition to a third rail, the City Council has adopted the majority report of the Board of Public Works, and a standard-gage franchise is to be offered for sale on First Street from Los Angeles to Main Streets and on Main Street from First to Second Streets in accordance with a petition of the Pacific Electric Railway Company. This action is in line with a policy that will permit the Huntington-Hellman syndicate to run its broad-gage interurban cars through the city streets to the big depot that is now building at the corner of Sixth and Main Streets.

LOS ANGELES, CAL.—C. S. Campbell-Johnstone, of Campbell-Johnstone Brothers, has been awarded by the City Council of Pasadena, for $300, a franchise for an electric railway to enter Pasadena from the west and to form the Pasadena entrance and terminal of the line which the Campbell-Johnstones are now building from Los Angeles. The contract for the work has been given to Sherer & Crowley, and 150 men and sixty teams are on the job. It is still believed in many quarters that the entire venture is backed by the Pacific Electric Railway Company, which may be desirous of making its Pasadena system more complete by reaching the South Orange Grove section of the city, with which there never has been street car connections. While for the immediate present there will be no local travel worth mentioning along the Campbell-Johnstone route, the line will open up a section of country perfectly adapted to residence purposes and give another direct line between Los Angeles and Pasadena.

SANTA ANA, CAL.—Application has been made to the City Council by Collins & Scott for a franchise to build an electric railway from this city to Newport Beach, a distance of less than 10 miles. The applicants are owners of Newport Beach, which is a popular summer resort.

OAKLAND, CAL.—The City Council has passed an ordinance granting a franchise to the Oakland Transit Company for the construction of an electric railway on Market Street, Alcatraz Avenue, Twenty-Second Street and other thoroughfares.

MODESTO, CAL.—Notice is given that application has been made to the County Commissioners by Herschel F. La Motte for a franchise to construct an electric railway commencing at Chinese Station and following the county road to the western boundary of Yosemite National Park via Chinese Camp, Jacksonville, Hughes Station, Priests, Groveland and Colfax Springs. Franchise is to be offered for sale March 16.

BAKERSFIELD, CAL.—Articles of incorporation have been filed by the Bakersfield & Ventura Railway Company, capitalized at $1,000,000. The plan of the company is to build an electric railway over the route for which J. W. Burson was recently granted a franchise. Surveys are now in progress. The directors of the company are: Eben Smith, J. W. Burson and Gervaise Purcell, of Los Angeles. The headquarters of the company are to be at Los Angeles.

SAN FRANCISCO, CAL.—Surveyors are laying out a route between a point on San Francisco Bay and Petaluma for an electric or steam railway. The identity of those behind the project has not been disclosed.

HANFORD, CAL.—L. M. Cole, of Bakersfield, plans to apply to the Supervisors of Kings County for a franchise to build an electric railway to connect Hanford, Armona, Grangeville and Lemoore.

SAN FRANCISCO, CAL.—Application has been made to the Supervisors for a renewal of the franchises of the Geary Street, Park & Ocean Railway. It will be recalled that a plan to take over the property of the company at the expiration of its franchise a few months hence was voted down at a special election a few weeks ago.

SAN BERNARDINO, CAL.—The San Bernardino & Highlands Electric Railway Company has been incorporated, with a capital stock of $150,000, to build an electric railway from San Bernardino to Highland and thence to Redlands, a distance of 15 miles. Interests identified with the San Bernardino Valley Traction Company are interested in the new company. The directors of the company are: Henry Fisher, J. H. Fisher, A. C. Denman, Jr., of Redlands; H. H. Sinclair, George B. Ellis, of Los Angeles; George M. Cooley, E. P. Roberts, of San Bernardino.

LOS ANGELES, CAL.—The Los Angeles Railway Company is to reconstruct thirty-one single-truck cars built by the Pullman Company in 1895 and 1896. At present they seat twenty-six passengers each, and are 25 ft. 2 ins. over all. When reconstructed they will be 33 ft. 10 ins. over all, with a seating capacity of thirty-eight passengers. Ten of these cars are being designed for use on the company's Second Street line to Westlake Park, which is very hilly, and for that reason each will be equipped with four motors. The new Westinghouse magnetic brake will be used on these cars. All the other cars will be equipped with two motors, Christensen air brakes and arc headlights. Walkover seats will be used.

LOS ANGELES, CAL.—The Los Angeles Railway Company has placed with the St. Louis Car Company another order for thirty-five new cars, making a total of 100 cars ordered from this company within the last year. The cars just ordered are for delivery in June. The Downey Avenue viaduct, about a quarter of a mile long, over which the new cars will operate, will be reinforced to meet the extra strain on the structure, and the T-rails will be substituted for the old combination rail of the former cable system now laid on the viaduct.

PUEBLO, COL.—The Pueblo & Interurban Railway & Power Company has just been granted franchises by the County Commissioners to operate electric railways over certain highways in the county for a period of twenty-five years. If the plans of the company, as outlined in its petition to the commissioners, are carried out, Pueblo will soon be connected by electric lines with Florence, La Junta, Rocky Ford and Canon City.

NEW LONDON, CONN.—It is understood that the two local petitioners for an electric railway franchise between Groton and Westerly have decided to combine their interests. The petitions in question are those headed by B. A. Armstrong and others, represented by H. A. Hull, and by A. H. Chappell and others, represented by C. B. Whittlesey.

HARTFORD, CONN.—The Branford & Clinton Street Railway Company is seeking incorporation.

ATLANTA, GA.—The Chattachoochee Terminal Company has just been incorporated, with a capital stock of $250,000, to build an electric railway from Atlanta to Maricta. The road will extend from Atlanta in a northwesterly direction through Fulton and Cobb Counties to Marietta and will be 20 miles long. The incorporators of the company are: Newton A. Morris, T. W. Glover, John Awtry, of Cobb County, and H. L. Collinsworth, W. F. Spalding, Alexander C. King, J. J. Spalding, Charles D. Tuller and B. M. Fowler.

SPRINGFIELD, ILL.—J. G. Schmidlapp, B. M. Campbell and H. A. Perkins, of Cincinnati, Ohio, are securing estimates for material for the construction of an electric railway from Decatur to Springfield. They will use the third-rail system will be used, and the line will be built on private right of way.

DIXON, ILL.—The City Council has granted a franchise to the Sterling, Dixon & Eastern Electric Railway Company.

ROCK ISLAND, ILL.—At a meeting of the stockholders of the Kewanee, Cambridge & Geneseo Railway Company, held here a few days ago, it was decided to increase the capital stock of the company from $100,000 to $850,000. Plans were discussed for building the road, and the erection of the main power house at Cambridge was considered. No official announcements have been made in regard to the project.

ROCKFORD, ILL.—The Rockford & Interurban Railway Company is to apply to the Council for franchises for two extensions, one in the Southeast End the other from Rockton Avenue to Independence Avenue, in West State Street.

CHICAGO HEIGHTS, ILL.—The Chicago Heights Street Railway Company has applied to the Council for a twenty-five-year franchise to construct a street railway here.

DANVILLE, ILL.—The interests that already have the necessary franchises and right of way for an electric railway between Danville and Lafayette, Ill., have organized a company to build the road. The directors of the company are: C. M. McCabe, W. W. Luke, A. E. Harrison, of Covington, Ind.; H. C. Martin, of Attica, Ind., and G. T. Buckingham, of Danville.

PEORIA, ILL.—The Central Railway Company is to apply to the Council for the right to extend its lines.

KOKOMO, IND.—The Kokomo, Converse & Marion Traction Company has just been incorporated, with a capital stock of $10,000, to build an electric railway from Kokomo to Marion via Converse. O. V. Darby, G. E. Bruner and T. C. McReynolds, of Kokomo; J. E. Kenney, Converse, and H. D. Thomas, of Marion, are interested in the company.

NEW CASTLE, IND.—Harrison Township has granted a subsidy of $10,000 to the New Castle & Pendleton Interurban Railway Company. A proposition to give the company $18,000 was defeated a short time ago.

LA PORTE, IND.—Judge C. M. Stone and others, of Cleveland, who are interested in the Toledo & Western Railway, are securing right of way between Michigan City and South Bend. The Hobart & Western Railway Company, of Chicago, is securing right of way between La Porte and South Bend. These are on the line of a through Cleveland-Chicago road.