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During 1906 the Street Railway Journal printed and circulated 426,950 copies, an average of 8210 copies per week. Of this issue 8500 copies are printed.

Keeping Equipment Details

The benefit of having in an accessible place the principal dimensions and details of the cars of the system has probably never occurred to many master mechanics of small systems. At any rate, quite a few men who keep their equipment in excellent shape have very vague ideas as to the total length, width, height, or weight of their cars. It is, however, of considerable advantage to have these figures

and many others of similar character at hand. Of course it cannot be expected that all of them can be retained in the memory. To attempt to do so would result in failure. Such dimensions as the length and width of the greater numbers of the cars should probably be committed to memory, but the smaller details should be kept in note books or on data sheets. It is also of great advantage to have as many blue prints of the equipments as can be obtained. Floor plans and elevations of the cars and drawings of the trucks and draw bars will frequently be found of much service. Considering the ease with which these are to be obtained, it is surprising that every master mechanic does not have them. The manufacturers of the cars and apparatus are usually most willing to send them on request. If for no other reason, such data should be kept for the effect that the ability to answer questions or give information to visitors or friends will have on the inquirers. A man may rightfully be expected to have definite knowledge concerning those things about which he spends practically all of his time, and he should have more than general information to give when called upon for definite figures.

Keeping Records of and Checking Train Orders

The importance with which the dispatching systems of electric railways are regarded by railway managements sometimes varies according to the number of collisions that have been due, or are thought to have been due, to errors in dispatching. On some roads where no trouble has occurred it is the custom for the trainman who is nearest the telephone to call up the dispatcher in an informal manner and receive oral instructions from him as to what to do. Neither the trainmen nor the dispatcher keeps any records. Other systems, however, have been taught by experience that it pays to surround the dispatching system with every possible precaution tending to minimize or prevent wrecks. If those companies which are lax in the matter of dispatching would profit by the experience of the other roads, no doubt in the course of a few years the work of the claim agent and the car maintenance expenses would be considerably less than what they will be otherwise. On a small road operated probably on ordinary days by two cars which always pass at one point, at first thought it does appear unnecessary to compel the trainmen to go to the trouble of copying all orders in duplicate and have the dispatcher keep a record of such orders. But on Sundays and holidays probably several extra cars are put on these roads, and the meeting orders are more complicated. When orders are not written on ordinary days, usually the practice is not varied with heavier schedules, and under such circumstances it may happen that sooner or later an order will be

misunderstood or will be forgotten and an expensive wreck will result.

Copies of all orders received should be made by the trainmen receiving them and the dispatcher should also keep a record of the orders so that those made by the trainmen may readily be compared with his. The copies of orders should not be regarded merely as a means of locating the blame for accidents after they have occurred—they should rather be considered as a means of detecting every mistake made in issuing orders. To do this the dispatcher's copy and the trainmen's copy should be compared and checked in every instance. It is safe to say that not one mistake in giving orders out of a dozen results in a wreck. If no order record is kept or if the copies are not compared, the chances are great that no one other than the dispatcher and the trainman will ever know anything about the eleven mistakes that do not result seriously. Under such circumstances there is a natural tendency for both trainmen and dispatchers to get careless. But if all copies of orders are compared and some one is obliged to explain every discrepancy between the copies, mistakes will be fewer and claims for damages against the road will consequently be less. The expense attached to keeping copies of orders and comparing them is of course small, and should be regarded in the light of insurance.

Some Advantages and Disadvantages of Large and Small Car Wheels

That there are many arguments in favor of wheels of both large and of small diameters for interurban cars, is well proven by the fact that throughout the country wheels varying in size from 33 ins to 39 ins. in diameter are employed in practically the same class of service. At first thought it might be supposed that the desired height of the car floor would always be the determining factor in selecting the diameter of the wheels to be employed, but an inspection of cars of different companies will show that the car body is not always placed as low as the clearance of the wheels would permit. Some managements evidently prefer a small wheel for other than the reason that it permits the car body to be hung low. In such instances the weight of the wheel is probably considered. With other advantages and disadvantages equal, the small wheel would certainly be preferable because of its less weight. A wheel 33 ins. in diameter should weigh from 50 to 100 lbs. less than a 37-in. wheel of equal strength and similar tire section. The use of a 33-in. wheel should consequently decrease the total weight of the car from 400 to 800 lbs., and this fact is worthy of a great deal of consideration. Although the decrease in weight by the use of the smaller wheel would be less than 1 per cent of the usual weight of interurban car, in the course of a year the cost of the current that would be consumed in hauling the unnecessary weight around would cause many who had not otherwise thought of using small wheels to consider them seriously.

Another advantage obtained with small wheels, although this advantage is probably of more theoretical than practical importance, is that the flange friction has a smaller lever arm than with large wheels. In other words, on account of the shorter radius of curvature, the surface of contact

of the flange and the rail in taking a curve is a shorter distance from the line of contact of the tread and the rail. This, of course, lessens the consumption of energy in flange friction.

So far as bearing friction and life is concerned, it is of course advantageous to use a large wheel. The bearing friction will of course vary inversely as the size of the wheel and due to the greater amount of metal in the tire, the life will be lengthened in about the same ratio. This increase of life, of course, lengthens the intervals between turning the tires or changing the wheels, and consequently reduces to an extent the labor item.

It is, to be sure, an easy matter to refer to the advantages and disadvantages of the different sizes of wheels. But it would be of more value to operating men if the relative importance of each advantage or disadvantage could be definitely determined upon. This, of course, would necessitate almost an endless number of tests, but probably within a few years enough of these will be made so that practice will narrow down to a smaller range of sizes than is at present in use.

The Rapid Transit Situation in New York

The message sent by Governor Hughes to the New York Legislature on Jan. 2 calls renewed attention to the congested condition of the traffic facilities in Greater New York, and particularly those intended for long-distance travel. Of the Governor's suggestion to relieve this situation by the appointment of a new commission with enlarged powers to take the place of the present State Railroad and municipal Rapid Transit commissions, we shall say nothing at the present time. We do believe, however, that all will agree in his recommendation for immediate action to relieve a situation long intolerable. That an "extraordinary congestion" exists on the long-distance transportation lines is not news to those who have to depend upon them for their daily transportation, nor to those who have read the articles in this and the last issue of this paper upon the East Side-Bronx transportation problem in New York.

In this series, which concludes with this issue, we have presented merely the bald facts, without any attempt to sit in judgment upon the causes of failure or the prospects of relief. The condition of affairs at the present moment is nothing short of terrible, and it grows almost daily worse. The great underlying cause we have pointed out in the unique geographical features of the metropolis. There is no other great city in the world driven by the deep sea into so narrow quarters. In spite of bridges and tunnels to the east and west, Manhattan Island must depend, in the main, on easy access from the north.

Within a decade or two the business section of the city has expanded uptown, but more than this skyward, piling the equivalent of three modern cities one upon another with no increase of street area. The second city in the world in gross population, New York stands absolutely alone in the density of its commercial population. As everyone knows, the subway, with all its serious disadvantages, has shortened a little the time of transit in certain directions, but is now hopelessly congested owing to in-

creasing demands. The elevated roads are in a similar state, and the surface lines cannot adequately meet even the minor requirements of local traffic. The commercial city is growing with prodigious rapidity, and within comparatively few years the daily flow and ebb of population will be doubled in volume. Even now it sweeps into the subway entrances like water into a penstock. Whatever may be done by extra tunnels and bridges to the east and to the west is only palliative. The main course of the tide can no more be deflected from its flow north and south on Manhattan Island than in the huge channels that hem it in. It is not something that needs to be done, but everything, if the transit facilities are to keep pace with the needs of the metropolis.

The two most striking features of the case brought out by our investigation are the inadequate facilities on the enormously crowded East Side, and the comparative slowness of the service everywhere. A glance at our map giving time contours shows plainly that a narrow strip of the West Side, inhabited largely by people who do not work long hours, is the section most easily reached. On the East Side and in the Bronx the time of transit is greatly lengthened, and the congestion is even more frightful there than elsewhere save on that terrestrial Tartarus, the Brooklyn Bridge. And for so-called "rapid transit" the time taken is prodigious. It is, roughly, 40 minutes from the Battery to the Bronx, a distance of less than 10 miles. It is half an hour to the region just north of Central Park, and yet it is clearly on the East Side in the territory beyond 110th Street and stretching far up into the Bronx that the future population of New York must dwell.

How can an extra million people in that region be adequately transported? Some slight relief may come from a shifting of the business center northward, but this movement is slow and does not in the least imply a cessation of activity far downtown. For every worker who moves uptown, two occupy the space made vacant by his departure. And the growth of business in the region between Fourteenth Street and Forty-Second Street displaces a considerable population which is added to that to be transported farther north. No working population is able to adjust itself so as to remove the necessity for rapid transit, since employment is, on the whole, non-permanent, and rents in New York rise much faster than wages, which, experience has shown, are uniformly "last on the field and first to leave it." There is therefore no reasonable prospect that any shifting of business or population can materially relieve the transportation situation. The population carried and the average distance of transport must be expected to increase steadily for years to come, and so far from making provision for this increase the congestion is steadily going from bad to worse, and remedial measures are subjects of talk rather than of action.

The need of the city to-day is immediate and forceful action, not along one line, but along many. A single subway or viaduct or elevated track is foredoomed to hopeless congestion before ever a wheel can be brought to turn upon it. Experience has already shown this in New York and other cities. There is no use in sitting timidly down and wondering whether remedies will pay. They must be applied at whatever cost, and no one who knows New York

can doubt that the returns will be adequate even from the start.

The present proposals for relief are of two kinds. First, it has been many times urged that the East Side elevated roads should be completely equipped with three tracks, thus giving one track for express service extending at least as far as 129th Street. Even the existing stretch of express track on the Third Avenue elevated has proved useful, and there is no doubt that the proposed extensions would be valuable. Second, there are two proposed subway routes via Third and Lexington Avenues, respectively, extending clear into the Bronx. It goes without saying that these would add greatly to the existing facilities, but they are of course open to the very grave objections to subways in general. The present subway with its serious ventilation problems is not an encouraging example in every particular, and it has not been a distinguished success in the matter of speed owing to the great number of local stops. Whatever the situation of the tracks in the next rapid transit scheme, the virtues of real express service should be tried, for without it any material improvement is hopeless. At least four express tracks are needed, stretching from the Battery, or near there, to the vicinity of 200th Street, and making no stops between, say, Fourteenth Street and 125th Street, with a running speed of not less than 40 m. p. h. between these points. This would send a passenger from City Hall to 200th Street in about half an hour at the outside, with due allowance for lessened schedule near the ends of the route, which is time enough and to spare for the 14 miles run. Some minutes could be clipped off this without much difficulty in giving a real express service. It does not make much difference in the general result whether the tracks are on one level or another. We have always been impressed with the advisability of avoiding subways when feasible, and see no reason why a four-track elevated structure, in two stories if necessary, and provided with all the modern improvements to reduce noise and secure stability, could not be used with admirable results. With express tracks on the higher level almost any speed could be maintained, and the trains would be in the open air so that they could be properly ventilated. A street already having an elevated road of the older sort would be very little damaged by the addition, were it suitably constructed. A third track on the present elevated structure would bring relief and should be installed immediately, but viewed in the broader aspects of the question would relieve the situation only temporarily. As to subways proper, the two proposed lines already mentioned and those proposed for the West Side should also be carried through to completion and the increase in speed decided upon for them over the present subway is in the right direction. There is no such thing as an effective compromise between express and local service.

The time has come for decided action. It is a tremendous problem that lies before the metropolis, and it must be handled in a large way and promptly. The prosperity of New York, involving as it does the welfare of nearly four million souls, is a thing too vast to be imperiled by legislative delays or conservatism, or blocked by the petty objections of a few East Side real estate owners. The need of action has grown to overwhelming proportions, and it is time to sink trivial questions in united effort.

TRACK CONSTRUCTION AND OTHER IMPROVEMENTS OF THE TRI-CITY RAILWAYS

The railway, gas and electric light properties of Rock Island and Moline, Ill., and Davenport, Ia., are at the present time being reconstructed by J. G. White & Company, who recently acquired them. The more extensive improvements, however, are being made in connection with the electric railway system. The railway properties at the time they were

POWER AND DISTRIBUTION SYSTEM

At the time the railway systems were acquired, power to operate them was obtained from three separate generating stations, one in each of the three cities. The station in Moline is now being provided with sufficient additional generator capacity to furnish power for all of the railway and lighting load, and the other stations are being dismantled and will be converted into sub-stations. A 1500-kw Parsons turbine is being installed in the Moline station and another will



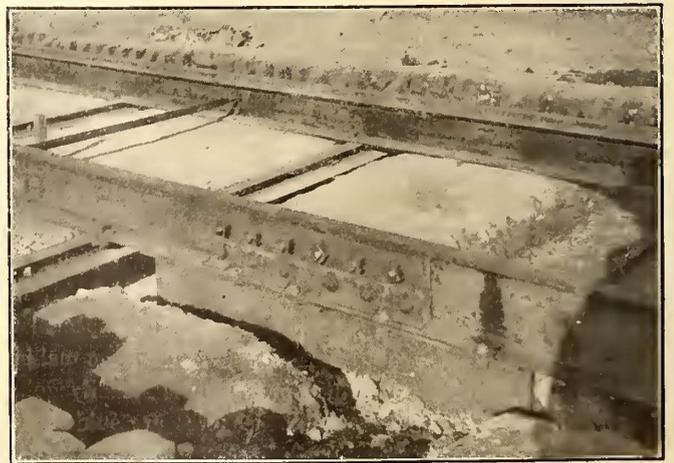
DOUBLE S CURVE UNDER BRIDGE, BEFORE AND AFTER STRAIGHTENING TRACK

purchased consisted of three separate systems: the Davenport & Suburban, with 11 miles of track; the Moline, East Moline & Watertown, having 8 miles of track, and the Tri-City Railway, with 65 miles of track. The work of reconstructing the systems will consist in centralizing the power supply for all

probably be installed within a few months. In connection with the turbine there are being installed three 500-hp Stirling water-tube boilers. The additional units in the station will provide emergency capacity to be used in the event of failure of the water-power plant of 2000-kw capacity which is run in connection with the steam plant. The water head under which the water-power plant is operated, and which is obtained by damming the chute of the Mississippi River between Rock Island and the Illinois shore, is at the present time limited to about 2000 kw, but is capable of a very much greater



PORTABLE CONCRETE MIXER AT WORK



JOINT WITH HALF OF 15-IN. I-BEAM AS SUPPORT

of the systems, reconstructing and rebuilding a considerable portion of the track, providing new car equipment and additional car-house capacity for it, and extending an interurban line to Silvis, a new town a few miles east of Moline. In fact, about \$1,500,000 will be spent in improving all of the properties.

development, and when the river freezes over in winter the plant under present conditions is liable to temporary shut-downs of brief duration due to floating needle ice, etc.

The two sub-stations, one in Davenport and one in Rock Island, will be connected to the main station by 5000-volt high-tension lines. The Davenport sub-station equipment

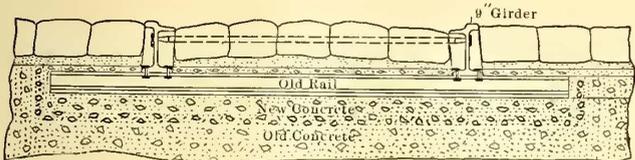
will consist of two 400-kw motor generator sets, two 300-kw and one 200-kw rotary converter.

TRACK CONSTRUCTION

The fact that the new purchasers might have radically dif-

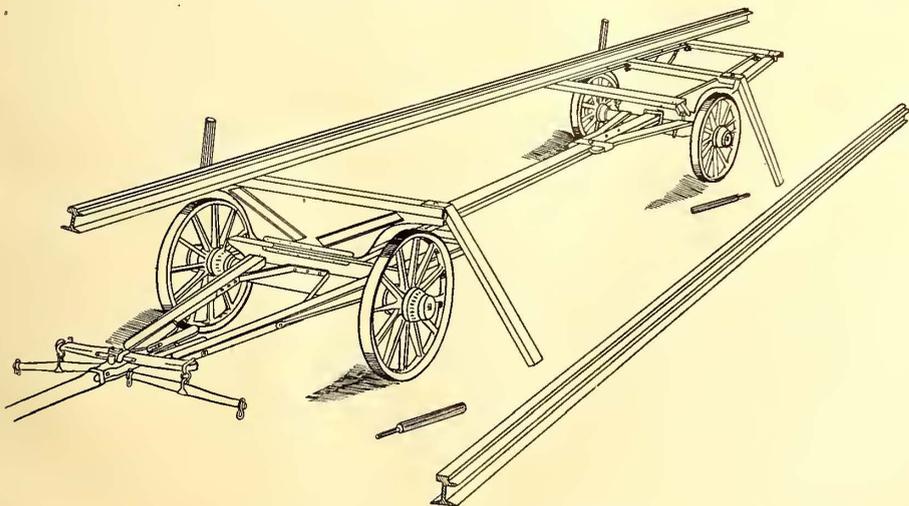


SECTION OF STANDARD TRACK CONSTRUCTION



CROSS AND LONGITUDINAL SECTIONS OF TRACK CONSTRUCTION ON FORT ARMSTRONG AVENUE

ferent ideas regarding track construction deterred the old management from making much-needed improvements of the track during the period the negotiations for the sale of the properties was being carried on. The rebuilding of about 20 miles of track was consequently the first work begun by the construction department of the purchasing company. As the city ordinances in all three of the cities did not permit of T-rail construction, girder rails were at first employed in the new work. However, permission was obtained from the City Council of Davenport to lay 800 ft. of double track with T-rail in paved street in order that the advantages and disadvantages of this construction might be observed. The location chosen for this strip of track was at a point where it would receive the hardest usage from crossing wagons. It is

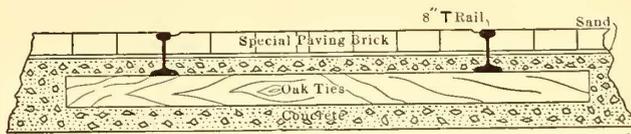


RAIL WAGON USED IN DAVENPORT

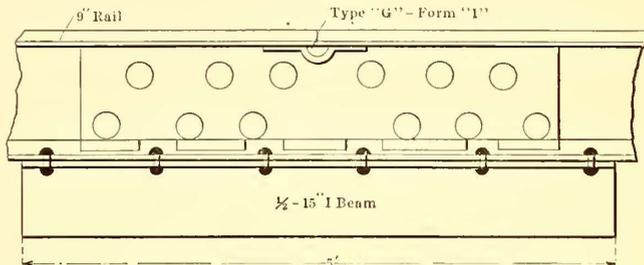
interesting to note in this connection that within three weeks from the time permission was obtained to lay the strip of track the T-rails were ordered, were rolled, and were on the ground. After a trial section of track had been in use for a few months and after frequent inspections had been made by the members of the Council, permission was granted to use T-rail in all of the new track work in Davenport. It is ex-

pected that permission will be obtained from the city authorities in Rock Island and Moline to use the same rail.

The sample track as built consisted of 8-in., 80-lb. T-rails supported by oak ties embedded in concrete. The concrete



SECTION OF IMPROVED T-RAIL CONSTRUCTION IN PAVED STREETS

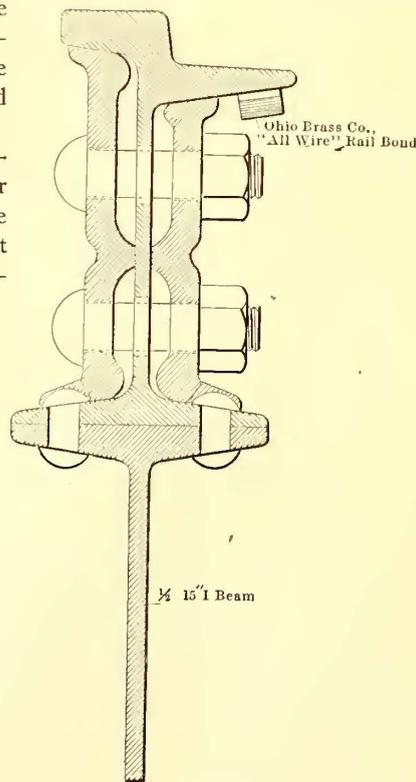


SIDE ELEVATION OF JOINT, WITH HALF OF 15-IN. I-BEAM

bed extended 4 ins. below and 2 ins. above the ties. Nose brick of the "Twin City" type were laid next to the rail and these, as well as the remainder of the paving brick, were laid on a cushion of sand 1 in. thick.

The track construction with girder rails is very similar to that with T-rails. To avoid chipping the brick and extending them under the head of the rail, however, the rails were filled with cement and sand.

Some special construction with girder rails which is of more than passing interest was employed in recon-

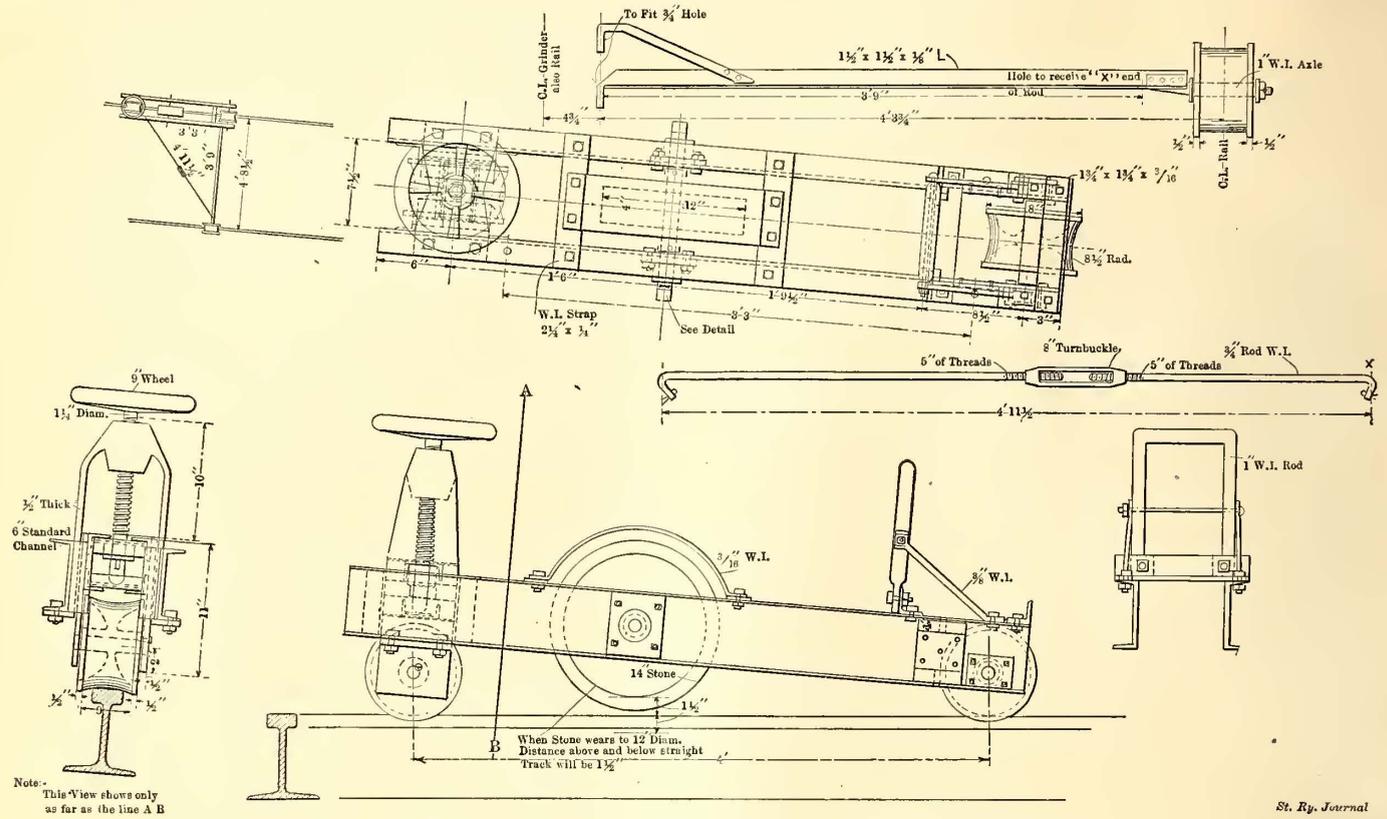


RAIL JOINT WITH HALF OF 15-IN. I-BEAM

structing the tracks on Fort Armstrong Avenue, which extends across the lower end of Rock Island Arsenal. When the work of tearing up the old track was begun it was found that this track had been laid with wood ties in a bed of concrete. The concrete was found to be in excellent condition, and as the work of tearing it out would have proved an almost endless task, a method of construction was devised whereby it was

allowed to remain practically undisturbed. At intervals of 5 ft., which was the spacing of the old ties, the new 9-in. girder rails were bolted together by means of anchors consisting of sawed lengths of old girder rails. Each tie was

One of these is a rail grinding machine the use of which prevents pitting the rails by excessive grinding at any one point. The emery wheel is carried at the middle point of a frame consisting of two parallel channel bars about 5 ft. long



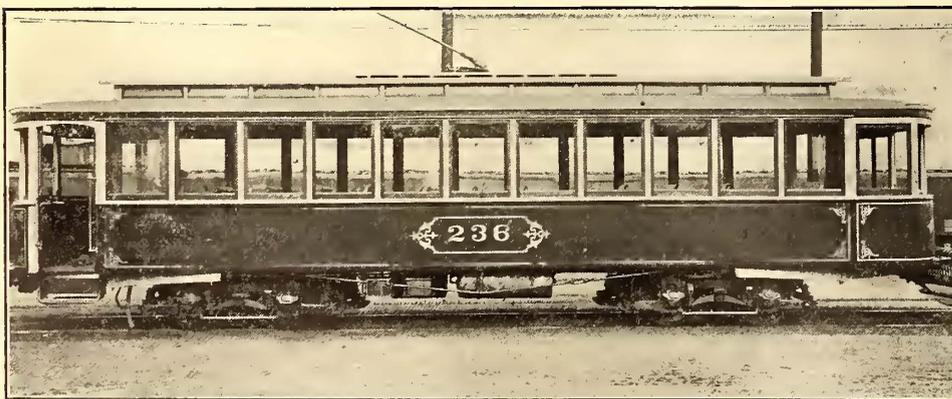
RAIL-GRINDING MACHINE OF TRI-CITY RAILWAY COMPANY

fastened by means of four bolts and interlocking washers, with its flange uppermost, to the running rail. The rail joints were made in a manner which practically assures of their remaining solid throughout the life of the track. In addition to the two 12-in. bolt plates on either side of the web a T-iron 5 ft. long, made by cutting a 15-in. I-beam

bolted together. This frame rests on two wheels immediately over the rail to be ground, and is held in an upright position over the rail by a bar extending across the track to the opposite rail, and which is provided at the extreme end with a double-flanged wheel riding on this rail.

A hand wheel by means of which one end of the channel-bar frame may be raised or lowered permits the height of the emery wheel to be varied as desired. The wheel is driven by a motor, power being supplied to it through a flexible shaft. Suitable handles are provided on the frame to facilitate the operator in moving the machine back and forth over the point being ground.

A rail wagon with several very novel features has also been designed. The wagon is intended for hauling 60-ft. rails, and is designed especially to prevent unnecessary lifting of rails in loading and unloading them. The wheels



STANDARD DOUBLE-TRUCK CLOSED CAR

longitudinally through the middle, was hot-riveted to the under side of the rail. After the rail sections had been bolted and riveted together, a rich mixture of concrete consisting of one part cement to two parts sand was flowed around the ties and around the bases of the running rails.

SPECIAL CONSTRUCTION TOOLS

The construction department in charge has designed and constructed several special devices to facilitate the work.

are comparatively small in diameter and the bolsters extend out over and beyond them. When rails are to be unloaded the bolster standards on one side are removed and skids sloping to the ground are fastened to the ends of the bolster. This design permits the rails to be unloaded by simply sliding them off the end of the bolster. In order to lessen the overhang of the rails on the rear end a supporting frame extends back several feet beyond the rear bolster. The front hounds

are of such a length as to permit of several feet of overhang of the rails beyond the front bolster without endangering the horses.

NEW CARS

The new cars for the system will be constructed in the company's shops. They will be of the semi-convertible type with cross seats, and will seat thirty-two people. The length over all will be 31 ft., and they will be mounted on a single truck.

For several years past the company has built all of its cars, and the building of the passenger cars that have been the company's standard for several years was the subject of an interesting paper read by John D. Fish, master mechanic of the system, at the Iowa Street and Interurban Railway Convention held at Dubuque, April, 1905. The cars measure 31 ft. over the body and seat 44 people. Owing to the fact that the head room is limited while passing over the Mississippi River on the government bridge the cars are constructed very low. In fact they measure but 11 ft. 2 ins. from rail to top of trolley board. The cars are of the semi-convertible type, the windows being removable in summer.

Two cars of rather unusual design were recently completed in the shops. These are large double-truck open cars having canvas tops supported on iron pipe framework. They were constructed especially to be used in handling excursionists from river steamboats and for "sight-seeing" cars during the summer season. The cars are 42 ft. long and seat seventy people. The framework supporting the canvas top is of very rigid construction. Wood

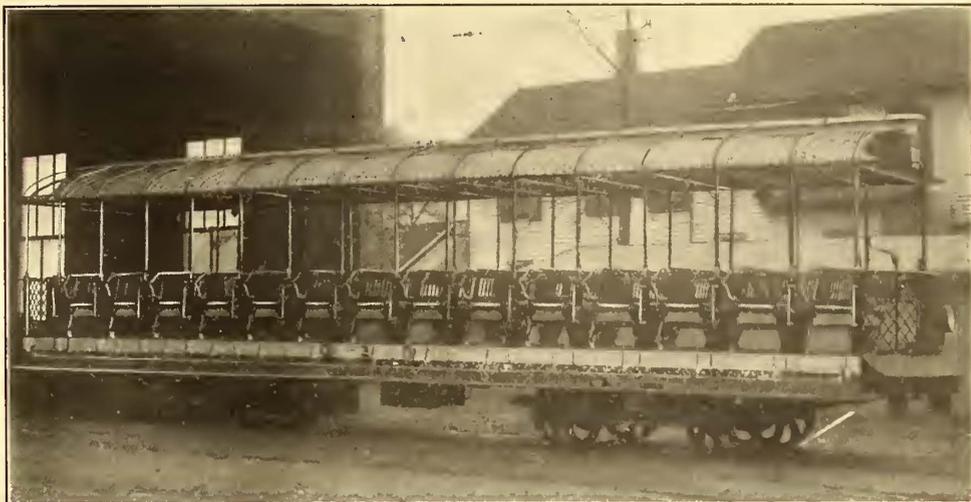


FRONT OF STANDARD CAR

posts which are carried up above the seat swivels are capped by heavy brass castings. The series of arches and uprights extending up from the wood posts are each constructed of one piece of double strength wrought-iron pipe. The framework is stiffened by longitudinal stringers at the top of the upright portions by ties extending between these stringers and by heavy trolley boards at the highest point of the arches. The lamp sockets are screwed to the board on the under side of the arches and the circuit breakers are mounted under the ends of the boards which project a short distance beyond the end arches. The canvas awnings are mounted on rollers, and when desired may be rolled back under the trolley boards. The car has latticed iron dashes at either end.

CONSTRUCTION OFFICE

With the exception of the car construction, all of the other new work is being carried on by a construction department under the supervision of H. A. Johnson, construction superintendent for J. G. White & Company. This department has



FOURTEEN-BENCH OPEN CAR USED FOR SIGHT-SEEING PARTIES

a complete organization of its own entirely independent of the operating department. The two departments of course operate in harmony in order to avoid any interruption to service. The new cars will be built by the operating department of the railway system under the supervision of J. F. Lardner, general manager.



END VIEW OF SIGHT-SEEING CAR

THE EAST SIDE-BRONX TRANSPORTATION QUESTION OF NEW YORK CITY—II., PROPOSED REMEDIES

The long-continued agitation for an increase in the transit means via the East Side to Bronx borough has now taken definite form in two distinct propositions, one for a pair of subways with feeders and the other for the continuous third-tracking of the Second and Third Avenue lines. The first plan is favored by East Side property owners, who are opposed to any further additions of any kind to the elevated railways in their territory for reasons which are obvious; while the second plan is approved by many residents of the Bronx, who are eager for rapid transit, believing that no other method will bring quick relief. These opposing elements of the public have not yet succeeded in coming to an understanding. As matters stand now, it is still uncertain which of these schemes will go through.

In furtherance of the latter scheme the Interborough Rapid Transit Company has proposed the addition of a third track

PROPOSED CHANGES IN THE EAST SIDE AND BRONX ELEVATED RAILWAYS

To understand the extent of the changes proposed by the Interborough Rapid Transit Company, reference should be made to the accompanying Fig. 7, which shows the present trackage layout in Manhattan and Bronx boroughs. Fig. 8 has been prepared to show the gaps in the third track. The only third track now available for express service is the Third Avenue section from Forty-Second to 129th Street. The other third-track sections shown are now used for storage. The proportions between the middle track length and that of the rest of the structure are also given on Fig. 8.

The company offers to install a middle track on the Second Avenue line all the way from East 122d Street and Chatham Square, and a middle track from Park Row and Pearl Street (this section of Pearl Street is practically at right angles to the part traversed by the line to South Ferry) extending to the City Hall terminus. The Third Avenue line would have a continuous middle track from 129th Street and Second Avenue along the former street to Third Ave-

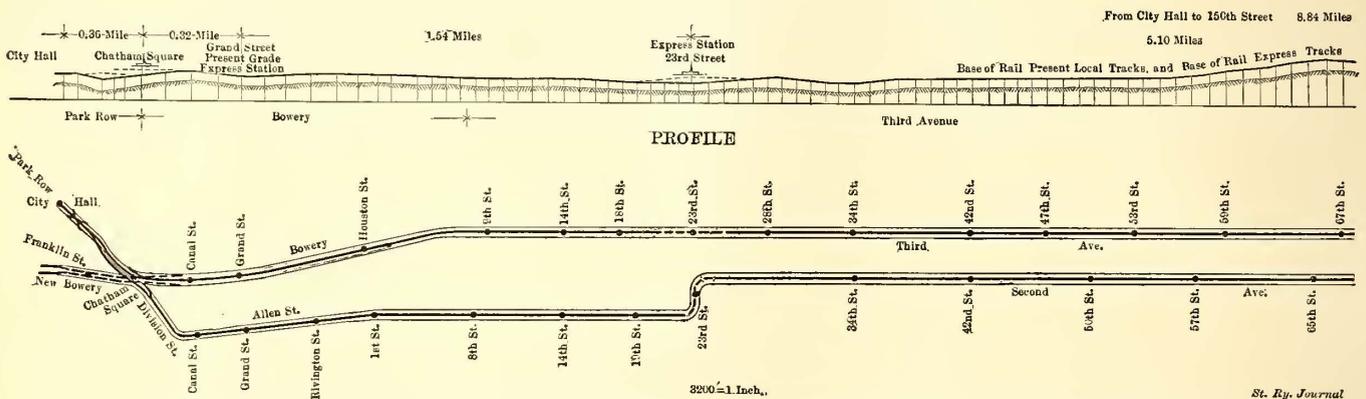


FIG. 7.—PROFILE AND PLAN OF PROPOSED EXPRESS TRACKS ON PRESENT EAST SIDE ELEVATED RAILWAYS

as the only plan that can be carried out quickly, and has directed attention to the fact that even if a subway should be built its construction would take so long that by the time it was built the traffic would probably have increased so greatly that, like the present subway, both lines would soon carry their full capacity without relieving the elevated lines.

It should be understood that at present the majority of the Rapid Transit Commission is opposed to the third-tracking plans, while, on the other hand, the State Railroad Commission, in its report of Nov. 20, 1906, on New York transit problems, recommended the immediate adoption of the Interborough Company's proposal. It is apparent, then, that the doctors, as well as the patients, disagree as to the cure.

The first extra-trackage proposal of the Interborough Rapid Transit Company was made on Feb. 9, 1905, when it applied for authority to four-track its Second Avenue line from the City Hall to 154th Street. The Rapid Transit Commission's Committee on Plans and Contracts reported adversely on this plan, and on May 12, 1905, its report was confirmed. On May 25, 1905, the company's application was revised in the form of permission to third-track its Second and Third Avenue lines, and specifications were presented on May 31. A public hearing was held on June 1, but it was decided to postpone further consideration until the operation of the West Farms branch of the subway would show what it could do toward relieving the East Side elevated lines. The next hearing was held on June 28, 1906, and all the members, except the Comptroller, voted against the application. Nevertheless, another hearing was granted on Nov. 1, 1906, on the application of May 31, 1905, and the matter again referred to the Committee on Plans and Contracts.

and thence south to Canal Street and the Bowery. It should be noted that of the 14.64 miles of middle track thus secured, 8.33 miles already exist in the form of storage tracks and the express track on part of Third Avenue.

There would also be the following four-track sections on Manhattan Island: The first, shown in plan in Fig. 7, extends for the 0.15 mile between Canal Street and Chatham Square; the second from Chatham Square along Park Row to Pearl Street, which is within a few feet of the northern ends of the City Hall station platforms, and a third section from Chatham Square along the New Bowery to where the South Ferry line enters Pearl Street. The detail of the proposed Chatham Square layout is given in Fig. 14.

It is proposed to have in the Bronx division a four-track line from East 154th Street and Third Avenue extending across a double-deck bridge over the Harlem River to East 122d Street and Second Avenue in Manhattan Borough. The section from East 122d Street to Harlem River is shown in detail in Fig. 13.

THE PROPOSED ELEVATED RAILWAY EXPRESS SERVICE

In connection with its petition the company presented details of the express service contemplated from the City Hall via the Second and Third Avenue lines. From these it appears that no changes would be made in the locations of any of the present main tracks except between Chatham Square and City Hall, between Second Avenue and East 122d Street and Third Avenue and East 150th Street.

At City Hall a station is to be provided with four platforms for the accommodation of three tracks. Two of these would be for inbound trains, one for the Third Avenue line and one for the Second Avenue line, over which local

and express trains of each road would come into the station. All trains would leave on the middle track, extending to Pearl Street.

There would be four tracks northward from Pearl Street, two for each line. The south-bound track of the Second Avenue line would be elevated to pass over the north-bound track and descend to the grade of the other tracks just north of James Street, where separate inter-track stations would be provided for both lines to take the place of the present Chatham Square station north of Chatham Square. The two stub tracks now forming the station tracks of what is known as the Chatham Square pocket would be raised to a steeper grade and would be continued at a high level across Chatham Square to avoid the present grade crossings and enable the Second Avenue line to be continued to City Hall at the present grade of the Chatham Square tracks. These overhead tracks would accommodate such Third Avenue trains as ought to be run to and from South Ferry, the remaining Third Avenue trains being run to City Hill over the

Bridge. These tracks would be run inside of the present main line tracks in the Bowery and New Bowery.

At Chatham Square an express track would run from a connection with the Third Avenue City Hall tracks on approximately the same grade northward through the Bowery over lattice cross-girders resting upon the tops of all present columns to a connection with the present middle track at Fifth Street and Third Avenue, continuing to 129th Street and Third Avenue, passing then over 129th Street at an elevation to avoid grade crossings at the terminal switches at 129th Street and Third Avenue to a connection with the west upper grade track of the proposed double-track bridge over the Harlem River. This express track would have a station at Grand Street on a level with the present station, and station platforms at Twenty-Third Street and 125th Street 11 ft. above the present station platforms to allow access to express trains across the present main tracks. To reach the proper elevation, the grade of the express track would rise from the grade of the present tracks for a length of

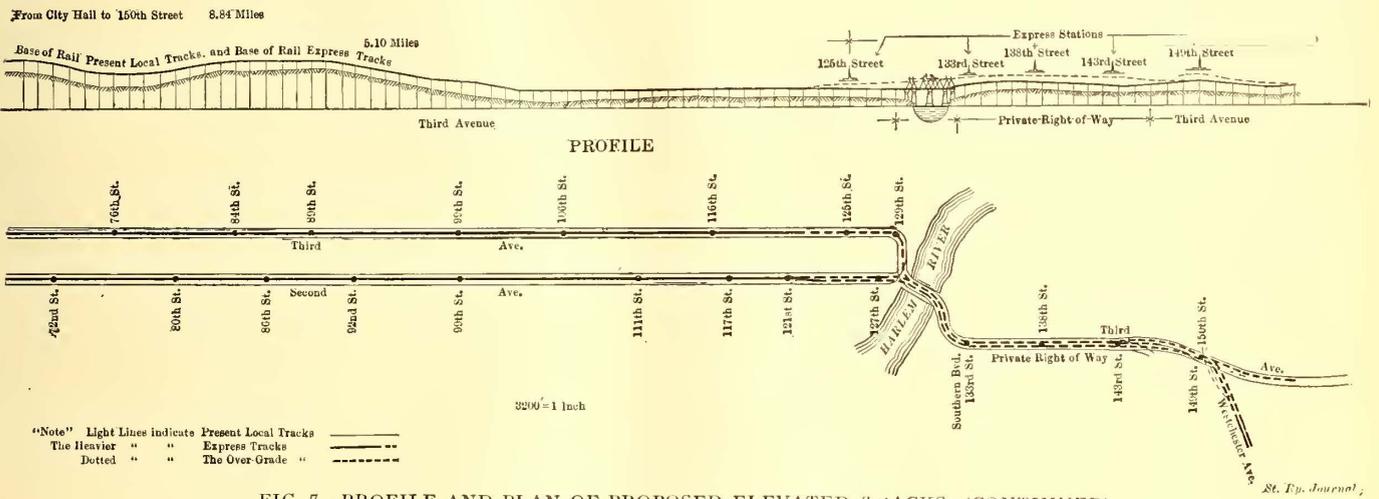


FIG. 7.—PROFILE AND PLAN OF PROPOSED ELEVATED TRACKS—(CONTINUED)

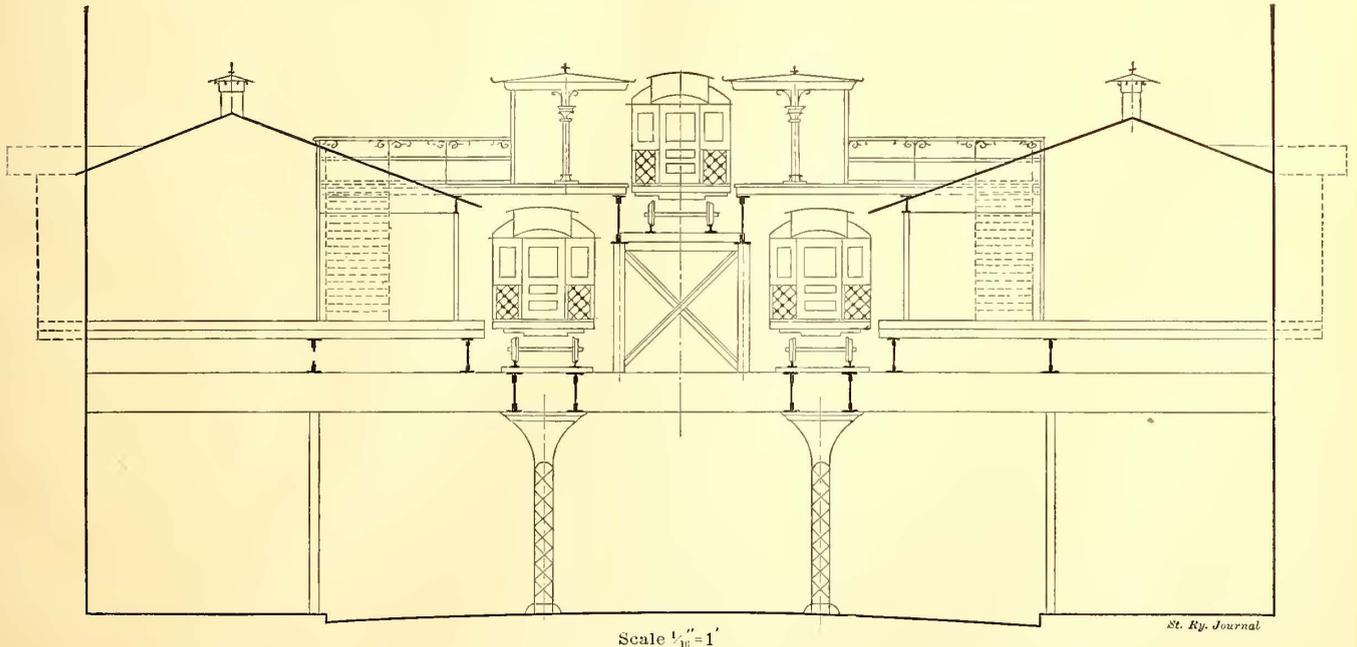


FIG. 9.—SECTION SHOWING PROPOSED EXPRESS STATION IN MANHATTAN BOROUGH

present tracks. The overhead tracks mentioned would have an upper grade station over the present Second Avenue station, from which they would descend to a connection with the present tracks through New Bowery at a point just north of Franklin Square to enable them to pass under the Brooklyn

two blocks at each end of the station. From the 125th Street express station the track would be extended on the higher grade to the bridge as already mentioned.

To obtain express service on the Second Avenue line, the present middle track on Division Street, just east of Chat-

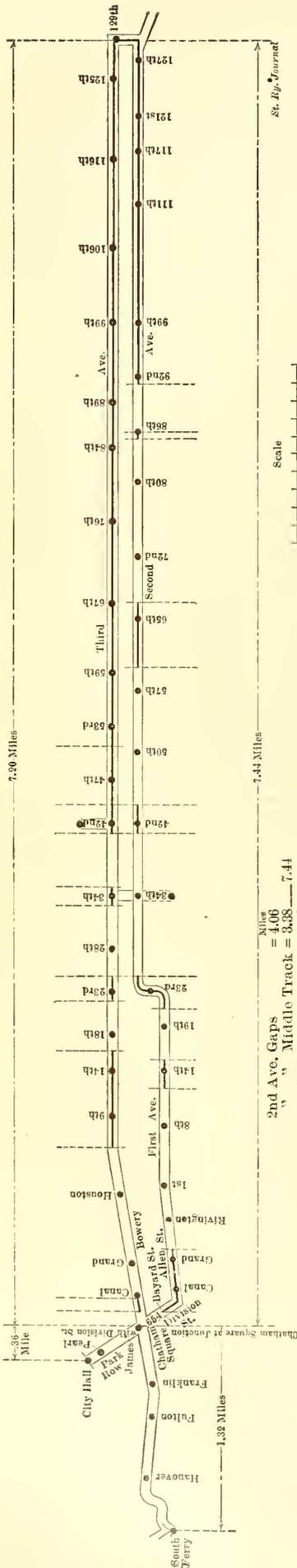


FIG. 8.—THE PRESENT TRACK LAYOUT ON THE EAST SIDE ELEVATED LINES, SHOWING THE GAPS IN THE THIRD TRACK

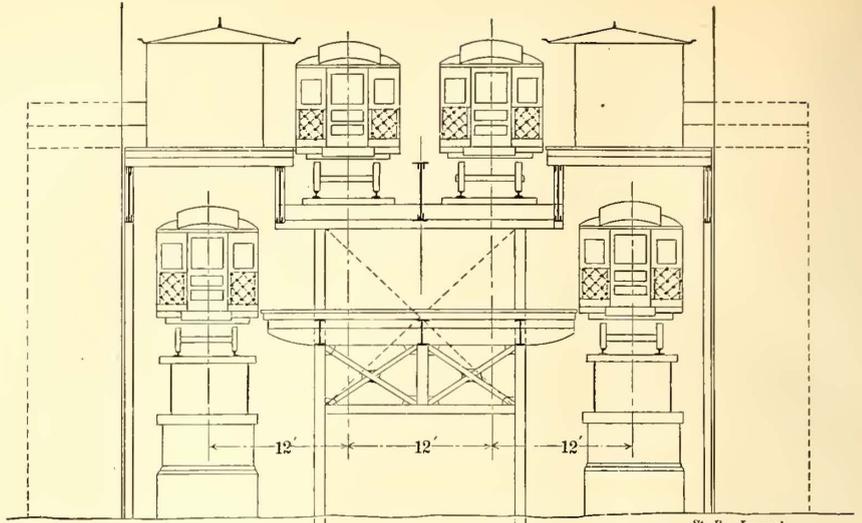


FIG. 10.—CROSS SECTION OF PROPOSED ELEVATED STRUCTURE AT 138TH STREET, BRONX BOROUGH

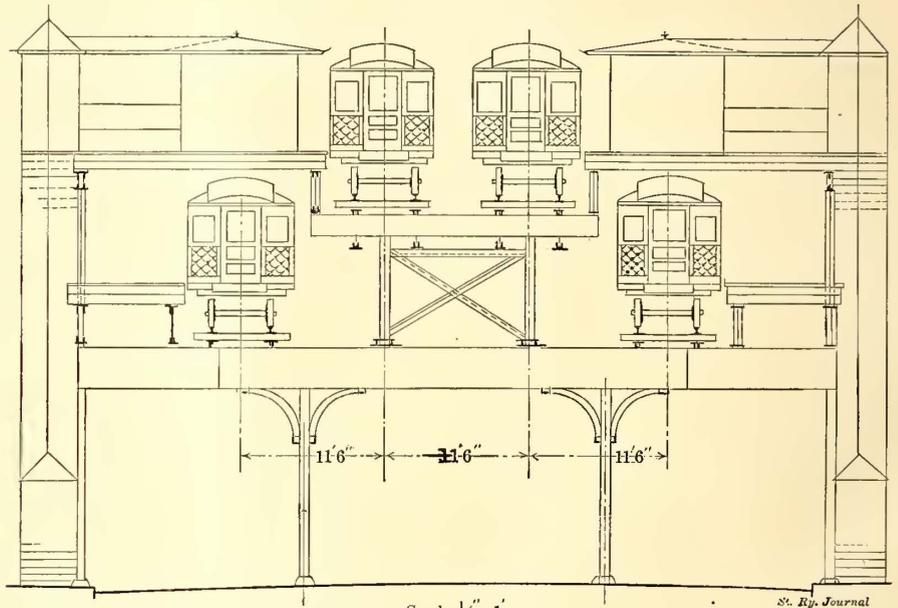


FIG. 11.—CROSS-SECTION AT 125TH STREET, ON THE SECOND AVENUE LINE

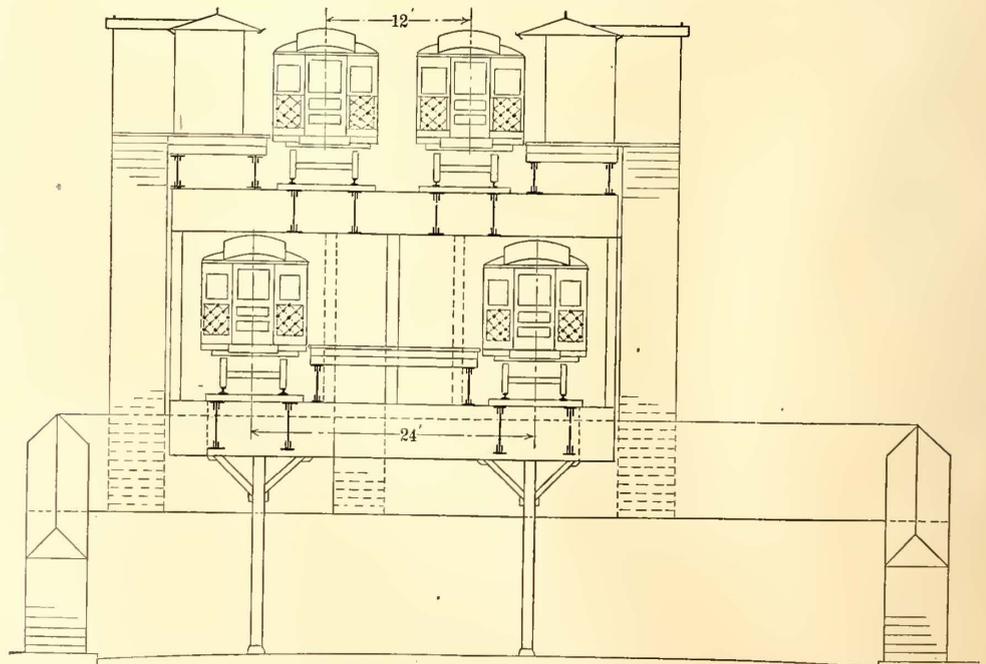


FIG. 12.—CROSS SECTION OF PROPOSED DOUBLE-DECK STRUCTURE AT 149TH STREET THIRD AVENUE, BRONX BOROUGH

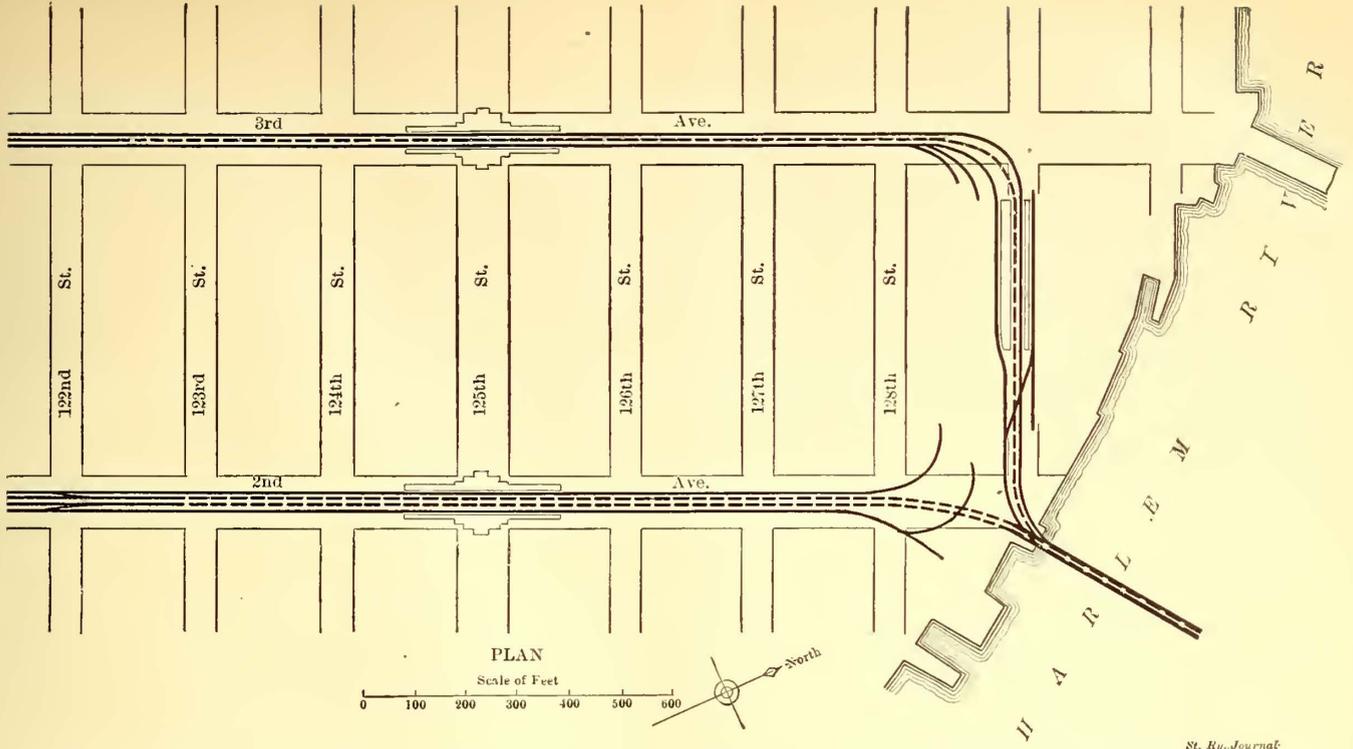


FIG. 13.—PROPOSED LAYOUT OF SECOND AND THIRD AVENUE ELEVATED TRACKS APPROACHING THE HARLEM RIVER

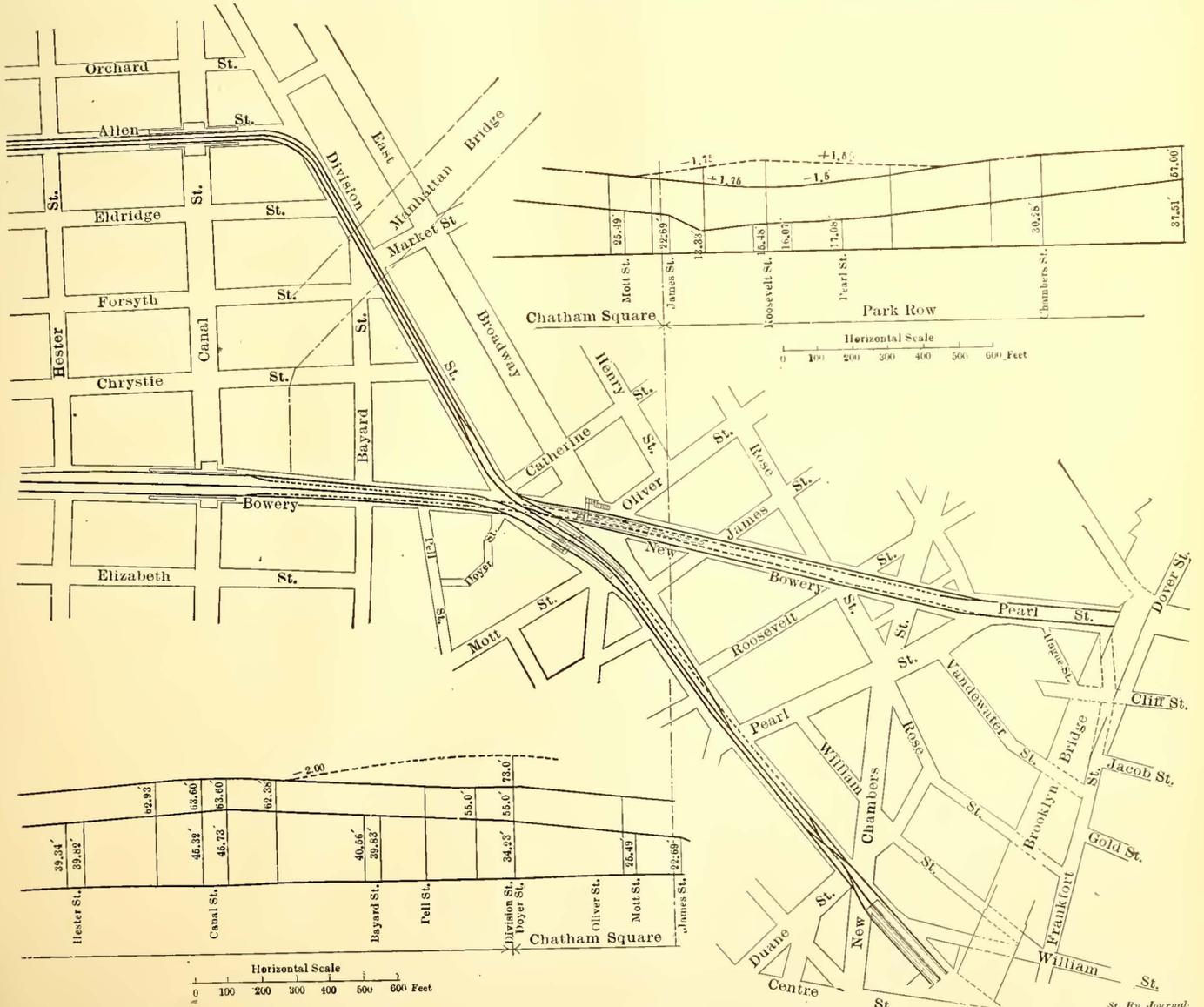


FIG. 14.—PROPOSED TRACK LAYOUT IN THE VICINITY OF THE CHATHAM SQUARE JUNCTION AND THE TERMINAL AT BROOKLYN BRIDGE

St. Ry. Journal

St. Ry. Journal

ham Square, would be connected by cross-overs with the present main tracks and the gaps in this middle track from Grand Street Station to Ninety-Second Street filled in to make a continuous middle track to 122d Street, at which point the structure would be made for four tracks, the two inner tracks rising to an elevation of 11 ft. at the proposed express station at 125th Street and continuing thence to an upper grade to and across the Harlem River to permit the east local track to pass under the same to the terminal at 129th Street and Third Avenue without a grade crossing. The express track would be provided with an express station at Twenty-Third Street between First and Second Avenues, elevated like those on the Third Avenue line.

The proposed double-track bridge across the Harlem River would carry two tracks on each deck. The lower tracks would perform the service of the present main tracks, and the upper pair be a continuation of the two interior Second Avenue tracks already mentioned. The present tracks of the Bronx or suburban line south of East 145th Street, located on right of way, would be spread to permit the two upper grade tracks to be located between them and continued to 150th Street and Third Avenue, where they would deflect to the east and descend on a grade connecting with the present tracks of the Westchester branch at Brook Avenue. Connections would be made between the upper grade tracks and the present suburban line tracks at 147th Street and Third Avenue, north bound, and 154th Street and Third Avenue, south bound.

PROPOSED SUBWAY SYSTEMS FOR THE EAST SIDE

By a decision of the Appellate Division of the State Supreme Court last July, the New York Board of Rapid Transit Commissioners was given permission to decide and place contracts within two years on any advisable number of certain subway routes approved by the courts. However, only a portion of these routes could be built with the city's money alone, since their estimated total cost of \$450,000,000 (including equipment) is nine times the amount the court suggested as available for such purposes within the next two years. As the court pointed out: "This will enable them, within the period named, in view of the then existing condition of the city's finances, to determine just what routes should be built, and after that time they should be required, if able to construct other routes, to renew their application to this court. This will render null and void our approval of all routes not selected and contracted for within the said two years." It should be understood that these financial limitations do not apply if private capitalists are willing to build the approved routes under the provision of the Elsberg law granting a twenty-year franchise.

Under the limitations thus imposed, the Rapid Transit Commissioners have been obliged to consider only the most essential routes. Of those suggested for the East Side-Bronx traffic, the Third and Lexington Avenue routes, shown in Fig. 15, are being favorably considered. These subways, if built, would take most of the long-haul business from the Madison, Lexington and Third Avenue surface lines, besides relieving the Third Avenue elevated railway.

The main line of the proposed Third Avenue subway, known as Route No. 2, would begin as a two-track subway on private property south of Southern Boulevard, between Third and Lincoln Avenues in Bronx Borough, through private property to a tunnel under the Harlem River to Third Avenue and East 129th Street in Manhattan Borough, thence as a four-track subway through Third Avenue and the Bowery to Chatham Square. From the Square the lines

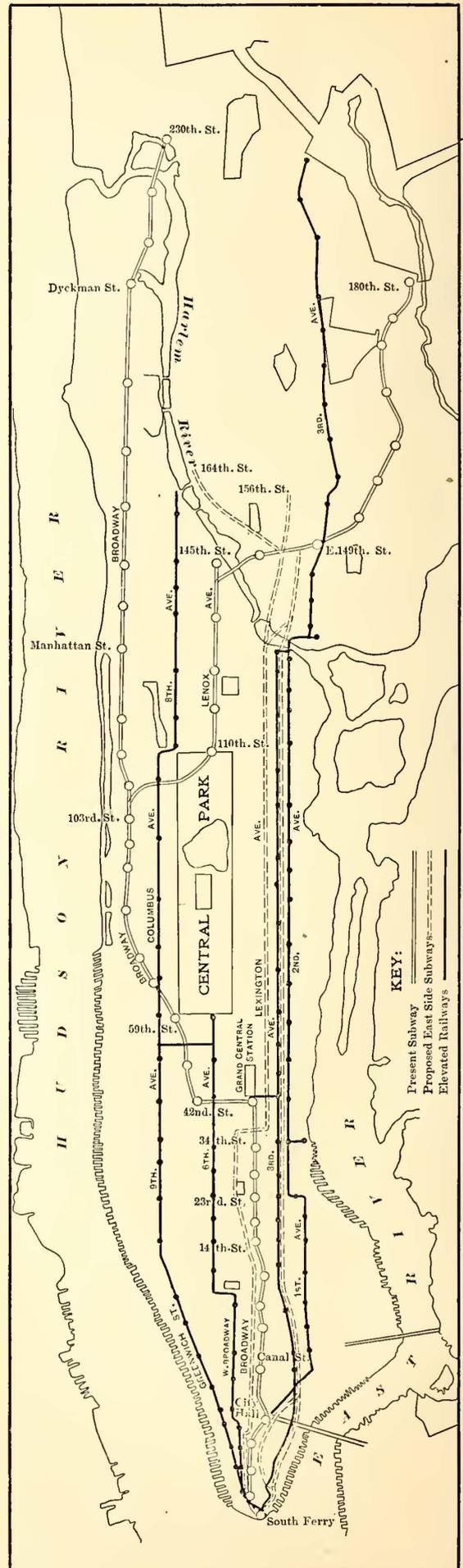


FIG. 15.—MAP OF MANHATTAN AND BRONX, SHOWING THE ROUTES OF THE PRESENT ELEVATED RAILWAYS AND SUBWAY, AND THE TWO PROPOSED EAST SIDE SUBWAYS

would run as follows: One two-track subway through New Bowery, Pearl, Broad, South and Whitehall Streets to Battery Park and around the present subway loop, thence to a terminal under the park; a second two-track subway from Chatham Square, through Park Row, Nassau Street, Broad Street to Pearl Street. There would be two cross-town spurs with the proposed Seventh and Eighth West Side subways and several feeders in the Bronx.

The proposed Lexington Avenue subway is known as route No. 5. It would begin at several points in the Bronx, converging at Lexington Avenue and East 129th Street in Manhattan Borough. These branches would be made up as follows: A four-track subway through Third and Morris Avenues, terminating at East 149th Street to connect with the present West Farms subway; a two-track subway running north by east through Park Avenue to East 156th Street; a two-track subway from East 149th Street and Park Avenue, running in a general northwesterly direction to East 164th Street; a one-track loop between the two branches last mentioned, and two short double-track spurs running respectively northeast and southeast from Park Avenue and 138th Street. From East 129th Street the main line would proceed as a four-track subway down Lexington Avenue to East Thirty-Fifth Street, west through East Thirty-Sixth Street, thence through Fifth Avenue and Broadway to Chambers Street, from where the line would be continued as a two-track subway under Broadway, Vesey Street, Church Street, Trinity Place and Greenwich Street to Battery Park. In addition the Lexington Avenue subway would be connected to the present subway at Forty-Second Street and Park Avenue; a four-track spur from near East Forty-Second Street to a point between East Thirty-Sixth Street and East Thirty-Seventh Street, continued as a two-track line to Fifth Avenue and East Thirty-Fourth Street, which would connect with another branch beginning between East Thirty-Sixth Street and East Thirty-Seventh Street on Lexington Avenue. At Broadway and Chambers Street there would also be a one-track loop under City Hall Park.

TRANSFERS BETWEEN ELEVATED AND SURFACE LINES IN PHILADELPHIA

Free transfers to and from the Market Street elevated road and the intersecting cross-town lines in West Philadelphia will be given by the Rapid Transit Company when the elevated road and subway line are placed in operation. Six tickets for a quarter will be sold, and they will be good on either the elevated or surface lines. To relieve the holiday rush, the temporary loop west of City Hall was placed in operation on Dec. 8, when the day schedule of cars went into effect. Other plans for better service in connection with the elevated railway and the surface lines are in contemplation.

DETAILS OF STATION TRAFFIC ON THE NEW YORK SUBWAY

The publication of the New York Rapid Transit Commissioner's 1905 report has released the detail figures of the New York subway station travel. These should prove especially interesting in connection with the articles published in the present and preceding issues on the East Side-Bronx transportation problem. The figures selected are for June and December, 1905, and for December, 1904. The comparatively small effect of the subway in relieving the East Side transportation problem in New York has already been discussed in the article mentioned, nevertheless it is interesting

to point out here that between December, 1904, and December, 1905, the ticket sales on the subway increased from 8,796,952 to 13,715,946.

STATEMENT SHOWING THE NUMBER OF PASSENGERS CARRIED FROM EACH STATION OF THE NEW YORK SUBWAY DURING THE MONTHS OF DECEMBER, 1904, AND JANUARY AND DECEMBER OF 1905.

Opening Oct. 27, 1904.	Dec., 1904.	June, 1905.	Dec., 1905.
City Hall.....	181,830	52,445	73,900
Brooklyn Bridge.....	1,548,881	1,145,922	1,717,380
Worth street.....	100,501	80,620	139,428
Canal street.....	149,509	123,490	222,232
Spring street.....	171,277	133,965	261,180
Bleecker street.....	180,620	146,114	260,500
Astor place.....	307,562	207,995	465,660
Fourteenth street.....	549,650	379,460	766,900
Eighteenth street.....	210,007	140,750	302,980
Twenty-third street.....	379,625	274,280	571,300
Twenty-eighth street.....	101,013	112,910	274,630
Thirty-third street.....	174,590	127,100	280,860
Grand Central.....	607,125	534,000	855,240
Times square.....	451,720	286,960	655,640
Fiftieth street.....	165,840	126,530	244,470
Columbus circle.....	231,820	148,600	325,540
Sixty-sixth street.....	149,180	100,590	193,200
Seventy-second street.....	209,940	140,590	287,460
Seventy-ninth street.....	137,604	80,810	186,480
Eighty-sixth street.....	160,473	101,660	209,342
Ninety-first street.....	86,560	55,364	112,630
Ninety-third street.....	210,145	166,360	300,180
One Hundred and Third street.	107,279	137,840	256,760
Cathedral parkway.....	84,133	66,794	129,757
Columbia University.....	70,730	46,670	95,820
Manhattan street.....	81,359	90,520	151,600
One Hundred and Thirty-seventh street.....	44,480	47,428	83,762
One Hundred and Forty-fifth street.....	138,780	104,578	175,036
Opening Oct. 28, 1904.			
One Hundred and Fifty-seventh street.....	76,404	102,538	140,950
Opening Nov. 23, 1904.			
One Hundred and Tenth street, Lenox avenue.....	228,952	206,470	331,800
One Hundred and Sixteenth street, Lenox avenue.....	345,408	278,430	487,720
One Hundred and Twenty-fifth street, Lenox avenue.....	303,051	236,645	478,740
One Hundred and Thirty-fifth street, Lenox avenue.....	241,973	211,910	347,560
One Hundred and Forty-fifth street, Lenox avenue.....	52,520	45,730	83,380
Opening July 10, 1905.			
Mott avenue.....	.....	.....	41,260
Third avenue.....	.....	.....	230,110
Opening Nov. 26, 1904.			
Jackson avenue.....	101,940	121,115	164,310
Prospect avenue.....	93,852	116,326	197,520
Simpson street.....	32,003	38,967	51,035
Freeman street.....	60,513	74,089	117,684
One Hundred and Seventy-fourth street.....	11,594	15,071	19,395
One Hundred and Seventy-seventh street.....	30,135	47,600	65,470
One Hundred and Eightieth street.....	27,465	82,050	60,480
Opening Jan. 16, 1905.			
Fulton street.....	.....	412,448	616,835
Opening June 12, 1905.			
Wall street.....	.....	149,840	366,711
Opening July 10, 1905.			
Bowling Green.....	.....	.....	132,340
South Ferry.....	.....	.....	171,400
Sum total, including miscellaneous.....	8,796,952	7,313,986	13,715,946

CLUB BUILDING PURCHASED FOR ST. LOUIS RAILWAY MEN

The residence at 1411 South Grand Avenue, St. Louis, is to be converted by the United Railways Company into a clubhouse for its employees. A hall 100 ft. x 100 ft. will be built in the rear of the present structure for dancing purposes. At the west end will be a stage 25 ft. deep. The addition will cost \$18,000. The house itself will be furnished throughout to provide reception rooms, parlors, library and reading rooms.

SUGGESTIONS ON RAPID TRANSIT WITH PARTICULAR REFERENCE TO ROLLING STOCK—1.

BY JOHN P. FOX

In the *STREET RAILWAY JOURNAL* for April 1, 1905, the writer discussed the subject of "Car Designs and Carrying Capacity," and compared a number of existing and possible car types with a view of bringing out the best features of

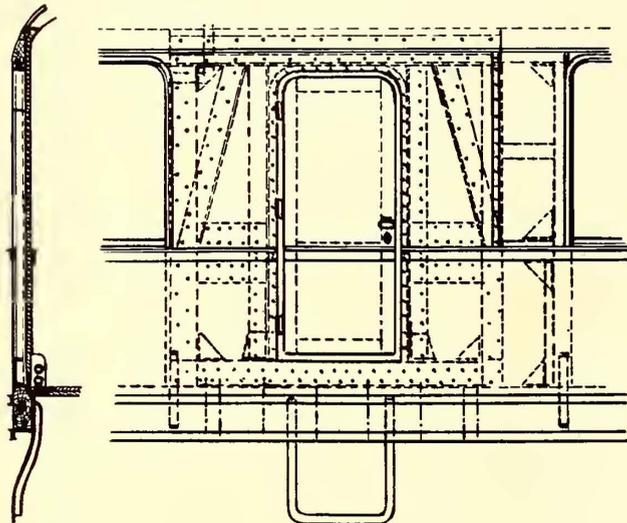


FIG. 1.—EMERGENCY DOOR IN GERMAN VESTIBULED CAR

each. He then endeavored to combine these in a car which could meet in the most satisfactory way the severest conditions of rapid transit service. As this article considered only the seating capacity of different cars, and did not take account of standing passengers, of the time to operate doors and give signals, and other practical matters of operation, it may be interesting to consider more in detail the practical working of a number of car types, and include this time all the factors that enter into the situation. The great difficulty found in handling crowds with the present cars in the New York subway suggests a place and conditions about as severe and varied as could be found, and, as specific recommendations are always more valuable than those which are general in character, the writer will consider the adaptability of each of various types of cars to the New York subway conditions. In this comparison it will be necessary to refer to existing practices on the New York subway and other roads, if faults are to be avoided in the future. The writer would be only too glad to have any of his mistakes corrected, and hopes that any criticisms which he may make of existing methods will be understood as being friendly and in no carping spirit.

A good many persons have expressed surprise that center doors, such as previously adopted on the Brooklyn Bridge and Boston Elevated cars, were not provided in the present New York subway cars. It has been claimed that the need of platform men to operate such center doors has been overcome by pneumatic operation, that proper stability in car construction can be secured with center doors, and that the open spaces at curved platforms necessary with them have been successfully filled in Boston by ingenious movable bridges. One answer to this is that at the time the

subway was built the New York public was used to the Manhattan or end-door car, and other things being equal, an existing or well-known type of car is preferable to one radically new. Again, at the time the present type of car was selected there was no indication that the amount of transferring between local and express trains at express stations would be anywhere near as great as it has since proved to be. This transferring is a large factor in accentuating the inadequacy of the present doors. The most important question now, however, is not what should have been done in the beginning, but what can be done now to relieve present congestion and the often exasperatingly long stops, with their hindrance to operation as well as their inconvenience to the public. At the same time, it is also important for the future to determine what center-door cars would have accomplished if they had been adopted in the subway. Two test runs will therefore be made on paper with different types of cars, including the Boston Elevated cars, as the best examples working in this country of the center-door type of car.

THE CENTER-DOOR CONSTRUCTION

For some time the writer was one of those who thought the Boston Elevated type would have greatly reduced the station stops in New York, and was so convinced of this as even to consider whether the present cars could not be reconstructed so as to allow one or more doors to be cut in their sides. The proposition of cutting through the main trusses without fatally weakening the cars seemed hopeless, until an illustrated account appeared of how the very thing had been done in Germany. It was a case of cutting an emergency doorway in the wood and steel side of a vestibuled steam car, and, as shown in Fig. 1, steel sections were added about the opening so as to carry all the compression strains above the door. Fig. 2 illustrates the struts used about the wide doorway of a German mail and baggage car. Without considering the question of expense or desirability or appearance, it seems now as though the plate girders of the subway steel cars might be cut through safely as in Fig.

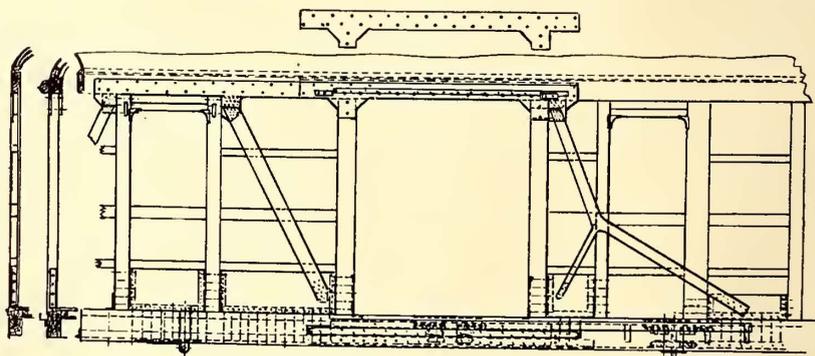


FIG. 2.—SIDE FRAME OF GERMAN MAIL AND BAGGAGE CAR

1, and the subway wooden cars treated as in Fig. 2. But as no need for such surgery really exists, the discussion of this point will be left to those car designers who do not wish to be outdone by the Germans.

It may be an interesting digression in this connection to look at four other examples of German car construction. Fig. 3 is the plain, longitudinal section, and cross section of the underframe of a Prussian side-door railroad car, with a wooden body above, such as is commonly used in Europe. Fig. 4 illustrates a Prussian vestibuled car, showing the ingenious German method of making the whole side of the car serve as a truss, with extra steel plates at the car ends in addition to the plates covering the whole side. The ad-

vantage of this treatment of the side was evident in the case of a German-built vestibuled car which the writer measured, in which the walls were only 2 ins. thick including the inside finish. It will be remembered that the new Great Northern & City steel cars in London also have the whole side treated as a truss, and, in spite of a center door, the weight of the body is 16 per cent less than with the previous wooden type. Fig. 5 is another Prussian vestibuled car, with continuous side plate girders as in the subway cars. Fig. 6 illustrates a Bavarian vestibuled car, with a steel truss plank.

EFFECT OF TWO SIDE DOORS

If side doors could be inserted in the New York subway cars, the best arrangement would appear to be to add two doors to each side as in Fig. 7. This leaves the diagonal braces undisturbed, and gets the doors nearer each end than if placed in the very center, so that the distance each guard has to see to operate his doors is reduced. If one door were

the form shown in Fig. 7 has two obvious advantages over a center door, viz: in bringing the openings nearer to the guard as already pointed out, and in allowing more passengers to pass through, because the wide Boston center door

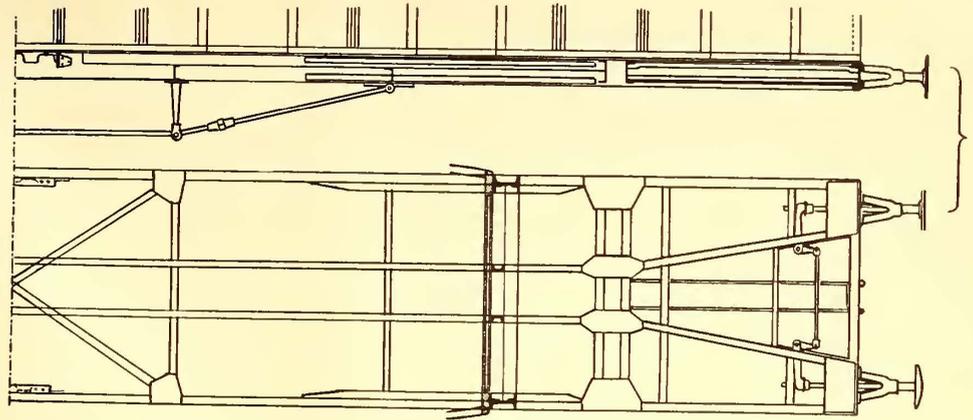


FIG. 3.—UNDERFRAME OF PRUSSIAN SIDE-DOOR CAR

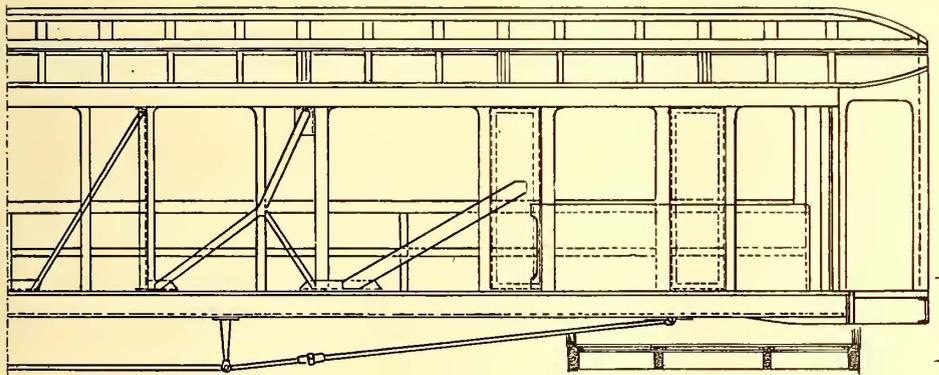


FIG. 4.—FRAMING OF A PRUSSIAN VESTIBULED CAR

placed on one side of the center post, it would allow 64 seats in the car, and two doors wherever placed would allow 56 seats if set facing each other. This arrangement of seats, if properly carried out, allows more standing passengers than at present, for if the seats are made compact so that people must sit up straight, and, as is commonly the practice in Europe, persons can stand between the seats, especially if suitable posts and handles are added. The present cars can hold 120 seated and standing passengers each, but the proposed arrangement can hold about 150 equally comfortably, or 110 with the aisle and all four doors on either side wholly clear, where the present cars would only hold about 66 passengers before some one was in the way. With a car as in Fig. 7, each guard would of course stand, as now, between the cars, and operate an end door on each adjoining car and also the nearest side door on each car. On the other hand, a single wide center door as in Boston would require the removal of the middle posts of the car. Moreover,

at the quickest allows only two passengers through in 1.3 seconds, while the minimum rate observed for two single doors would permit two passengers to pass through in 0.8 of a second. The car suggested in Fig. 7 has one unavoidable inferiority over the Boston

Elevated cars, in the solid partitions in the end of each motor car. These have been removed in the Boston cars, as well as in the New York trailers, so that the guard has a better view of the center doors, although the motorman's cab is greatly reduced. Perhaps such inside partitions would not be serious, and on the Metropolitan District cars in London, which have pneumatic center doors, the inside openings are even narrower than in New York.

EFFECT OF SIDE DOORS ON LENGTH OF STATION STOPS

Any one who knows the remarkably short stops of the Illinois Central cars with twelve side doors would naturally

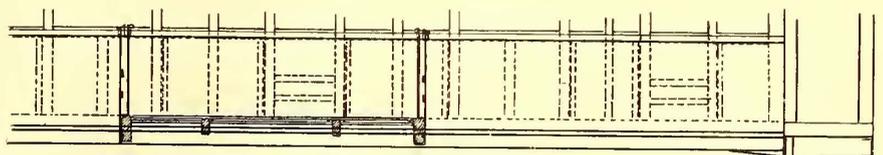


FIG. 5.—PLATE GIRDER CONSTRUCTION OF A PRUSSIAN VESTIBULED CAR

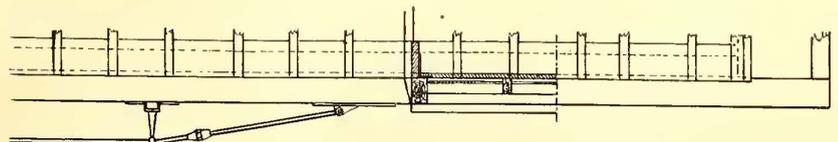


FIG. 6.—CONSTRUCTION OF A BAVARIAN VESTIBULED CAR

expect that the addition of two doors to each side of the New York cars would greatly reduce the length of all station stops. But before advocating such alterations it would be well to study carefully the actual results of opera-

tion of the Boston Elevated cars. An account of these cars and their early performances was given in the STREET RAILWAY JOURNAL for April 1, 1905, where it will be remembered a marked reduction in stops was shown with the new trains with pneumatic end and center doors, over the old trains with platform gates and center doors opened only by platform men at terminals throughout the day and at most of the other stations during rush hours only. The writer had greatly admired the Boston improvements, and was much disappointed at the results of further investigations. When the Boston stops were timed at different periods of the day it was soon noticeable that they were undesirably long, especially during the slack hours, in spite of the improvement noted over the older type. As these figures accumulated, it became evident that the Boston stops, excluding those at terminals, were longer than the local stops in the New York subway below 116th Street, including the stops of express trains at local stations on two-track sections. The results finally collected are given in Table I., and it should be stated that the Boston figures are for summer travel entirely, while the New York figures were for last winter.

DELAYS WITH THE BOSTON TYPE OF DOOR

As it did not seem possible that the traffic could be heavier in Boston than in New York, the writer looked for the cause of the differences elsewhere, and found it at last in the arrangement and operation of the Boston doors. The trou-

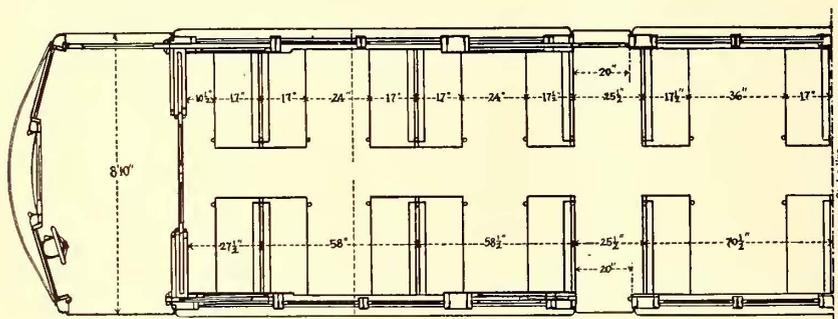


FIG. 7.—REMODELED NEW YORK SUBWAY CAR. FIFTY-SIX SEATS

ble is that the forward guard has to operate four air valves at each station, and while he can open the doors quickly in

TABLE I.—LOCAL STOPS IN SECONDS.

	Boston Elevated.	New York Subway.
Average rush hour stop.....	29.	25.
Average slack hour stop.....	24.6	14.3
Longest rush hour stop.....	68.	72.
Shortest rush hour stop.....	16.	9.
Longest slack hour stop.....	54.	30.
Shortest slack hour stop.....	13.	4.

pairs, moving a handle with each hand, for reasons of safety he usually closes the doors one at a time, carefully watching the entrances for any late comer who may try to crowd through at the last minute. All this takes time, although it was rather surprising at first to find stops of 13 seconds and over with no passengers getting on or off. It is this latter condition that constituted the principal reason for the long stops in Boston.

The Boston doors move at different speeds which are largely independent of the number of passengers passing through the doors. Some times of closing, observed by the writer, are given in Table II.

As the New York subway car doors are hand-operated,

the speed of movement depends mostly on the activity of the guard. Often the doors are wide open by the time a train is stopped. Sometimes the starting signal is given before all the doors are closed. The average time taken to close a single door is about one second, and varies from perhaps 0.7 second to 2 seconds. The latest type of sliding door can be opened or closed by hand in as short a time as 0.3 of a second, with a surprising ease of movement.

TABLE II.—BOSTON ELEVATED CARS. TIME TO OPEN AND CLOSE DOORS SINGLY IN SECONDS.

	END.		CENTER.	
	Open.	Close.	Open.	Close.
Average.....	2.33	2.30	2.46	3.28
Maximum.....	5.	7.	4.	4.80
Minimum.....	1.	.70	1.80	1.

It seems hard to make the Boston doors move at just the right speed, and in extreme cases it has taken as long as 5 seconds to open and only 0.7 of a second to close a door. While it is safe to have doors open at any speed, 2 seconds seems about as fast as it is safe to close them, and the most desirable mechanism appears to be one giving a uniform velocity that can be instantly checked or reversed. If automatic electric signals are in use, a mechanism that closes too slowly at the end is evidently as undesirable as one that closes too fast for safety.

When a Boston train stops at a station, then, a minimum time of about 13 seconds is occupied in opening and closing the doors and in getting the power on. Possibly this might be reduced to 10 seconds with faster doors and quicker guards. Of course passengers can pass in or out some during this time while a guard is closing a door elsewhere. The 13 seconds is taken up roughly thus: Three seconds on the average to get all the doors open, 2 seconds to close each of the four doors, and 2 seconds for the motorman to release brakes if necessary and get started. Only the forward

guard has four doors to operate; all the others have three, so the movements of the former generally determine the length of stop.

The minimum stop of 4 seconds timed by the writer in the New York subway shows that manually-operated doors and hand signals can be very quick, but the 3-second minimum stop of an Illinois Central train is still more remarkable, with the twelve doors to each car to be opened by passengers and closed by hand by the guard. The latter has the advantage in this car of having to look in only one direction and of closing all his doors at once instead of singly at four places as in Boston. The Boston Elevated officials were quick to see the advantages of the Illinois Central type of car, and perhaps might have tried it if their other type had not been already fixed.

As the New York doors are often open by the time a train stops, 5 seconds seems a fair average as a minimum time to close doors and start the train. It is clear now why the Boston stops are the longest in spite of the center door, for, unless the number of passengers getting on or off at a station is over about 40 to a single car, the Boston cars cannot make up for the handicap of 8 seconds.

LENGTH OF STOPS WITH DIFFERENT KINDS OF CARS

For comparative purposes it will be assumed that persons

pass through single-end doors at the rate of one a second, which is about the average. It will be remembered that a wide end door as found in New York is no quicker than an ordinary door, because people crowd up to it, or line up close each side, thus narrowing the opening. At the center of a car, however, as in Boston, a wide door is more effect-

ive, as already pointed out, and the time per passenger passing through will be assumed at 0.75 of a second, though the actual average is about 0.93 of a second.

It may be well to point out here that the rate of movement of people through doors assumed in this article is exceeded regularly in the rush hours with the Brooklyn Bridge cars.

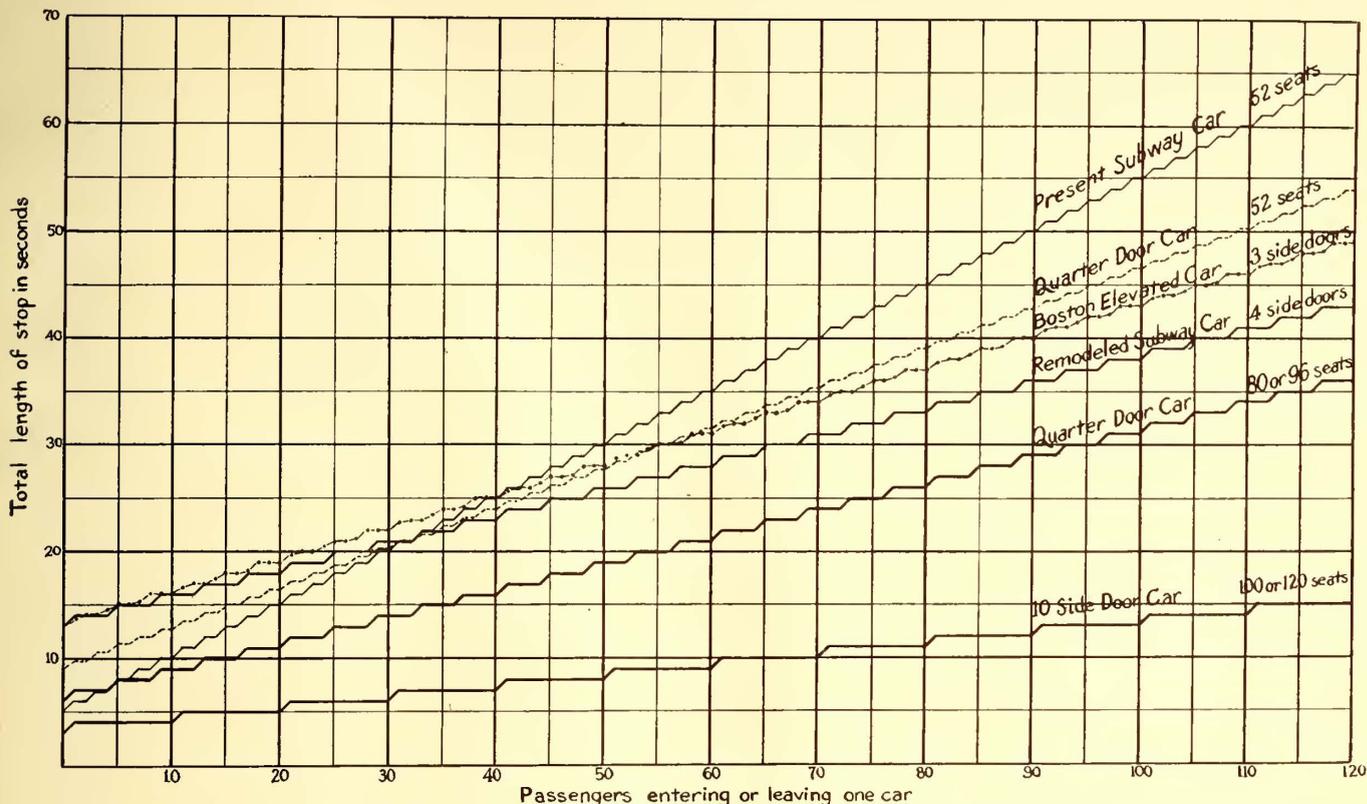


FIG. 8.—TOTAL LENGTH OF STOP WITH DIFFERENT NUMBERS OF PASSENGERS

TABLE III.—ESTIMATED STOPS IN NEW YORK SUBWAY IN SECONDS—EXPRESS RUN.

STATION.	PASSENGERS PER CAR.			Present New York Cars.	Boston Elevated Cars.	Remodeled New York Cars, 4 Doors.	Remodeled New York Cars, 2 Doors.	Side-Door Cars.	Quarter-Door Car, 120 Places.	Quarter-Door Car, 112 Places.	Quarter-Door Car, 168 Places
	Getting Off.	Getting On.	In Car After Start.								
South Ferry.....	0	5	5	.....	.....	.....	.....	.....	.....	.....	.....
Bowling Green.....	0	15	15	13.	18.	17.	13.	5.	15.	15.	10.
Wall Street.....	0	20	40	15.	19.	18.	15.	5.	16.50	16.50	11.
Fulton Street.....	0	30	70	20.15	22.09	21.	20.	6.	20.40	20.40	14.
Brooklyn Bridge.....	10	40	100	33.25	29.93	26.	30.	8.	30.15	30.15	19.
14th Street.....	20	40	120	48.	38.80	28.70	36.40	9.	41.25	56.20	21.
Grand Central Station.....	40	40	120	65.	49.	34.20	47.40	11.	54.	81.	26.
72d Street.....	20	0	100	25.	25.	18.70	16.40	5.	24.	50.	11.
96th Street.....	50	30	80	47.95	38.95	34.	45.	11.	41.45	41.45	27.
103d Street.....	15	0	65	13.72	18.45	17.	13.	5.	15.52	15.52	10.
110th Street.....	15	0	50	13.08	18.05	17.	13.	5.	15.08	15.08	10.
116th Street.....	15	0	35	13.	18.	17.	13.	5.	15.	15.	10.
Manhattan Street.....	10	0	25	10.	16.	16.	10.	4.	15.	15.	9.
137th Street.....	10	0	15	10.	16.	16.	10.	4.	15.	15.	9.
145th Street.....	10	0	5	10.	16.	16.	10.	4.	15.	15.	9.
157th Street.....	5	0	0	.....	.....	.....	.....	.....	.....	.....	.....
Total stops.....	...	...	...	337.15	343.27	296.60	292.20	87.	333.35	401.30	196.

LOCAL RUN.

Brooklyn Bridge.....	...	20	20	.....	.....	.....	.....	.....	.....	.....	.....
Worth Street.....	...	20	40	15.	19.	18.	15.	5.	16.50	16.50	11.
Canal Street.....	...	20	60	15.	19.	18.	15.	5.	16.50	16.50	11.
Spring Street.....	...	20	80	15.70	19.42	18.	15.	5.	17.03	17.03	11.
Bleecker Street.....	...	20	100	18.	20.80	18.05	15.10	5.	18.75	20.20	11.
Astor Place.....	...	20	120	25.	25.	18.75	16.50	5.	24.	50.	11.
14th Street.....	100	20	40	68.50	51.10	43.	65.	15.	56.63	56.63	36.
18th Street.....	...	20	60	15.	19.	18.	15.	5.	16.50	16.50	11.
23d Street.....	...	20	80	15.70	19.42	18.	15.	5.	17.03	17.03	11.
28th Street.....	...	20	100	18.	20.80	18.05	15.10	5.	18.75	20.20	11.
33d Street.....	...	20	120	25.	25.	18.75	16.50	5.	24.	50.	11.
Grand Central Station.....	100	20	40	68.50	51.10	43.	65.	15.	56.63	56.63	36.
Times Square.....	...	20	60	15.	19.	18.	15.	5.	16.50	16.50	11.
50th Street.....	...	20	80	15.70	19.42	18.	15.	5.	17.03	17.03	11.
59th Street.....	...	20	100	18.	20.80	18.05	15.10	5.	18.75	20.20	11.
66th Street.....	...	20	120	25.	25.	18.75	16.50	5.	24.	50.	11.
72d Street.....	40	10	90	41.15	34.69	26.75	31.45	8.	36.10	49.80	19.
79th Street.....	...	10	100	12.	17.20	16.15	10.25	4.	14.20	16.	9.
86th Street.....	...	10	110	13.50	18.10	16.30	10.50	4.	15.30	22.	9.
91st Street.....	...	10	120	20.	22.	16.69	11.15	4.	20.25	44.	9.
96th Street.....	20	20	120	.....	.....	.....	.....	.....	.....	.....	.....
Total stops.....	...	...	...	459.75	465.85	398.27	393.15	115.	444.45	572.75	261.

Persons board these cars at the end platforms as fast as two in a second, instead of one a second, and enter the wider center doors about as fast. While this speed slows down somewhat as the space in the cars becomes filled, even the last passengers to get on may take very little time, as when they are pushed into the car by the platform men just as the train starts. Such quick movement is hardly possible elsewhere, except after long and expensive training of the passengers until all are as expert as football players. Neither

on a 54-second headway, twenty five-car trains could furnish 40,000 seats an hour.

Fig. 8 shows the estimated length of stop for different types of cars with different numbers of passengers passing through the doors, including the time to operate the doors and start the train, that is, from a full stop to a start, and it will be seen that the New York cars are quicker than the Boston till 39 passengers are handled per car, and slower above 42. It is evident then that if the Boston cars were

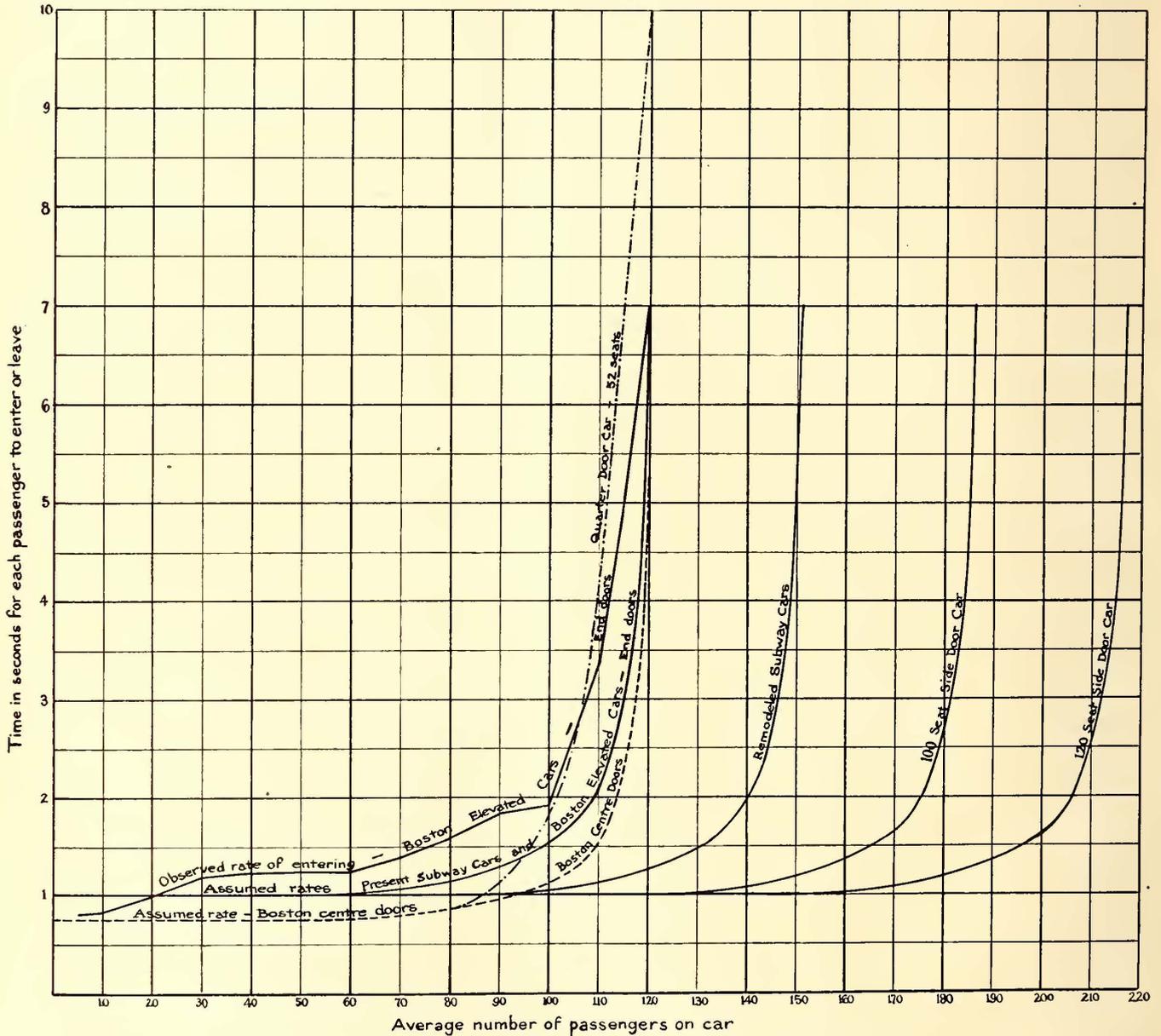


FIG. 9.—RATES OF PASSENGER MOVEMENT WITH DIFFERENT DEGREES OF CAR CONGESTION

is it really desirable, for it invites accidents without limit in the tremendous crush and pushing, in the starting of trains with persons still boarding; and in the rapid closing of doors and gates with cars in motion, a stuck door occasionally may have to be left open. Nor is it strictly necessary, because side-door cars seating 120 passengers each could be used, and loaded or unloaded in about half the time, with people moving just twice as slow. With such trains, consisting of five cars, as at present, and of the same length, run on one minute headway, the seating capacity of the bridge trains would be 36,000 persons an hour, which is about the present maximum traffic. If trains could be run

in use in the New York subway they would probably make shorter stops at the express stations, at least during rush hours, and longer stops at local stations, especially during the slack hours. Subway cars with two additional doors in each side have been assumed to require 13 seconds to operate doors and signals, the same as the Boston cars; but they would be slightly quicker in handling passengers otherwise, as already pointed out, and so would be as quick as the present subway cars in handling 31 passengers, and quicker after 34 per car.

Fig. 8 makes no allowance for the slowing down of passengers' movements in and out of a car that is crowded.

from each end, with twice as many cross seats as now, with longitudinal seats at the car ends, and motorman's cabs and folding seats as on the Manhattan elevated cars, the total number of seats being 52 as in the present subway cars. The doors would be operated by the guards from between the cars as now.

In seeing what the stops of such cars would be on our sample subway runs, it seems safe to count the quarter doors (as the writer called them in his previous article) as equal in capacity to the center doors of the Boston cars, being away from the ends of the car, so that the rate of passing through will be assumed at a passenger every 0.75 of a second. For the safe closing of the doors, 3 seconds each does not seem too much to allow. Then if the doors are open by the time a train stops, and 3 seconds is allowed for the bell signals as used on the present cars, the minimum stop with no passengers would be 9 seconds. As seen from the curves in Fig. 8, these 9 seconds would make the stops of this quarter-door type longer than those of the present subway cars until a movement of 31 passengers per car was reached. Another disadvantage of this type is the reduction of standing room by the introduction of more cross seats, which would cut the total capacity of the car, compared with the others, down to 112 places. This would slow down the movement of passengers when the car was nearly full somewhat as suggested by the curve in Fig. 9, so that the rate of the Boston side doors would not hold to the end. Disregarding at first this slowing down, and supposing the car to hold 120 passengers, its estimated stops in Table III. will be seen to come out at the end just a trifle better than the present subway cars. But if the reduced standing capacity affects the stops as suggested by the curve in Fig. 9, increased delay at express stations would make the type the slowest of all considered, as shown in Table III.

Fig. 11 represents the quarter door type as it might or probably would have been built before the subway was opened. In the light of recent experience, the type could be much improved, as illustrated in Fig. 12. Here compact cross seats are used so that passengers can stand between them. There is also a thin wall construction described later, which would allow five seats across the car in place of four, without exceeding the present width. This car would accommodate 80 seated and 52 standing passengers when the aisles and doors are clear on one side, or 88 standing passengers with all space occupied, giving a total capacity of 168. By widening the car above the station platforms, the present clearances in the subway would allow six seats across with an aisle, or a car with 96 seats and space for 100 more to stand. The doors in Fig. 12 have been made double not

only to allow quicker movement, but also greater safety, on account of the introduction of a vertical grab-handle post in the middle. The main object of this post, however, is to make the wide opening of the door act as two single doors by dividing the crowds and thus increasing the capacity of the opening over the ordinary center door, through which passengers too often pass in the middle and not two abreast. This post is set back from the door enough to keep people away from them while the doors are being closed. The Metropolitan District cars in London have similar doors pneumatically operated, though without any dividing post.

The stops of this third type of quarter-deck car are given in the last column of Table III., and make the best showing except for the side-door type. Automatic electric signals are assumed, cutting 3 seconds off the stops, and there would be no slowing down of movement with the largest crowds here considered. But if the Interborough Company had originally adopted a quarter-door type, it would, as stated, probably have been like the first form shown in Fig. 11., which, as shown, would not have been any quicker than the present cars. If then there had been no choice except between the Boston Elevated type, the quarter-door type,

TABLE IV.—COMPARATIVE CAPACITY OF CARS FOR THE NEW YORK SUBWAY.

TYPE.	Fig.	Seats.	WITH STANDING PASSENGERS.			
			Aisles and Doors Clear.		Aisles and Doors Filled.	
			Standing.	Total.	Standing.	Total.
Present cars.....	..	52	14	66	68	120
Remodeled, with 4 side doors...	7	56	54	110	95	151
Remodeled, without 4 side doors	10	64	54	118	87	151
*Side door car No. 6000 .....	..	100	33	133	86	186
*Side door car No. 7000 .....	..	120	33	153	97	217
Quarter door, 1st type.....	11	52	8	60	60	112
Quarter door, 2d type.....	12	80	52	132	88	168
Quarter door, 3d type (wide) ..	..	96	60	156	100	196
Boston elevated cars.....	..	48	10	58	72	120

* These cars will be described later.

and the present subway type, it would appear that no great mistake was made in keeping the standard form of car already in use on the elevated lines. Nevertheless the seat arrangement of Fig. 10 seems better in every way than the one adopted, and it would be interesting to see it at least tried now in the subway, though the passengers might give some trouble about keeping out of the aisles and standing between the seats.

CARRYING CAPACITY OF TYPES OF CARS UNDER CONSTRUCTION

In Table IV. is summarized the holding capacity of the types of cars under consideration.

TABLE V.—COMPARATIVE DATA FOR RUNS IN NEW YORK SUBWAY.

EXPRESS RUN.—SOUTH FERRY TO 157TH STREET.

	Present New York Cars.	Boston Elevated Cars.	Remodeled New York Cars. 4 Doors.	Remodeled New York Cars. 2 Doors.	Side-Door Cars.	Quarter-Door Car, 120 Places.	Quarter-Door Car, 168 Places.
Assumed time, including stops.....sec.	1,800	1,800	1,800	1,800	1,800	1,800	1,800
Stops.....sec.	337	343	297	292	87	333	196
Time, excluding stops.....sec.	1,463	1,457	1,503	1,508	1,713	1,467	1,604
Stops, per cent of length with present cars.....	100%	102%	88%	87%	26%	99%	58%
Speed, including stops.....m.p.h.	21.18	21.18	21.18	21.18	21.18	21.18	21.18
Speed, excluding stops.....m.p.h.	26.06	26.15	25.35	25.27	22.25	26.00	23.78
Per cent reduction in speed over present cars.....	0	+ 0.35%	-2.72%	-3.03%	-14.62%	-0.23%	-8.75%

LOCAL RUN.—BROOKLYN BRIDGE TO 96TH STREET.

	Present New York Cars.	Boston Elevated Cars.	Remodeled New York Cars. 4 Doors.	Remodeled New York Cars. 2 Doors.	Side-Door Cars.	Quarter-Door Car, 120 Places.	Quarter-Door Car, 168 Places.
Assumed time, including stops.....sec.	1,560	1,560	1,560	1,560	1,560	1,560	15.60
Stops.....sec.	460	466	398	393	115	444	261
Time, excluding stops.....sec.	1,100	1,094	1,162	1,167	1,445	1,116	1,299
Stops, per cent of length with present cars.....	100%	101%	87%	85%	25%	97%	59%
Speed, including stops.....m.p.h.	14.84	14.84	14.84	14.84	14.84	14.84	14.84
Speed, excluding stops.....m.p.h.	21.05	21.15	19.92	19.85	16.02	20.73	17.80
Per cent reduction in speed over present cars.....	0	+ 0.50%	-5.40%	-5.70%	-25.00%	-1.52%	-15.44%

If the stops of the trains in the New York subway could be reduced, one way to utilize the advantage would be to reduce the maximum speed and thus cut down the current consumption. This would reduce the temperature of the subway and thus lessen the rate at which it will inevitably become hotter from year to year.

Comparative figures for different station stops, but based on the same schedule speed, are given in Table V.

The economy of the side door car is very apparent from the preceding table. It would be interesting to know the relative current consumption for the different types of cars on the test runs, but the matter needs further study. From approximate figures, however, it appears that on the express run the side door cars might use about 12 per cent less current than the present cars, while on the local run, the side door cars might save as much as 46 per cent of the current. While such economy, if confirmed, might be found to such an extent only in the rush hours, it suggests the need of further practical trial of side door cars, to see especially if they might not cause a sufficient reduction in operating expenses and cost of maintenance to make it profitable to substitute them, in time at least, for the present car bodies.

(To be Continued.)

THE ELECTRIC RAILWAYS OF GERMANY AT THE CLOSE OF 1906

BY A GERMAN ENGINEER

The electric railway companies in Germany with but few exceptions are in a prosperous condition. Many railways which were unable five years ago to earn their operating expenses have since recovered and are paying dividends ranging from 1.2 per cent to 5 per cent. For those roads which are operating under unfavorable conditions the average annual increase in traffic has been at least 3 to 4 per cent during the last five years. For most of the roads the increase has amounted to from 6 to 7 per cent, in quite a few cases it has reached 10 per cent, and in exceptional instances even more than 30 per cent. It is natural that such steady increase in business for a number of years should wipe out the earlier losses and convert poorly paying roads into profitable enterprises. Had all the stockholders foreseen this condition several years ago many of them would not have disposed of their securities at 50 per cent loss, as they did, but would have held them up to the present time to sell at an advance of 25 per cent.

There is, however, another cause for this favorable turn of affairs. The Prussian law of 1892 relative to the building of street and interurban railways was a great incentive for the construction of such lines. This development continued uninterruptedly for some six years, the promoters being so anxious to take advantage of it that they fairly fell over each other in offering to the municipalities all kinds of returns, including maintenance of the pavements, free transportation to municipal employees, the purchase of current from the municipal power station at high prices, etc.

Reaction, of course, was inevitable, as the expense of electric railway construction and operation had been underestimated in most instances. Large concerns which had built as many as a score of railway systems or holding companies which had guaranteed the interest payments on railways taken over fell into financial difficulties and had to reduce their nominal capital sometimes to one-third of the

original amount. Instead of receiving dividends the stockholders in these corporations were assessed on their stock to make up for operating deficits, and the public lost confidence in electric railway investments. One notable feature was that the city lines lost money in freight handling, although this was one department of their business which they hoped would be especially profitable.

Naturally the vicissitudes of these earlier companies had the wholesome effect of discouraging the construction of competing lines, so that the natural increase in traffic which a new railway always creates has come to reward the pioneer companies after years of unprofitable operation. Another cause for the present prosperity lies in the fact that the burdensome conditions formerly imposed have been considerably ameliorated, such as the municipalities sharing the cost of paving and reducing the price for current purchased. Another factor contributing to the better state of affairs has arisen from the policy quite commonly followed by the railway companies of not extending their systems unless those to be benefited (generally the municipalities) would guarantee 4 per cent on the money invested. Traffic has also been increased by the gradual connection of neighboring systems.

STATISTICS

Great caution has also been shown in later years in the building of new street railway systems, the increase in the number of companies between 1903 and 1904, for instance, being only 10, or from 212 to 222. It is probable that not more than six new lines were built in 1905, and probably another six in 1906. In 1903 the total length of lines was 1949 km (1228 miles). In 1904 this was increased by 141 km (87.5 miles), and within the last two years the extensions have probably not been any greater. This figure, according to the method followed in Germany, represents length of route, not length of single track as with the American custom. It does not, therefore, indicate the increase in the amount of double track, which has been considerable.

As there is quite a number of different gages used in Germany it may be of interest to give a list here of their comparative number and lengths:

GAGE.	PRUSSIA.		REST OF GERMANY.	
	Number of Roads.	Per Cent. of Total.	Number of Roads.	Per Cent. of Total.
1.437 m. or 4 ft. 8½ ins.	49	31.2	7	10.8
1 m. or 3 ft. 3¼ ins.	97	61.8	42	64.6
750 mm. or 29½ ins.	2	1.3	..	..
600 mm. or 23¾ ins.	2	1.3	1	1.5
Mixed gage.	3	1.9	3	4.6
Miscellaneous.	4	2.5	12	18.5
Total	157	100.	65	100

Standard gage is now favored, whenever possible, because of the difficulty of designing motors for narrow-gage cars. Of course, in extensions of present systems it is necessary to retain the old gage.

There are still a few steam lines devoted largely to light freight, operated as carriers in connection with the State steam railways, and a few horse railways in towns where the small amount of traffic would not justify electrification, or where the municipalities demand exorbitant terms for their consent. One of the most common of these demands is that the streets should be widened at the railway's expense—a process often costing more than the entire track construction. This accounts for the peculiar fact that even on many large systems small sections are still operated with horses.

This is not unlike the situation on certain of the downtown lines of the Chicago Union Traction Company.

Of all the Prussian street railways operated at the end of 1904, 148 were used exclusively for passenger transportation, 4 exclusively for freight, and 70 for mixed service. Of these 70 lines 28 conducted limited freight service only, and 15 confined their business to express packages. Eight railways still have two classes of passenger cars.

An ever increasing percentage of the mileage operated is now given by trailers. In 1905 the motor-car mileage increased 6.8 per cent, but as the total increase over the preceding year was 8.3 per cent for all cars it appears that the trailers have grown in popularity. The 1905 receipts of the street railways in Prussia are estimated at \$27,000,000, which is considerably more than the preceding year.

Since the street railway companies have done little in the way of extensions recently, they have been able to devote more attention to improvements and betterments, a matter which, according to German standards, had been somewhat neglected in earlier years. This was all the more necessary as the higher costs of operation had not always been accompanied by a corresponding increase in net receipts.

FARES

It is well known that in every country the amount of fare charged is largely dependent upon the standard small coin in common use. In the United States this is 5 cents, because 1 cent would be too low and a 5-cent piece is next in value. In England the common small coin is a penny (2 cents), in France it is 10 centimes (2 cents), and in Germany 10 pfgs. (2 $\frac{3}{8}$ cents). From this it will be seen that the American railway capitalist has the best of the bargain, for even if the operating costs are greater in the United States than in Germany, still 5 cents is more than double 10 pfgs.

As has been noted in former issues of the STREET RAILWAY JOURNAL, this is one great reason why the single or uniform fare system has been successful in America and unsuccessful as a rule in Europe, where it has caused a great deal of trouble. Nearly all the German railways which have tried the uniform fare system (of course on the 10 pfg. basis) and which were not required by their franchises to continue it, have discarded it for a considerably higher zone fare. It is noteworthy that the municipal lines were the first to increase fares. According to their idea it was all right to force a private corporation to accept a 2 $\frac{1}{2}$ -cent uniform fare, even at a loss, but it was otherwise with public corporations. This action of the municipalities has not failed to react favorably for the private street railway corporations, so that the improvement in fare charges has contributed not a little to the healthier state of the industry. Commutation tickets, which are sold extensively by the street railway companies in Europe, have in particular been considerably increased in cost. Formerly commutation tickets were sold at a reduction of from 50 per cent to 75 per cent of the corresponding number of single fares, but the minimum figure has been doubled, and even if some passengers have been lost the great majority have been retained at the higher fare.

POWER

Another factor that has done much to improve the financial condition of the companies is the increased attention now given to the sale of power. In former years there was very little public demand for electricity, but to-day it is not uncommon to find electric lights in the smallest villages and electric motors employed for a large variety of farming and

manufacturing work. Many small manufacturers have realized that if there is any possibility of competing successfully with large manufacturers it is in the application of electric drive for their machines.

Up to a short time ago the impression was general that small power stations were unprofitable. This has been disproved by an investigation made by General Secretary Dettmar of the German Electrotechnical Society, which led to the conclusion that the smaller power stations such as those existing in cities of 1000 to 5000 population are the most profitable. All of Mr. Dettmar's statistics came from stations in operation at least two years, newer ones being left out, as the interest and depreciation charges for the first year are so much more liable to error. Of the sixty-four stations compared thirty-two showed a surplus of 8 per cent on the capital invested, after paying interest and dividends, and the others averaged a surplus of 5 per cent. There was but one station which showed a loss and that amounted to but 0.6 per cent. A closer investigation of this particular case showed that the loss was due to high cost of management, and to an excessive investment charge. In the thirty-two power stations first mentioned the average cost of the labor and management was 15.9 per cent, and in the other thirty-two stations 20.2 per cent of the total expenses. In a single case it was 40 per cent. Further it was determined that the less profitable stations were not necessarily in the smaller cities, as the average number of inhabitants of the towns served by the more profitable stations was 3350 and of the others 3550. The former had an average income per inhabitant of 8.32 marks (\$2.08) and an average investment per inhabitant of 32.9 marks (\$8.25). The corresponding figures for the less profitable stations were 6 marks (\$0.50) and 53.3 marks (\$13.32). Eleven stations showed a surplus of over 13 per cent, which is certainly remarkable.

Mr. Dettmar also made an investigation for cities from 5000 to 10,000 inhabitants. Of thirty-six stations in this class the highest surplus was 23.7 per cent, the lowest 5.5 per cent and the average 10.2 per cent. The cost of management and labor varied between 9.1 and 28 per cent of the total expenses and averaged 14.9 per cent. The investment per inhabitant ranged between 15.5 marks (\$3.88) and 79 marks (\$19.75), and averaged 37.3 marks (\$9.40). It is interesting to add that the companies were successful even in towns with gas plants. In cities of 10,000 to 20,000 people the average income was 10.6 per cent. From these statistics it is apparent that even the unprofitable undertakings could be bettered by not permitting the wages charge to exceed 20 per cent of the total cost. If this is not possible in small towns a practical mechanic should be engaged instead of a higher-priced engineer. The employees should also be used for other work when not engaged in taking care of the power station, and more attention should be given than heretofore to such outside work as the sale of motors, switches, wattmeters, etc. Another improvement would be effected if rubbish were used as an auxiliary fuel. Even the operation of ice machines can be made a source of income. In one city of 10,000 inhabitants power was profitably sold for machinery making about 185,000 lbs. a month. Central station matters of this character unfortunately have not been discussed very widely in German technical literature. How much these small earnings from side lines can affect the total is apparent when one considers that the average capital invested in one of the smaller power stations in Germany is only 150,000 marks (\$37,500), so that an annual net increase of 3000 marks (\$750) means 2 per cent of the investment.

ROLLING STOCK

Returning now to the subject of street railways, there has been considerable increase in the number of cars in Germany, particularly as double-truck cars have gradually fallen into disuse except in Berlin. Single-truck cars with rather longer wheel base are now preferred. These wheel bases now vary from 3.6 meters (11 ft. 10 ins.) to 2.5 meters (8 ft. 2 ins.), instead of 1.7 meters (5 ft. 2 ins.) to 1.5 meters (5 ft.) as formerly. A radial movement of the axles on curves is secured by allowing a gap of about 1 in. between the journal boxes and the pedestals. The early short wheel base trucks were satisfactory enough while the track was new, but now they are so shaky that a longer wheel base has gradually come into use. This is especially true of trailers, because there are some problems in motor suspension with long-base radial trucks which have not been satisfactorily solved. In Austria and Hungary, however, particularly in Buda Pest and Vienna, greater success seems to have been met in adopting the long wheel base truck for motor-car operation.

The installation of train or simultaneous acting brakes is making progress, though a large number of railways are still using the ordinary hand brake and the short-circuiting or magnetic brake only for emergencies. The air brake has not been adopted to any considerable extent, the German railways believing that it has no advantages over the electric brake, while costing more for installation and maintenance. Detailed statistics on this point will be found in the report on braking presented at the Milan convention of the International Street Railway Association by Mr. Scholtes, of Nurnberg, and published on page 432 of the *STREET RAILWAY JOURNAL* for Sept. 22, 1906.

The Leipzig street railway system has adopted a rope brake based on the principle of the hand brake and friction drum. One end of a braided hemp rope, which is wound around a drum on the car axle, is fastened to the brake rod and the other end to the brake handle. This arrangement has been found well adapted both for motor cars and trains with trailers. The initial cost is said to be only 200 marks (\$50) and the maintenance required very little. This rope brake may also be actuated by a small solenoid.

The most common form of car lightning arrester is the well-known Siemens horn type, which is favored for its low cost of installation and maintenance as well as reliability.

The trolley wheel is still used to a much greater extent for current collection than the bow, but most of the new lines are being equipped with the latter, as its advantages are becoming more apparent. The greater use of the wheel may be ascribed to the fact that the owners of the trolley bow patent, Siemens & Halske, built fewer lines than the other electrical firms. Several companies have changed from the wheel to the bow, but none from the bow to the wheel. The advantages of the bow lie in the simplification of the overhead suspension and the greater safety in operation, because the bow accommodates itself to changes in direction and cannot jump off the wire. While the wheel advocates claim that the bows wear out faster, their statements have never been proved by figures. In any event, the greater safety afforded should outweigh a considerable amount of increased wear even if it does exist.

TRACK CONSTRUCTION

In track work no company is installing to-day grooved rails weighing less than 40 kg per meter (80 lbs. per yard), and in many cases sections weighing 50 kg to 60 kg per meter (100 lbs. to 120 lbs. per yard) are employed. The

usual height of rail up to the present has been 150 mm (6 ins.) for a rail having a base of the same dimension, but as the paving blocks used in Germany are mostly 7.1 ins. deep it is necessary to disturb the track foundations when repairing the paving. This increases the cost of keeping the track in condition. Lately, however, the railway companies have begun to remedy the evil by adopting the old "Goliath" or high rail. For instance, Hamburg is now using a rail 180 mm (7.1 ins.) high, and Munich 210 mm (8¼ ins.) high with an 180 mm (7.1 ins.) base. The new Munich angle plate weighs 59 kg (130 lbs.), is 640 mm (25 ins.) long and has twelve bolt holes. With this construction two cross-ties are used at every joint, while the rest of the track is laid without cross-ties, as is common throughout Germany. The Munich track, including ties and joints, weighs 138 kg per meter (276 lbs. per yard).

The rail length is also constantly increasing. Formerly 10-m (32-ft. 10-in.) lengths were the most common, though some pieces were 12 m (39 ft. 6 ins.) long, but to-day lengths up to 18 m (59 ft. 1 in.) are not uncommon, and lengths less than 10 m (32 ft. 10 ins.) are never laid.

The continued increase in the use of asphalt pavements in cities costs the railway companies a great deal of money. The municipalities prefer it as it costs no more than the best stone paving, and is noiseless. From the standpoint of the railways, however, asphalt is not a good pavement because it does not adhere to the rail; it thus allows water to percolate into the roadbed and injure it. The tendency of vehicles to use the rails is an old story. Many of the wagons are not quite of the same gage as the track, with the result that one of the wheels tends to run very close to the rail and peel off the asphalt. Originally most of the railway companies agreed to pay a fixed sum to the paving contractors for annual maintenance. The contractors, however, inserted a clause to the effect that they would not be responsible for damage to paving caused by loose rails, and that they would make no repairs unless the track was first placed in satisfactory condition. This clause proved a pitfall for the railway companies, for the track could not be repaired without renewing the asphalt, which had to be done at the company's expense. It is not likely that many railways have renewed contracts of this kind.

The municipalities have consistently refused to permit stone or wood paving between or alongside the rails, but since municipal operation has been started on a large scale the communities "have dispensed with the laws which they themselves have made." In other words, the municipal roads are frequently paved along the rails with one or two rows of Australian hardwood. Experiments along these lines have not yet been carried on long enough to reach definite conclusions, still it would seem that this innovation will cause a reduction of the maintenance cost of paving. The difference in cost between rail and track in Germany is made clear by the fact that two lengths of rail 40 ft. long cost about 300 marks (\$75), but by the time these rails have been installed and are ready for service the expense has been increased to 350 marks (\$87.5).

The rail joint problem, while still giving trouble, is assuming more definite shape. The Falk joint has not been installed for several years, and the general tendency is to favor either the Goldschmidt thermit method or the Melaun rail joint. The cost of both of these joints is about the same, namely 45 marks to 50 marks (\$11.25 to \$12.50) per weld or joint when installed in large numbers.

The great evil in German railway practice has been the absence of standards. It is not uncommon for a large rail-

way to have six kinds of motors, brakes or cars. This trouble is being partially remedied by the consolidations of manufacturing companies, but great improvements cannot be expected until the railway companies themselves get together on the subject. One step in this direction has recently been made by the German Street and Interurban Railway Association, which has prepared the track work specifications published elsewhere in this issue. Work is also under way for the adoption of similar standards for car parts and the overhead work.

EMPLOYEES

It may be of interest to give some figures relative to power consumption per car-kilometer. In general the power required for single-truck cars weighing 7 tons to 9 tons varies between 400 watt-hours and 600 watt-hours per car-kilometer (666 watt-hours to 1000 watt-hours per car-mile). In exceptional cases the consumption has been as low as 350 watt-hours per car-kilometer (583 watt-hours per car-mile), and as high as 700 watt-hours per car-kilometer (1166 watt-hours per car-mile). Most of the city lines average 833 watt-hours to 900 watt-hours. Owing to the high cost of power in many localities (3 cents per kw-h. to 3.75 cents per kw-h.), a great deal of attention has been given to this subject. Three types of current checking instruments for cars are in vogue, namely, wattmeters, current-time recorders and current-distance recorders. The wattmeter is the most accurate and most widely used instrument, but it is expensive, and requires frequent calibration to insure reliability. However, semi-annual calibration has been found sufficient to keep the errors within 3 per cent, which is accurate enough for the purpose. The cost of such wattmeters ranges from \$17.50 to \$27.50, to which must be added the expense of installation and maintenance. Despite this all railways employing these meters say they have saved money by their use.

The current time recorder is a more rugged instrument, which indicates only the length of time the current was in circuit. Although useless for accurate measurements their moral effect is good. In Frankfort, for instance, the power consumption has fallen 20 per cent since their installation. The current distance recorder, which measures the distance traveled while power is on, was tried in Hamburg and one or two other places, but was abandoned as impracticable.

There is still a great difference of opinion whether motormen using least current should be rewarded or extravagant ones punished. On some systems, as in Hamburg and Magdeburg, about one-third of the men receive extra pay in proportion to the power saved. An additional incentive is to give a high annual premium to the best motormen. It would seem that without some premium system the men would gradually return to wasteful methods.

Within the last year there has been considerable improvement in the wages of car men, but it is still common to pay the motorman more than the conductor. For this the following reasons are given: The motorman has greater responsibilities, his work is more exhausting, as he must keep his attention fixed on other street traffic, and he does not receive any tips from passengers. The tips to a conductor are often equal to his regular wages. Other railway companies have adopted the practice of paying the same wages to both the motorman and conductors, and alternate them in both positions every week or month. Most of the large railways pay monthly and give fourteen days' notice in case of discharge, while other railways pay daily. The customary monthly wages on the larger systems are as follows: One month under instruction, \$18.75 to

\$20; six months on trial, \$22.50; up to the close of the second year, \$23.75 to \$25; between three to five years, \$26.25; five to ten years, \$27.50 to \$28.75; ten to fifteen years, \$30 to \$32.50. In addition bonuses which may amount to \$3.50 to \$3.75 extra a month are paid when the runs exceed a certain mileage. Some companies furnish uniforms free, while others pay only part of this cost.

Conductors are usually paid \$22.50 a month, and their positions are in high demand, particularly on lines with zone fares, because the conductors can earn from 25 cents to \$1 a day extra from tips. It is a peculiar fact that the tips are more numerous on the lines patronized by working people than on those running through the wealthy districts. A conductor who has been disciplined would rather pay a fine of 10 marks, or \$2.50, than be transferred from a lucrative line to a poor one.

A number of companies has installed independent pension systems for their employees, in addition to those required by law. In Berlin, Hamburg, Munich and perhaps a few other cities these funds are carried as a special account, while the smaller companies insure their risks in pension insurance companies. Considering the large pensions required by law of the public service corporations in Germany, only the most prosperous companies can afford to establish supplementary payments. While from 4 per cent to 5 per cent of a workman's wages would suffice for keeping up a fund for pensioning him at old age, 10 per cent really is needed because the pension is also paid to his widow and children. Where the railways have such auxiliary systems the company pays at least half and the employee the rest. Some companies have not adopted these pension systems because their franchises will expire in a few years and the municipalities who will take over the systems have not signified their willingness to carry on this beneficial work.

AUTO 'BUS COMPETITION

There has been a remarkable development in the automobile omnibuses, the public seeming to believe that they will prove a universal cure for all transportation troubles. Small undertakings are springing up everywhere like mushrooms, and auto-bus factories are stocked with orders for more than a year in advance. This reckless development is really a waste of money, as the maintenance cost of auto-buses is so high in Germany that many of these undertakings will not succeed even where there is a reasonable amount of traffic and no street railway competition. This idea of enormous profits to be made by auto-bus lines reminds one of the great activity which took place in street railway construction after the Prussian railway law of 1892, and mentioned earlier in this article. Of course, the practical man recognizes that a railway often is built not with the idea of immediate profit, but primarily to develop a certain territory. The average small promoter does not understand this and confuses gross receipts with net profits. This lack of knowledge has resulted in the creation of many small auto-bus undertakings, most of which have already failed. The greatest responsibility for this condition lies with the automobile manufacturers, who have failed to give the public the truth with regard to the maintenance cost and probable income. It is a fact that some of the greatest companies in this line have told their clients that the operating cost per car-kilometer would not exceed 34 pfgs. (\$.14 per car-mile), including depreciation and 4 per cent interest on the investment, whereas the actual expenses are much more. At the same time, the manufacturers try to create the impression that an omnibus, seating for in-

stance thirty-eight passengers, would carry that number for 75 per cent of the total distance, while the experience of German street railways operating under like conditions shows that even 30 per cent is a high figure. The whole subject has been very carefully taken up from the statistical side by General Secretary Vellguth of the German Street and Interurban Railway Association.* The figures cited in Mr. Vellguth's article make pleasant reading for the owners of street railways, since he shows that the auto-bus cannot be operated at anywhere near the same cost. It is curious to note that the German railways have not regarded the auto-bus development from the competitive side, but rather have endeavored to exploit the new vehicle themselves. About a dozen lines own two or three and the Grosse Berliner Strassenbahn has ordered sixty to make possible an exact study of costs. A further drawback to the development of auto-buses in Germany is the increase in the cost of gasoline, which is now about 9 cents to 10 cents per kilogram, even when purchased in large quantities. This has encouraged the use of alcohol engines.

ACCOUNTING

As is well known, street railway accounting has been worked out in Germany to quite a degree of refinement. In the early days of electrification the operators had all they could do to adapt themselves to the rapid changes in apparatus. In recent years, however, a great deal of attention has been given to the subject. The German Street and Interurban Railway Association, for example, has worked up a form of accounts suitable for all companies, at the request and at the expense of the Prussian Minister of Public Works.

The International Street and Interurban Railway Association's accounting system, which was developed at an earlier date, has met with more success within the last few years than formerly. To-day there are probably fifty to sixty systems in Europe using this method. As noted in previous issues of the *STREET RAILWAY JOURNAL*, the International Association's system is based on the Dewey system, with ten main accounts and with the subsidiary accounts classified under the decimal system. It may be added here that all those who have used this system report favorably as to its convenience.

INTERURBAN LINES

In conclusion, it is of interest to note that there are now several interurban electric lines in Germany. They are not electrifications of old steam lines, but are long extensions of the city railway systems. These roads are not built under the street railway law, but are given the same kind of franchises, including the privilege of freight haulage, as on the old "secondary" steam railways. Hence the line of demarcation between city and the "secondary" railways is beginning to disappear. Such extensions are frequently built with the assistance of the communities affected, which guarantee interest on the bonds and present the right of way.

SPECIFICATIONS FOR TRACK MATERIAL ADOPTED BY THE GERMAN STREET AND INTERURBAN RAILWAY ASSOCIATION

The German Street and Interurban Railway Association (Verein Deutscher Strassenbahn und Kleinbahn-Verwaltungen) has recently adopted specifications for track material which are of unusual interest, as they call for what the

association considers the minimum qualifications that should be embodied in material manufactured and sold at a reasonably low cost.

(1) RAILS

Material: Grooved rails are to be made of ingot steel according to the manufacturer's own methods, but the buyer may demand information as to the method and chemical analysis employed.

Strength, Tenacity and Density: The purchaser reserves the right to test completed rails for strength, tenacity and density; tensile and pressure tests shall be used for measuring strength, the drop test for measuring the tenacity and the acid test for the density. In general, pieces cut off the ends of the rails and free from defects must be used for all tests.

The tensile strength of the rails must be at least 70 kg per square millimeter (99,570 lbs. per square inch) with at least 10 per cent elongation. The test pieces shall be 200 mm (8 ins.) long and 20 mm (0.8 in.) thick. For the pressure test, hardened cast-steel balls of 19-mm (0.76-in.) diameter are to be used under a pressure of 50,000 kg (110,000 lbs.). The depression thus caused in the rail must not be less than 3.5 mm (0.14 in.) or more than 4.5 mm (0.18 in.). In the drop test the supports of the rail should be 1 m (39.37 ins.) apart. The blows of the drop hammer are to be delivered on the rail midway between these supports, and are to be continued until the rail has been bent to a depth of 160 mm (6.4 ins.) to 80 mm (3.2 ins.) or 60 mm (2.4 ins.), according to the height of the rail. The momentum of the blow given can be chosen at will. The pieces after the test must show no cracks or breaks.

Sections: The variations in the profile from the sections specified shall not be more than those given below. The rail maker shall supply the tools necessary for taking these measurements. In height, for rails up to 160 mm (6.4 ins.) in height, variations of 0.5 mm (0.02 in.) are allowed, and for higher rails, 0.75 mm (0.03 in.) either way; in width of head, 1 mm (0.04 in.); in base of rail, up to 2 mm (0.08 in.) for rails 160 mm (6.4 ins.) wide at the base, and 3 mm (0.12 in.) for wider bases. For compound rails the variation in the width of the head must not exceed 0.5 mm (0.02 in.).

Tests: It is understood that 0.5 per cent of the total order is at the disposal of the buyer for test purposes. Should the first test prove unsatisfactory, a second and if necessary a third test shall be made on rails in the same lot. Should these later tests also prove a failure, all rails of that particular heat will be rejected. Irregularities on the rails arising during rolling, and scale, may be chipped off provided they do not exceed 1 mm (0.04 in.) thickness or affect the ends of the rail or top or sides of the head.

Holes: All holes for angle bolts must be bored, but any other holes may be punched out. The burr from punching is to be carefully cleaned off. The holes for the angle plates are allowed to vary in diameter within 0.5 mm (0.02 in.) either way, and those for the bond terminals may be 0.2 mm (0.008 in.) less than specified.

Length of Rails: In the length of rails a variation of 3 mm (0.12 in.) is allowed.

Curved Rails: Curved rails are to be bent cold at the mill and a drawing furnished afterward guaranteeing the accuracy of the work. The gage of the curved rails must be less than the straight track to which it will be connected. The joints must be so placed that the line connecting opposite joints must be exactly at right angles with the axis of the track.

* See *STREET RAILWAY JOURNAL*, Nov. 17, 1906.

Marking: All rails are to be rolled with the foundry symbol, the year and the casting number. Curved rails are to be marked in white oil paint with the number, radius and length. On rails partly curved, the lengths of the curve and of the straight part are to be indicated. The head of the outer rail of the curve must be painted white and the inner one red. If the rails are part of crossings, switches or other special work, they are to be painted red and their purpose and the place where they are to be used, indicated. Rails shorter than standard must have the length marked in green paint.

Weight: The weight of rails may be 3 per cent more than specified, but payment will be made only for overweights up to 1 per cent. Nothing additional for overweights will be paid if the rail is bought at a specified rate per running meter.

Guarantees: All rails must be guaranteed for five years from the date of commencing operation, and ties, switches, crossings and smaller miscellaneous track equipment for two years. Material proving defective within the guaranteed time must be replaced.

(2) ANGLE PLATES AND ACCESSORIES

Angle Plates: Angle plates may be either of mild steel or hard steel. If made of mild steel the tensile strength should be 40-50 kg per square millimeter (56,890 lbs. to 71,117 lbs. per square inch), with an elongation of 20 per cent; if of hard steel they must have a tensile strength of 50-60 kg per square millimeter (71,117 lbs. to 85,340 lbs. per square inch), with a 15 per cent elongation. Half-joints are to be made of the same material as the rails and under the same conditions. Holes in angle plates can be punched, the variation in the position of the holes may be 0.5 mm (0.02 in.). The bonds for the return circuit may be 0.2 mm (0.008 in.) smaller but never larger than specified.

Angle plates for curves must be bent to the same radius as the rails themselves and be plainly marked with the curve radius.

Tie-Rods: The tie-rods and bolts for the tie-rods and angle plates are to be of mild steel having a tensile strength of 38-50 kg per square millimeter (54,000 lbs. to 71,117 lbs. per square inch), with 20 per cent elongation. The manufacturer must guarantee these parts for two years. One in every 500 of these parts may be tested.

(3) T-RAILS

The specifications for T-rails are similar to those for the ordinary grooved type, with the following exceptions: For lines with light traffic (a) the tensile strength must be 60-70 kg per square millimeter (85,340 lbs. to 99,570 lbs. per square inch); medium traffic (b), 65-75 kg (92,452 lbs. to 106,862 lbs. per square inch); heavy traffic (c), 70-80 kg (99,570 lbs. to 113,787 lbs. per square inch); all for a minimum elongation of from 15 per cent to 10 per cent. The corresponding drop tests are to allow the following bending distances; for (a), 100 mm (3.9 ins.); for (b), 80 mm (3.2 ins.); for (c), 60-mm (2.4 ins.).

The pressure tests with 19-mm (0.76-in.) diameter steel balls under 50,000 kg (110,000 lbs.) should give the following depressions: For (a), 5.5 mm (0.22 in.); for (b), 5 mm (0.2 in.), and for (c), 4.5 mm (0.18 in.). The variations in the width of the rail base must not exceed 0.5 mm (0.02 in.) in rail bases up to 120 mm (4.8 in.).

(4) TIES, TIE-PLATES, CLAMP-PLATES AND BOLTS

Ties: Metal ties and their accessories are to be of mild steel with a tensile strength of 38-50 kg per square milli-

meter (54,048 lbs. to 71,117 lbs. per square inch), with 20 per cent elongation. The surfaces of the ties on which the rails rest must be placed smooth. The ties may vary 0.5 and 2 mm (0.08 in.) in height and width. The position of the holes may vary 1 mm (0.04 in.) from that specified and 0.5 mm (0.02 in.) in diameter. It must be possible to bend the ties cold under a hammer or in a press so as to flatten them in their longitudinal direction and bend them into a loop whose diameter is 80 mm. One piece in every 500 may be used for testing.

Tie Plates and Clamp Plates: Tie plates and clamp plates must have a plane supporting surface and must correspond to the specified dimensions. They may vary 1 mm (0.04 in.) in length and breadth, 0.5 mm (0.02 in.) in thickness, 1 mm (0.04 in.) in distance between holes, and 0.5 mm (0.02 in.) in diameter of holes.

Bolts: The thread of the bolts must be cleanly cut and the manufacturer must guarantee them for 2 years.

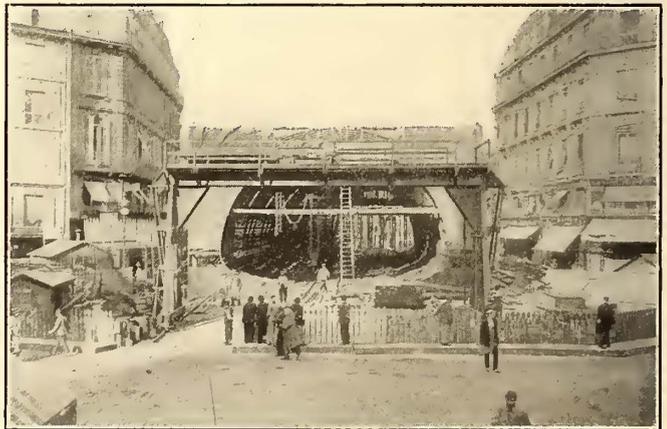
(5) DELIVERY

Concerning deliveries, special agreements are to be made.

THE ELECTRIC TRACTION SITUATION IN FRANCE AT THE END OF THE YEAR 1905

BY OUR REGULAR CORRESPONDENT

The tramway situation in Paris and France generally may be considered to be satisfactory during the present year. Only a very few small lines show insignificant decreases in traffic, and the majority of lines certainly show large increases. In addition, the near future will probably see a considerable extension of the interurban connections in France. The progress made along the lines of motor omnibuses will undoubtedly turn a certain number of what might be doubtful paying tramway schemes into motor omnibus lines, and even where tramway lines may be laid it is not sure whether it will not be found advantageous in certain



PART OF TUNNEL UNDER CONSTRUCTION ON SHORE

cases to place in service tramways propelled by petrol motor engines in lieu of the overhead trolley and electric motor. In fact there has been formed in Paris recently a powerful combination which has for its object the examination and promotion of likely schemes for motor omnibus traffic where the district is too sparsely inhabited or presents constructional or natural difficulties against the establishment of an electric tramway. It is of interest to note that the Darracq-Serpellet Company, well-known promoters of steam-driven vehicles (Serpellet engines have been used

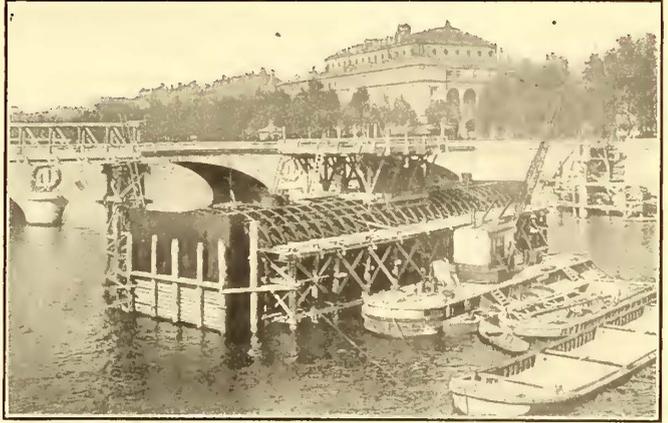
for many years on tramways) are interested in this scheme.

In Paris itself the surface traction question appears to resolve itself more and more into two distinct branches, that concerning omnibus traffic and that connected with traffic on rails. At present they are rather intimately connected in the General Omnibus Company, which exploits both tramway lines and omnibuses. The concessions of this latter company expire in 1909-1910. Their renewal is causing and has caused immense difficulties towards a satisfactory solution of the problem of future transport within Paris. The municipal commission appointed two years ago, for the consideration of the matter and to originate proposals for the future régime of the tramways and omnibus lines of Paris, has recently been dissolved by the Prefect of Police, since their labors had been unattended with any tangible results in the two years of the existence of the commission.

The caisson work now being finished in connection with the tunneling beneath the Seine for the No. 4 line of the Paris Metropolitan Railway is being watched with a deal of interest on all sides. The caissons which are destined to form the sections of the tunnel beneath the bed of the river were constructed on floating erections and when ready for lowering were towed to the spot above their final position. Other caissons for the part nearest the river banks on the shore side were constructed ready in position and lowered into their destined hole which was dug as the caisson construction was progressing. The work has caused a certain amount of unavoidable traffic obstruction, but on the

factor generally evades all valuation, but is illustrated by such an example as this: On line 1 the average daily receipt was F. 23,000 in 1901 and increased to F. 28,000 in 1903 by the sole addition of line 2. The opening of line 2 (south) similarly raised the daily receipts of line 1 by F. 5,000 per day.

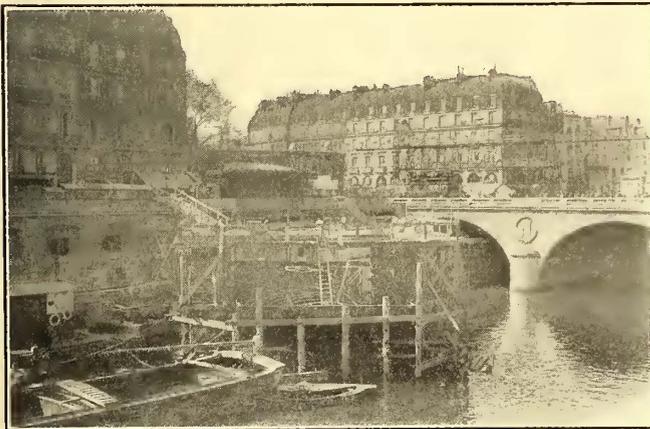
The important engineering scheme for the uniting of the two shores of the English Channel has been receiving renewed attention both in France and in England. It may



SINKING A TUNNEL SECTION IN THE MIDDLE OF THE RIVER

be taken for granted that French public opinion and financial circles are ready for the immediate floating of the company to undertake the work. There is actually a bill before the British Houses of Parliament for the necessary authorization to start the work and form the necessary company. Since the Anglo-French approachment in 1906 there has been less hostility shown to the proposals on the English side of the channel and there are serious probabilities of the bill passing into law. It is therefore interesting to note that the capital of the company would be raised equally in France and in England and would amount to \$40,000,000. It is estimated that the annual number of passengers would amount from the opening of the tunnel to 1,300,000 and the annual receipts from all sources to \$7,700,000. The annual expenses, as calculated by British as well as French authorities, would amount to \$2,000,000, and the balance available for dividends is estimated to be sufficient to pay 9 per cent. The tunnels, of which there would be two, would be 18 ft. in diameter and bored through the chalk bed which extends from shore to shore, running to a thickness in places of over 80 ft. The length of the submarine part of the tunnel would be 24 miles and the approaches 6 miles. Two generating stations would be erected, one at either side of the channel, and there would run in the two directions fifty electrically-operated trains daily. The rolling stock of the principal European lines would be accommodated in the tunnel, the construction of which does not appear to present any skill beyond the resources of the modern engineer in tunnel practice. The construction of the tunnel is estimated to require nine years, and its completion would reduce the passage to India from London by twenty-six hours. The scheme, which has been smoldering for the past thirty years, having been first proposed in 1875, has never seen brighter prospects of fulfilment. It would be known as the Caldover Tube.

The French government has voted the purchase of the Ouest Railway, of France, one of the largest but worst-paying networks of the country, whose practice and management has been under constant criticism.



SINKING A TUNNEL SECTION IN THE SEINE NEAR THE SHORE

other hand certain of the sections of caisson destined for the two arms of the Seine below which line 4 passes were of very large size.

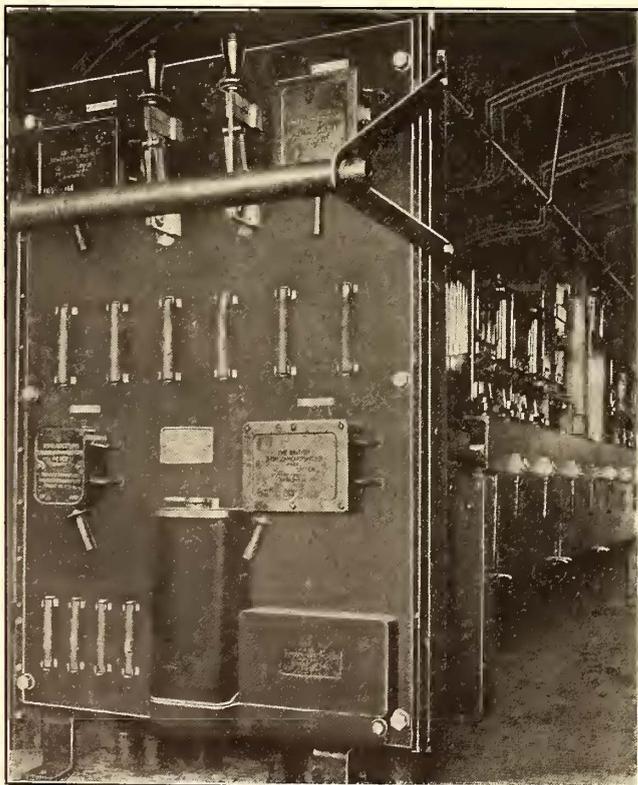
The Metropolitan Railway continues to be one of the matters of foremost interest in Parisian traction matters. The line has achieved great success, despite initial difficulties and lack of experience. The net profits are not decreasing, as was feared on some sides, on the inauguration of new lines. The net receipts per kilometer of track in 1901 reached F. 130,580 for a length of 13 km; in 1904 they were F. 200,400 for a length of 26 km, and in 1905 F. 202,927 for a length of 32 km. The receipts for 1906 will in all probability exceed the figure as is inferred from the reports for the first nine months of 1906, which show an average receipt per kilometer of F. 201,000, against F. 199,000, representing the average of the first eight months of 1905. Two main reasons explain this result, the first being the reduction of working expenses and the other is the creation of new traffic on existing lines. This latter

THE GREAT NORTHERN, PICCADILLY & BROMPTON RAILWAY

The rapid transit facilities of London received a noteworthy addition on Dec. 15, 1906, which marked the inauguration of train service on the Great Northern, Piccadilly & Brompton Railway. This is the second of the subways controlled by the Underground Electric Railways Company, to whom it is leased at a yearly rental of 4 per cent of the paid-up capital of the original company. The latter was a Yerkes consolidation of the Brompton & Piccadilly Circus Railway Company and the Great Northern & Strand Railway Company. The length of the line is 9 miles and its cost is estimated at £7,206,000, or about £800,000 per mile.

Graduated fares have been adopted for this railway, the maximum fare for the whole distance of 9 miles being 4d., and the lowest fare between any two stations, 1d., as experience seems to show that the graduated fare is more successful and meets the wants of the London traveling public much better than the uniform fare for any distance. The average fare works out at about 0.77 of a penny per mile, so that the rates are very reasonable.

The new railway extends from Hammersmith, in the southwest of London, to Finsbury Park in the northeast.



PART INTERIOR VIEW OF MOTORMAN'S CAB

The station at Hammersmith is on the surface and it also serves as a station for the District Railway Company. The new line runs practically parallel with this railway as far as South Kensington, but at that point it diverges in a more

northeasterly direction, running underneath Knightsbridge, Hyde Park corner, Piccadilly, Leicester Square, Covent Garden, Russell Square, King's Cross, and so on to Finsbury. It will therefore be seen that it taps an area which hitherto has been totally unserved by railways of any kind, and it should therefore make a most valuable acquisition to the service of transportation from the southwest to the northeast, and as a radiating medium from the busy center



TYPE OF CARS USED ON THE GREAT NORTHERN, PICCADILLY & BROMPTON RAILWAY

of Piccadilly Circus or Leicester Square, which may be termed the center of the West End shopping district and theater life in the evening. Connection will be made with the Baker Street & Waterloo tube (described in the *STREET RAILWAY JOURNAL* of April 7, 1906), at Piccadilly Circus. From Holborn there is a spur line running south to the Strand which ought to be invaluable for the large masses of people who have business in that portion of the city, and who up to the present moment have the greatest difficulty in reaching the northern suburbs. The great main railway stations at Euston, St. Pancras and King's Cross will also be made much more accessible, and when the other tube, the Charing Cross, Euston & Hempstead Railway, is completed about next June, London will have unequalled electric railway service. In addition to the connection with the Baker Street & Waterloo Railway, this tube will communicate with many other railways, with the Great Northern Railway at Finsbury Park and King's Cross; with the Euston Extension of the City & South London Railway (London's first tube) at King's Cross; with the Central London Railway (the original "Twopenny Tube") at Holborn; with the Charing Cross & Hempstead Railway (in construction) at Leicester Square. Besides these, the Surrey Street Station will be only 1200 yards from the Temple Station on the District Line, and connection will also be made at Earl's Court with the District Railway for trains to Wimbledon.

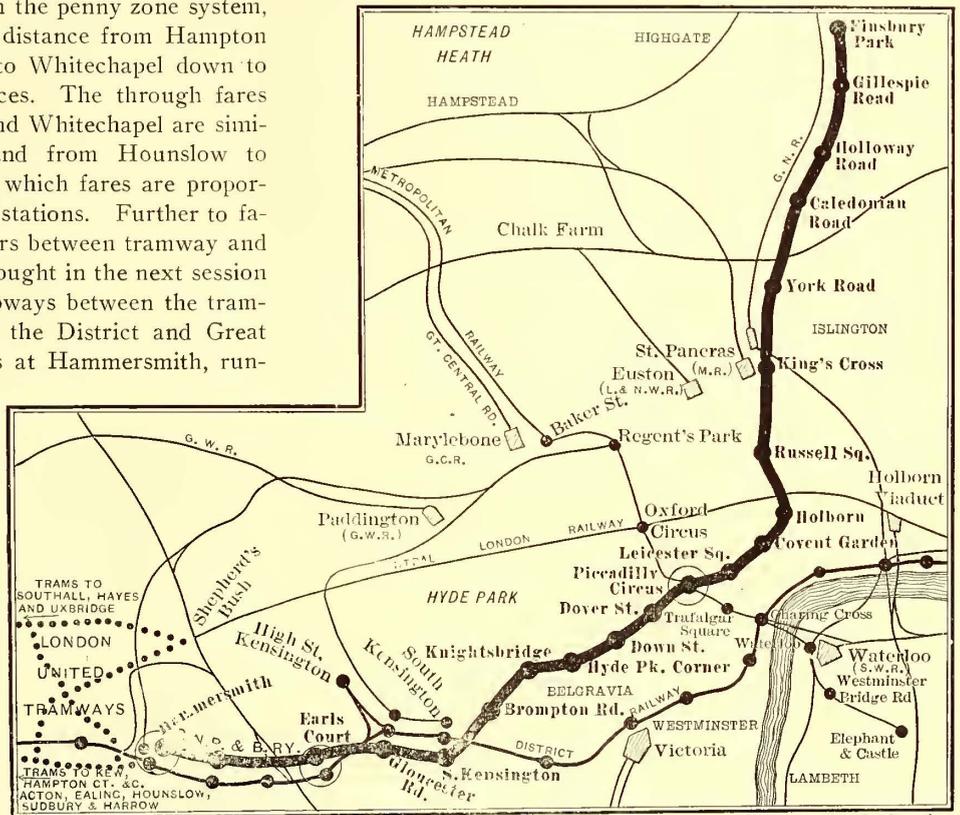
Interchangeable tickets at through fares will be issued to passengers wishing to continue their journey by the Metropolitan & District, Great Northern & City, Baker Street & Waterloo Railways, and (when completed) by the Charing Cross, Euston & Hempstead. For the first time in England it has been found possible to arrange through bookings between railways and tramways, and by agreement with the London United Tramways Company a novel method of working has been devised, the simplicity, economy, and convenience of which cannot but commend themselves to intending travelers. With the object of in-

ducing tramway passengers to continue their journeys by the various systems directly or indirectly controlled by the London Underground Electric Railway Company and to enable them to accustom themselves gradually to the innovation, the tramway routes selected for the initial experiment are those converging at Hammersmith from Uxbridge, Hounslow, and Hampton Court respectively. Under the through booking arrangements with both the District and the Great Northern, Piccadilly, and Brompton Railways the tramway fare from Hampton Court to Hammersmith, hitherto 6d., will be reduced to 5d., the fares from Uxbridge and Hounslow to Hammersmith remaining as at present—5d. and 4d. respectively. When the Surrey-Side section of the London United Tramways is completed through bookings will also be put in force between Surbiton, Kingston, etc., and the District Railway by way of Wimbledon. The interchangeable fares are arranged on the penny zone system, and range from 9d. for the whole distance from Hampton Court to Finsbury Park, and 8d. to Whitechapel down to 2d. and 3d. for intervening distances. The through fares from Uxbridge to Finsbury Park and Whitechapel are similarly 9d. and 8d. respectively, and from Hounslow to Finsbury Park the full fare is 8d., which fares are proportionately less between intermediate stations. Further to facilitate the interchange of passengers between tramway and tube and vice versa power is to be sought in the next session of Parliament to construct foot subways between the tramway terminus and the stations of the District and Great Northern and Piccadilly Companies at Hammersmith, running under the Broadway and entering the stations at platform level. The only novel feature of the through tickets is that they will contain two punching spaces, one for the tram fare and the other for rail fare.

The construction of this railway is practically the same as that of the "Bakerloo" tube, described in the April 7, 1906, issue of this paper. There are two iron tubes, each having a diameter of 11 ft. 8 in., and 12 ft. on curves, made in the usual way by boring through the London clay by Greathead cutting shields, and fitting in cast-iron segments. The ventilation has, however, in this newest tube been given the most careful consideration, and there are installed nineteen exhaust fans of 5-ft. 6-in. diameter, each of which is capable of exhausting 18,500 cu. ft. of air per minute, or a total of 21,000,000 cu. ft. per hour, so that the atmosphere of the tunnels will be changed entirely many times during the twenty-four hours. This railway reaches considerable depth at places, the deepest station being at Covent Garden, where it is 123 ft. below the surface; at Piccadilly Circus the depth is 102 ft.; at Holborn, 114 ft., and at Russell Square 110 ft. At South Kensington one of the tunnels is directly above the other, the lowest platform at that point being 78 ft. below the street. The usual large Otis elevators have been provided, and at Holloway Road a novelty has been introduced in the shape of a moving spiral staircase, the success of which will be watched with great interest. The constructional work was carried out under the direction of J. R. Chapman, engineer-in-chief and general manager, and H. H. Dalrymple, acting as engineer of the tunnels.

The track work and bonding are similar to that originally adopted for the Baker Street & Waterloo Railway. The middle portions of the ties rest on a rigid concrete foundation while the ends under the rails rest on a loose packing of crushed granite to secure elasticity. The ties are of slow-burning Australian Karri wood. The rails were laid in 45-ft. lengths of standard 90-lb. bullhead section furnished by Bolckow, Vaughan & Company, who also supplied the steel conductor rails supported on Doulton insulators in the tube portions of the line. The special work at cross-overs and car sheds was furnished by Hadfield's Steel Foundry Company.

The station buildings, lighting and interior decorations do not differ materially from the other subways mentioned, but the station platforms are 350 ft. long, as compared with



ROUTE OF THE GREAT NORTHERN, PICCADILLY & BROMPTON UNDERGROUND RAILWAY

291 ft. in the "Bakerloo" and 325 ft. in the Central London tubes.

Power for this line will be furnished from the great Chelsea station, which was fully described in the STREET RAILWAY JOURNAL of March 4, 1905. The three-phase, 11,000-volt current transmitted from this station is changed to 600-volt direct current in sub-stations, located at Holloway, Russell Square and Hyde Park. The western end of the line receives power from the same sub-stations which supply the District Railway at South Kensington and Earl's Court. The three-core, lead-covered transmission cables to the new stations were supplied by the British Insulated & Helsby Cables (Ltd.). The station equipments are similar to those installed on the Baker Street & Waterloo Railway and are of Westinghouse manufacture.

The signaling system, which is of the Westinghouse electro-pneumatic type, has in every signal box an illuminated diagram to indicate automatically the exact position of every train in the section controlled from that particular box. It will also be possible to telephone from any train

to the manager's office, as the two bare telephone wires installed throughout the tunnels, can be used from the cars by employing connecting devices carried on each train.

The car house, repair shop and terminal yard is at Lillie Bridge, West Brompton. The car house is 1312 ft. long and 78 ft. 6 ins. wide. Pits are provided for all of the eight tracks. As it was considered impracticable to lay the conductor rails inside the car house, the cars are moved by plugging in a twin flexible cable attached to a pair of overhead wheels.

The rolling stock consists of 72 all-steel motor cars and 144 trailers. They are finished with no rivet heads showing, to give them the appearance of wooden cars. The resemblance to the interior of a wooden car is secured by using a 1-16-in. thick non-inflammable mahogany paneling over asbestos millboard. The cars measure 49 ft. 1½ ins. over all in length and 8 ft. 4 ins. in width. They have both cross and longitudinal seats. The motor cars seat 46 and the trailers 52 passengers, giving a seating capacity of 300 for a six-car train, including four trailers. As the platforms are 350 ft. long, seven-car trains can be used when necessary.

The electrical equipment was furnished by the British Thomson-Houston Company. Owing to the limited space available on these cars, all of the control apparatus, including the contractors, reversers, main circuit-breaker, etc., is mounted in the motorman's cab. The other side of the cab, which is not shown in the figure, contains the compressor and Westinghouse air brakes and other apparatus.

The elevators before mentioned are especially interesting owing to the care taken to secure absolute safety to passengers. If an elevator is over-run it is brought to a standstill by two oil buffers in a stroke of 8 ins.

REGENERATIVE CONTROL FOR RAILWAY MOTORS

At a meeting of the Manchester (Eng.) Association of Engineers held on Nov. 24, 1906, Edward H. Johnson presented a paper on regenerative control under the title of "The Third Function of Electric Traction Motors." Mr. Johnson explained his use of this term by referring to the dual function of dynamo-electric machines as generators and motors, the third function being the possibility of returning to the line the current created when a motor acts as a generator instead of wasting it in braking and resistances. The differences between a standard and regenerative equipment of the type developed by Mr. Johnson, Robert Lundell and Gustaf Lang were summarized by the speaker as follows:

The motor frames are of the standard rating, type, dimensions, and construction, save an additional opening for the inspection of the extra commutator. The armature windings are divided between two commutators to yield two independent armature circuits per motor, to allow double series paralleling with but two motor units. The divided windings are so connected as to effect a balance of their electro-motive force when operating in parallel. The field windings are of the usual four-pole type, but each pole is supplied with a relatively small series, and a full shunt winding, the series turns being ample for the purpose of compounding, but not to give in full value the simple series excitation; hence the shunt coils are arranged to be connected in parallel, and made to serve as series turns when full series excitation is required. The field changer is a

circuit controller, made to operate automatically through a solenoid and a retractile spring or gravity. Its function is to convert the motor characteristic from series to compound, and vice versa. It is controlled through a thumb switch in the handle of the platform controller, and may be considered the key to the system.

The excess voltage preventer is a switch, adjusted to deprive the motors of their shunt excitation in case of accidental loss of trolley contact, thereby preventing the excessive rise of voltage which would ensue from the unopposed voltage development of the motors acting as generators.

The mechanical power brake consists of the following parts: The usual wheel and track shoes with their accompanying system of leverages, a specially-constructed spiral band to grip the axle frictionally or a shaft driven thereby, and thus exert a pull on the brake levers and a solenoid carrying a core, which imposes a drag on the free end of the spiral, and thus brings the brake into action; the function of the solenoid, of course, is to pick it up and hold it when the brakes are not required. Contacts for controlling the solenoid are placed in both the platform and the automatic controllers, and in a special emergency switch conveniently placed for both motorman and conductor.

Mr. Johnson then described his system in greater detail and presented some data derived from a number of tests to demonstrate the saving in power when representative control is used under certain conditions. He also reiterated several other claims, such as the reduction in maintenance, saving in original power installation, better braking, etc.

TRADE MARK AT MINNEAPOLIS

The general passenger department of the Twin City Rapid Transit Company, of Minneapolis and St. Paul, has just announced the adoption by the officials of a trade mark which will hereafter be seen on all printed matter, blanks, time tables, newspaper advertising and other forms of publicity the company will issue.

Practically every steam road and steamship line in the country is distinguished by its trade mark, and the prominent electric lines are falling into line in this respect. The

Twin City Rapid Transit Company, appreciating the advertising advantages of such a symbol, started some weeks ago to secure a design for a trade mark. Looking over the wide range of trade marks the company discovered that nearly every geometrical form had been appropriated, circles, squares, ovals, shields, diamonds, flags, banners and the whole family of patterns that lent themselves readily to an attractive mark. Many suggestions were offered for complicated designs which meant much study, for pictures of cars and tracks, of "Minnie" and "Paul" and a host of other ideas serious and silly. A good trade mark seemed to be defined as a striking design that would look equally well if printed as small as a dime or as large as the top of a barrel, a design that would look well if printed in one color or two



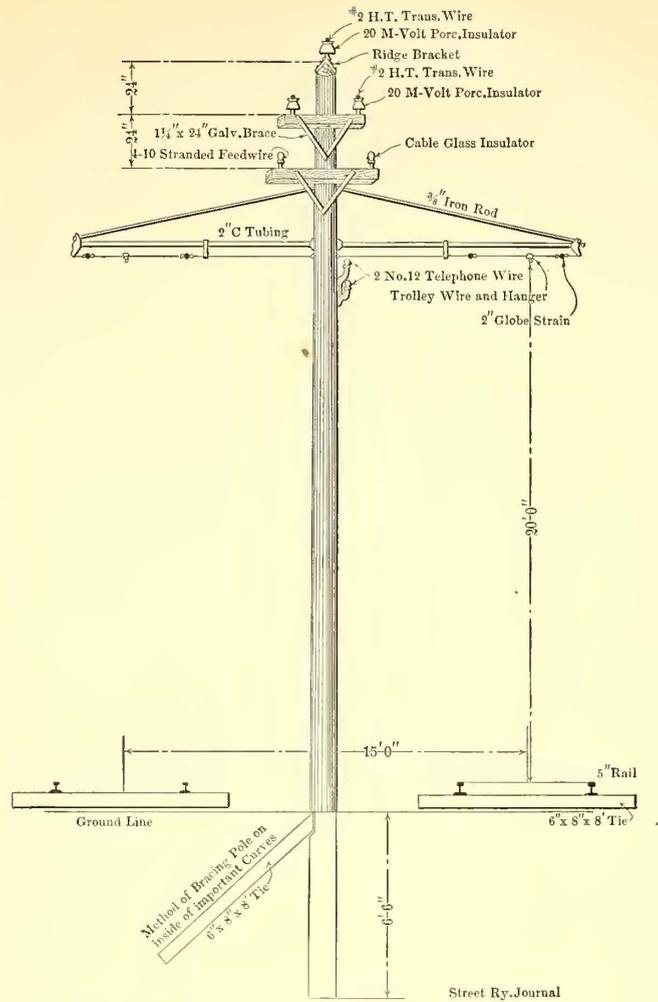
TRADE-MARK JUST ADOPTED
BY THE TWIN CITY RAPID
TRANSIT COMPANY

colors, something that told its story at one glance, and yet so simple as to be remembered and admit of being drawn from memory by those who saw it; also a design that would wear well and improve on acquaintance; and so with the many problems involved the passenger department finally worked up the trade mark shown herewith.

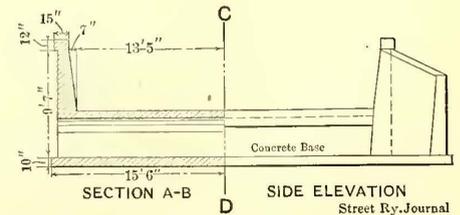
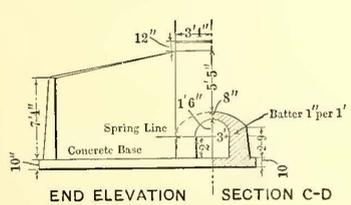
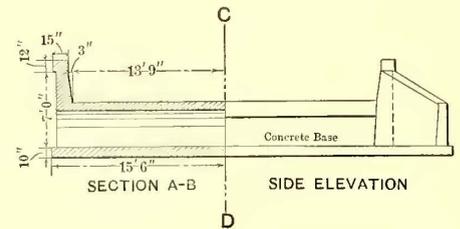
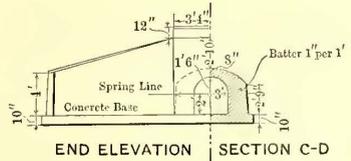
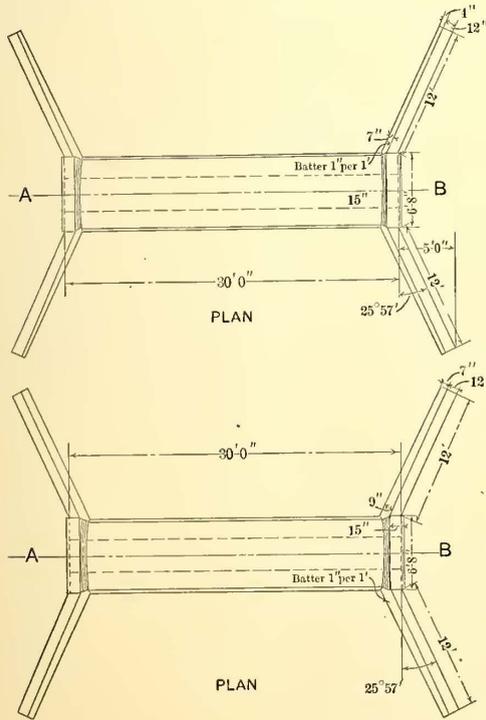
It represents a Spanish mission window which is typical of the Spanish mission architecture to be employed in all the company's buildings at Big Island Park, the new Lake Minnetonka resort. The words "Twin City Lines" include all the Twin City Rapid Transit properties, local lines, suburban lines, steamboat lines, in the same broad way as "New York Central Lines" and "Pennsylvania Lines" include their many rail and boat properties. "Twin City Lines" is practically the nickname the public gives all the Twin City properties, and it is a sweeping, characteristic title, sure to prove popular and easy to remember, and it will look well on the flag of the company's fleet of twelve Lake Minnetonka boats, on a conductor's button or on any other place the company chooses to place it. For the most part it will always appear with the center red and the border white and black. It is a strong, simple, effective design, artistic, well proportioned and clever, and worthy the progressive, up-to-date company it will advertise; besides, it is different, no other transportation company having a design just like it.

CONSTRUCTION WORK AT OKLAHOMA CITY

In making extensions to its system the Oklahoma City Railway Company, of Oklahoma, follows a policy which the conditions in cities of slower growth would hardly warrant. Instead of building into already populated portions of the city, extensions are pushed out into practically unsettled outskirts, and the line constitutes the reason for the construction of homes. Past experience has shown that it is a



STANDARD OVERHEAD CONSTRUCTION AT OKLAHOMA CITY



OKLAHOMA CITY STANDARD CONCRETE ARCH CULVERT, 3-FT. SPAN

matter of but a year or so until the population follows the line to such an extent as to make it a paying one.

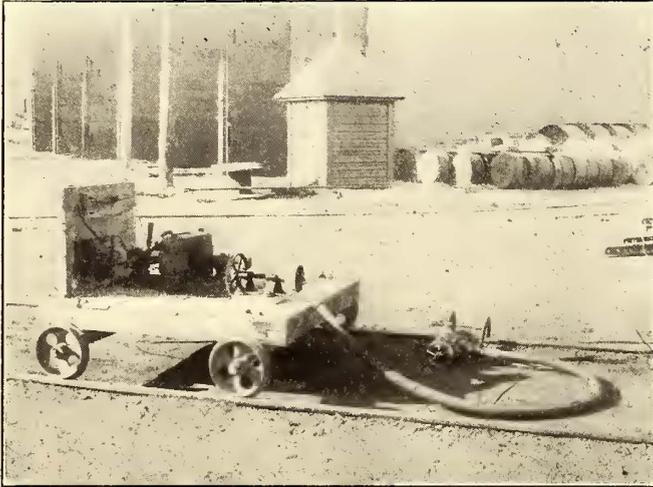
Through the courtesy of Anton H. Classen, president of

the system, this publication is enabled to give a short account of the extensions now being made by the company.

A line is being extended north to North Oklahoma City,

5½ miles. The proposed terminal is at the present time a very small settlement, and the region between it and Oklahoma City is almost devoid of houses. After the construction of the line, however, it will in all probability be but a matter of a year or two until the whole route is built up. Already a large portion of the building sites near the route have been purchased by prospective builders of homes.

It is the intention within a season or two to extend the line north from North Oklahoma City to Britton, 7½ miles distant from Oklahoma City, and eventually this line will probably form a portion of a 30-mile interurban system



MOTOR-DRIVEN TRACK DRILL AT OKLAHOMA CITY

between Oklahoma City and Guthrie. At present the track is laid to Belle Isle, 4½ miles from the city. At this point an artificial lake is being made and a pleasure resort will be built up. The lake, which will contain 111 acres, is being made by throwing up between two hills a wide embankment which will form a roadbed for the electric line. At the north end of the embankment the tracks will be laid over a spillway formed of a concrete arch having a 30-ft. span. The arch is being reinforced by a series of ribs made of old steel rails. The rails are bent to a curvature corresponding to that of the arch, and are spliced together in pairs. When in position the joints in the rails will be at about the middle point of the archway. Double track is being laid to Belle Isle. Beyond this point a loop about one-half mile across is being built.

The track is laid with 70-lb. rails and the other details of construction are correspondingly heavy. The maximum curvature is 4 degs. The right of way has been acquired and the roadbed is being built with a view of constructing a highway on either side of the tracks. All of the culverts underneath the roadway are of concrete and of a design shown in drawings on page 31.

The overhead work is of center-pole bracket type. The poles, which are of pine, 30 ft. long, with 8-in. tops, are treated with a creosote and zinc solution. A cross-arm immediately over the brackets carries direct-current feeders. Two of the wires of a three-phase high-tension system will eventually be carried on a cross-arm above the feeder

arm and the third wire will be carried on a pin on top of the pole.

The high-tension wires at 2300 volts will feed a sub-station containing a motor generator set of 250-kw capacity, which will probably be located at North Oklahoma City.

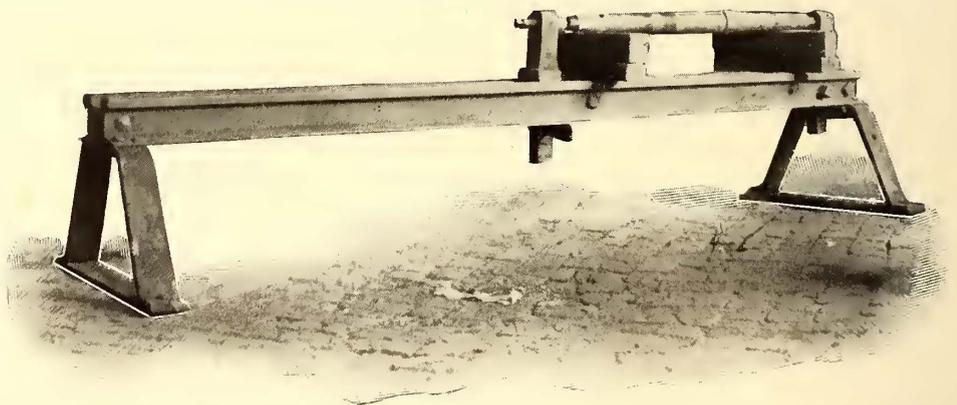
In drilling rails for bonds the Oklahoma City Railway Company employs a motor-driven track drill which in itself may be a good suggestion to other systems having a small motor that is not in use. The accompanying illustration gives a very good idea of the device. The motor, which is of 2 hp, was the first one employed in driving the machinery in the company's shops, and until put into service on the track drill had been out of use for several years. The rheostat also was a discarded one.

With the exception of the grading, which is done under contract, the railway company is doing all of the construction work on the new extension. The work is under the immediate supervision of Charles W. Ford, general superintendent of the system.

A DEVICE FOR STRAIGHTENING SHAFTS AND AXLES

It is customary in many shops to straighten axles and armature shafts in turning lathes, but lathes were not built to withstand such rough usage as they are sometimes subject to when used to straighten shafts and axles, and many have been injured by employing them for this purpose.

To prevent lathes receiving such abuse in the shops of the Denison & Sherman Traction Company, of Denison, Tex., the device illustrated has been constructed. The bed is made of two rails, bolted together. What might be termed the head stock is stationary at one end. The tail stock is adjustable. A portion of the flanges of the rails is cut away to allow the tail stock to be fastened in positions corresponding to the lengths of axles and armature shafts of both car and air motors. Both the head and tail stocks



BED USED IN STRAIGHTENING ARMATURES ON THE DENISON & SHERMAN RAILWAY

are fastened in position by wedges which pass through portions projecting below the flanges of the rails.

The work of straightening axles and shafts is very much facilitated by a kerosene oil torch. This consists of a tank holding 6 gals. or eight gals. of oil provided with a small air pump. The burner is placed on a hose which is connected to the tank.

The Portland Railway, Light & Power Company is planning to erect five buildings in the vicinity of its different car houses, to be fitted up as club or recreation rooms for the employees.

SENSATIONAL DEVELOPMENTS IN CLEVELAND— CLEVELAND ELECTRIC AGAIN TO SELL SEVEN TICKETS FOR A QUARTER

Last week was marked by the most sensational move that has yet taken place in the street railway controversy at Cleveland. The Forest City Railway Company endeavored to lay a temporary track between the Superior Avenue viaduct and the Public Square under cover of darkness in order to circumvent the restraining order preventing the



THE POLES UP AND THE RAILS ON THE GROUND

use of the Cleveland Electric tracks. After the City Council adjourned Wednesday evening, the Board of Public Safety was called together and a permit issued to the company to do the work. Everything had been made ready beforehand, and soon after 12 o'clock Thursday morning a large number of men were on the scene, as well as wagons loaded with rails, temporary poles and other material. It is even said that a number of the wagons were stationed on Rockwell Street in the rear of the City Hall and others placed at convenient points near Superior Street, so that they could be called out as soon as the permit was secured. In any event, they were on the ground in a very few minutes after the permit had been issued.

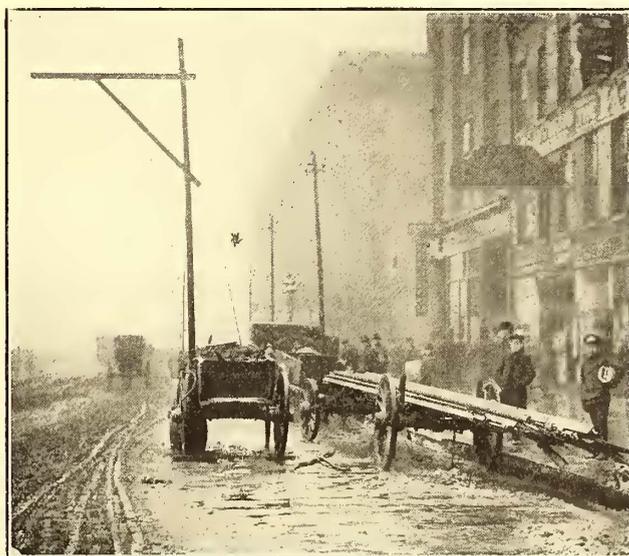
The tracks across the viaduct belong to the city. The first work, therefore, was making the connection between the temporary tracks and the city tracks at the corner of Superior Avenue and West Ninth Street. In order to do this considerable pavement had to be torn up and replaced. From that point east the rails were laid on top of the pavement, just south of the Cleveland Electric tracks. This is claimed to be free territory, but the Forest City was denied the immediate use of the old company's tracks by a temporary restraining order, which has not had a hearing yet. The decision will depend upon the evidence of legality of all the measures passed by the City Council since Mayor Johnson is alleged to have become interested in the company. In order to get cars to the Square at once, a temporary track seemed necessary to the management, as the courts are taking time to sift matters to the bottom.

Partially bolted together, the rails were held in position by strap-iron ties, and although the entire roadbed was in terrible shape, it was thought by the engineer that cars could

be run over this track until a decision was had in the injunction case. The illustrations shown here will give some idea of the difficulties that would have met a motorman in getting his car over such a line. From appearances the rails and other material had seen hard usage before, and this would have made the work even more difficult. Crooked and disjointed, with ties as the joint connections, the track's rails probably would have been inclined to slip with a heavy load on them and the trouble, it seems, would have overbalanced any advantage that might have been gained through the use of the street.

A trolley wire was stretched from a post at the viaduct to the flag pole in the Public Square. It was supported by poles made of two scantlings spiked together lengthwise, with an arm of the same material at the top, supported by a brace which was strengthened by blocks at either end. The poles were set in barrels of ashes that had been placed beside wagons heavily loaded with the same material. Nailed to the wagon boxes, ropes from the tops of the poles to the ends of the wagons served to steady them when the heavy wire was suspended. No other material was at hand, so the trolley was fastened to the arms with iron or steel wire. This improvised line presented a grotesque appearance when the city awoke Thursday morning.

A close watch had been kept of the movements of the company, however, and at 3 o'clock an injunction was served upon Fred C. Albers and Mayor Johnson, the latter seeming to have as much to do with the direction of the work as Mr. Albers and the engineer. The injunction was issued by Judge Keeler at the instance of I. C. Cooper, a property owner on Superior Avenue, and included the Forest City Railway Company, the Municipal Traction Company, the Low Fare Railway Company and Tom L. Johnson. Track laying had proceeded as far as West Sixth or Bank Street, when deputy sheriffs appeared and served the



THE IMPROVISED TRACK COMPLETED

notices. Vice-President J. J. Stanley, of the Cleveland Electric, and Attorney Taft had arrived on the grounds a few minutes before that time. Mr. Johnson, although questioning the right of Mr. Cooper to bring injunction proceedings, at once announced that the work would be stopped.

Thursday afternoon Attorney Tolles filed another application for an injunction against the Forest City Railway Company, at the instance of property owners and merchants

along the streets. This asked for the removal of the rails and debris along the street, as it prevented people from reaching the stores and diverted traffic from the street, as well as made it impossible for them to get wagons to their front doors. On Saturday this petition was amended in such a manner as to demand that the company be prevented from building a temporary track along the street, with an order for the immediate removal of the rails that have been laid and the poles and wagons that had been placed on the street. It alleges that there is no pressing necessity for a temporary track on the street and that, if the courts so decide, the company will be able to reach the Public Square in a regular way.

This latter petition was intended to cover the action taken at a called meeting of the City Council Friday morning, when the Forest City Railway Company was given a permit to place temporary tracks on Superior Avenue, by a vote of 27 to 5. This action was taken at the suggestion of Mayor Johnson, it is said, in order to block the effect of the injunction that had been granted. So the second petition, asking that the company be prevented from building and operating a temporary track on that portion of the street, stops that movement also. The legal skirmish is interesting in the extreme.

The hearing on the Cooper injunction was begun before Judge Beacom Saturday forenoon, and President Dupont and Engineer Bunning, of The Forest City, were placed upon the stand. Mr. Dupont stated that it was the intention to replace the temporary pole construction with iron poles, but that the track would remain on top of the pavement, with plank crossings at the street intersections. Mr. Bunning said he was in charge of the work Thursday morning and that Mayor Johnson was there simply as a spectator. An affidavit concerning the question of danger resulting from such temporary construction from E. P. Roberts, of the Roberts & Abbott Company, of Cleveland, was submitted. The arguments in the case, together with the consideration of the petition of Attorney Tolles, were to have been taken up Monday, Dec. 31.

Two amendments have been made to the grant that is to be given the Low Fare Railway Company to get from Erie Street Cemetery to West Twenty-Fifth Street, where it will meet the Forest City Line. One is that the compensation to the Cleveland Electric for operating over a section of its track from the Superior Avenue viaduct to West Twenty-Fifth Street shall be changed from \$1,500 to \$5,000 per car-mile, and the other is a grant for the use of that strip of track. The original ordinance provided for the right to use Euclid Avenue from East Fourteenth Street to the Square, the two loops about the Square, Superior Street to the viaduct and Detroit Avenue to Twenty-Fifth Street. This would give the company just what it wants in the way of getting to the Square from both the east and the west. Yet the city has been urging the old company to get some of its cars away from the Square and prevent any danger of blockades there. In spite of the fact that the streets through and about that place are restricted to the use of pedestrians in the evening and that the company has re-routed many of its cars, blockades occasionally occur. It is thought that the cars of another company operating to that point would complicate matters still more.

Announcement was made Sunday that on Monday morning the Cleveland Electric Railway Company would begin the sale of seven tickets for a quarter, with transfers and transfers on transfers over the cross-town lines. This is a temporary arrangement to give both the people and the

company an idea of the merits of the plan proposed by the company in settlement of the long fight that has been waged on the fare question in Cleveland. Although the officers would not state how long they expected to continue this trial, they said that 10,000,000 tickets had been printed and several million more had been ordered. As the company handles in the neighborhood of 120,000,000 fares annually, the supply on hand will last perhaps a month, and it is surmised that the trial will be continued perhaps two months.

No doubt this is a part of the general campaign being waged for a settlement of the question on the terms proposed by the company. For several months the newspapers were used to popularize the offer, but some time ago this was stopped. On Saturday, however, one of the evening papers contained a page advertisement and in the morning papers the same space was used to tell the people that they now have an opportunity of testing the merits of the plan and will be able, after satisfying themselves, to settle the question for good.

This is the third test of low fares made by the company. A few years ago six tickets for a quarter were sold for several weeks, and again when the zone system was advocated the company made a 3-cent fare within a territory bounded by Wilson Avenue on the east and Gordon Avenue on the west. The last offer is the lowest ever made in a city of the size of Cleveland, and it is claimed by the officers of the company that it is the lowest in the world, considering the length of the haul, transfers and the general service rendered. In speaking of the test President Horace E. Andrews said:

"We have decided upon this course because sentiment seems to demand it. We have had a large number of letters from people all over the city for a long time past, urging us to give a test of our offer, so that the people could have an actual demonstration of the benefits of the low fare offer as embodied in our ordinance before the Council. The average citizen is tired of the constant contentions as to the merits of various low fare schemes. We are going to give the people a demonstration under conditions exactly similar in every way to the conditions outlined in that ordinance."

It seems to be the general belief among the business people of the city that the offer of the company would meet with the approval of a majority of the people, if an expression could be gotten from them in any way. The plan to put the question to a vote was blocked and as yet no other means of securing the will of the voters has been put forward. Should the decision of the Council be finally in favor of the new companies, it is entirely possible that the people in some portions of the city would pay two fares for years. This would be in the nature of an increase that could not be offset by all the low fares they would pay after the system is established.

Having obtained the permission of the court to do so, the Forest City Railway Company on Friday and Saturday removed much of the material from Superior Avenue. The trolley wire was taken down and most of the wagons, with their ash-barrel accompaniments, were hauled away.

The Cooper injunction case was resumed on Monday, when arguments of several of the attorneys were heard. The attorneys for the Cleveland Electric Company did not bring in the question of the Mayor's financial interest in the new companies, but argued the question on the right of the company to place a temporary track on the street. The case was not finished and was taken up again Wednesday.

A NEW TYPE OF MOTOR COMPRESSOR

The National Brake & Electric Company, of Milwaukee, is now manufacturing in large numbers its new types of motor compressors, of which the most frequently used for street railway service are the A-4 and BB-2 types. One of

The valve head 4 is constructed with discharge valves towards the center and the suction valves toward the outside of the head. The valves are of the solid cold-drawn tubular steel type and are interchangeable. They are seated by gravity aided by air pressure. The discharge pipe runs straight out of the valve head to the main reservoir, thus dispensing with the necessity of attaching unsightly elbows and goose-necks. Both gear and pinion are a standard herringbone pattern, cut with the greatest accuracy.

The motor of the compressor outfit is a standard four-pole machine of the enclosed type designed with an unusual liberal rating and with a view to accessibility. One of the many distinctive features of the motor is the heavy insulation employed in the brush gear. This insulation on the National motor compressor brush gear is 1¼ ins. which gives assurance against a breakdown likely to occur from the current eating through the bushing or creeping over the small oil-covered surface.

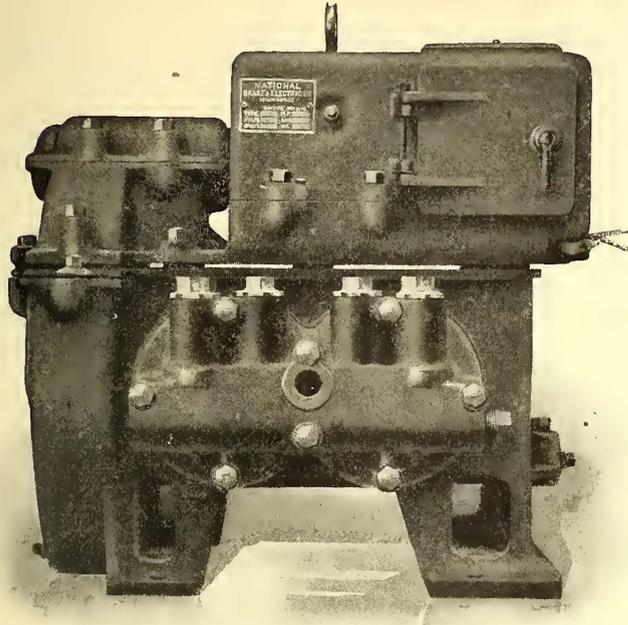


FIG. 1.—THE COMPLETE COMPRESSOR

their many distinctive features is the construction of the motor and compressor as entirely separate and self-contained units. When the two parts are assembled a very compact and rigid compressor unit is produced. In Fig. 1 is shown a complete A-4 type compressor. The crank chamber cover and motor base are separated by a ½-in. air space, which is clearly shown in the illustration. In addition to acting as an insulator of the heat radiated by the compressor the motion of the car causes a strong current of air to circulate through this space, thus rapidly carrying away the heated air. This feature greatly conduces to low-temperature operation, while the separate cover gives the required bracing and stiffening for the crank chamber casting.

The simplicity of design and construction of the compressor is shown in the phantom view Fig. 2. Referring to Fig. 2, the crank shaft is fitted with a third bearing 2 in its center, which in addition to supporting and strengthening it at the weakest point, eliminates all tendency of the shaft to fracture at the center. This third bearing also makes the operation of the compressor much quieter and gives greater freedom from vibration than is the case with two-bearing compressors. Thus the life of the pump and gearing and their efficiency are greatly increased. Removal of crank shaft and gear is accomplished by lifting them straight out of the crank chamber. As the removal of the gear from the shaft is unnecessary, greater accessibility to the pump is gained and a minimum of time consumed in dismantling and reassembling the parts. The splash system of oiling is used, the gear and crank running constantly in a bath of oil which is splashed over all the operating parts of the compressor. The gear case 1 is constructed as an integral part of the crank case instead of being cast separately.

PREPARING FOR PARK BUSINESS

Marking the first of the amusement park enterprises for the new year was the opening of Parque Luna, City of Mexico, on Jan. 1, by Frederick Ingersoll, of Pittsburg. The event approached a national holiday. The guests of honor included a number of public officials and prominent members of the American colony.

At least five new amusement parks, not one to cost less than \$300,000, will be installed by Mr. Ingersoll this year. Two already are under way and the grading and dredging and preliminary work on the others will be commenced shortly. One of these is at Burlington Bay, Hamilton, One. This park will contain all the features that have proved successful in the Luna Parks of Pittsburg, Washington, Cleveland and Scranton.

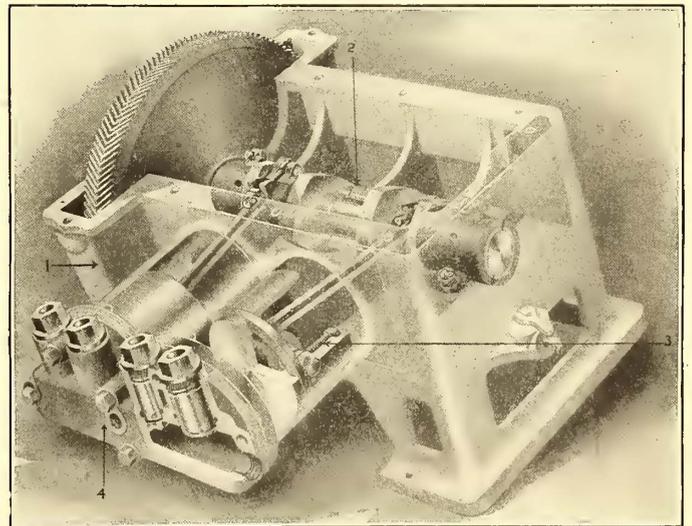


FIG. 2.—PHANTOM VIEW OF COMPRESSOR

Old Monarch Park, Cincinnati, has recently become the property of a company controlled by the same interests and will be transformed into an amusement park along similar lines.

In connection with his street railway park business, Mr. Ingersoll has already contracted for the building and installation of fifteen roller coasters and as many aerial swings and carousels.

MULTIPLE SCALE VOLTMETERS

To protect its multiple-scale voltmeters against injury as a result of wrong connection, the American Instrument Company provides all of its instruments which have more than one range with a multiple-scale switch which makes it practically impossible to injure the instrument by careless connecting or through ignorance. This switch is placed on the instrument where it is easy to see and operate, as is shown in the accompanying illustration.

Normally the indicator stands at "Open" as shown. Connection is made to the one pair of binding posts no matter what range is wanted, and the button is turned till the indicator points to the range desired and the readings are made. The switch is securely held in position for the required range until the operator is through.

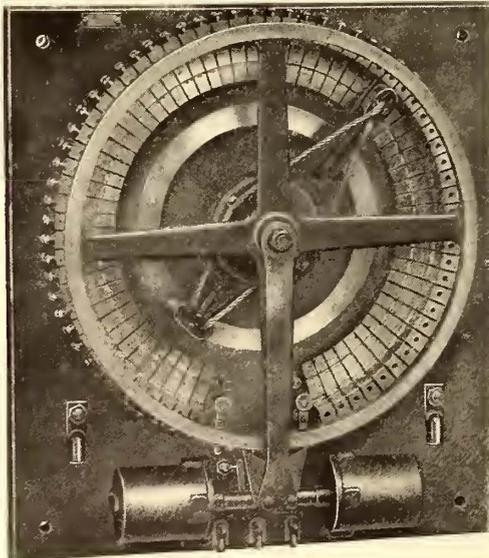
Then either by pushing a button or closing the lid of the instrument it is released and flies back to the open position. Thus the switch always stands at "Open" when the instrument is not in use, and it is impossible to use the low range without connections having first been automatically made to the higher ranges.



DIAL OF MULTIPLE SCALE VOLTMETER

REMOTE CONTROL RHEOSTAT SWITCHES

Modern switchboard engineering tends toward making the controlling board as compact and safe as possible. To this end, remote-controlled apparatus with low-tension wiring at the switchboard has been devised. The accompany-



REMOTE CONTROL FIELD RHEOSTAT

ing illustration shows a simple remote-control field rheostat recently placed on the market by the General Electric Company. This new solenoid-operated rheostat has been developed to take the place of the bulky and expensive motor-driven switch, and aside from being smaller and simpler than the old type, has the advantage of having no momentum to carry it beyond the desired point of rest.

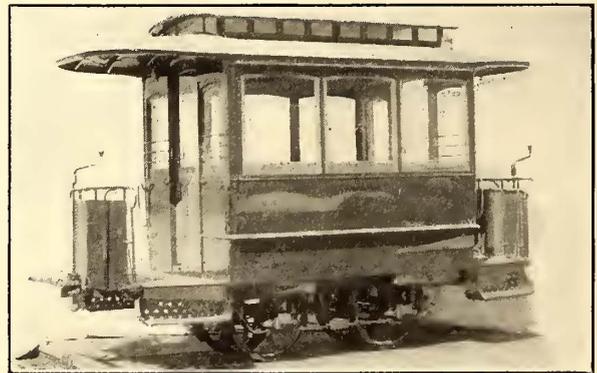
The automatic rheostat is arranged so as to cut resistance in and out of the circuit by a revolving arm making contact on a series of points corresponding to divisions in the resistance. The switch arm is rotated by means of pawls which engage in the knurled rim of a wheel upon which it is mounted. The pawls are operated by a solenoid plunger to which the necessary reciprocating motion is imparted by alternately making and breaking the energizing circuits of the solenoid magnets. A single-pole, double-throw control switch is used to close the circuit in one solenoid or the other, depending upon the direction in which it is desired to turn the switch arm. Limiting switches are provided so that when the rheostat arm reaches either end of its travel it opens the operating circuit.

With the standard switches the operating solenoids are wound for $\frac{3}{4}$ of an ampere and 125 volts. Three capacities are made, namely: 50 amps., with seventy divisions; 100 amps., with sixty-five divisions, and 200 amps., with forty-six divisions. The manufacturers can also furnish special switches with solenoids wound for any standard voltage and with switches for smaller or larger capacities.

While remote-control rheostats of the type described are especially built for varying the field strength of generators, their use is not limited to this service, but they are adapted as well for cutting in and out resistance for any purpose from a distant point, where automatic "no-voltage" and "overload release" features are unnecessary.

AN ODD CAR FOR YUCATAN

The car shown in the accompanying illustration is unique as being the smallest built by the J. G. Brill Company within the past twenty years. Its destination is Merida, Yucatan, to which place many similar cars of larger size have been shipped by the same builders, one car in particular being very sumptuous in its appointments and intended for the private use of the President of Mexico. The Compañia de Tranvia de Merida, which is owned by Escalante &



CAR FOR YUCATAN

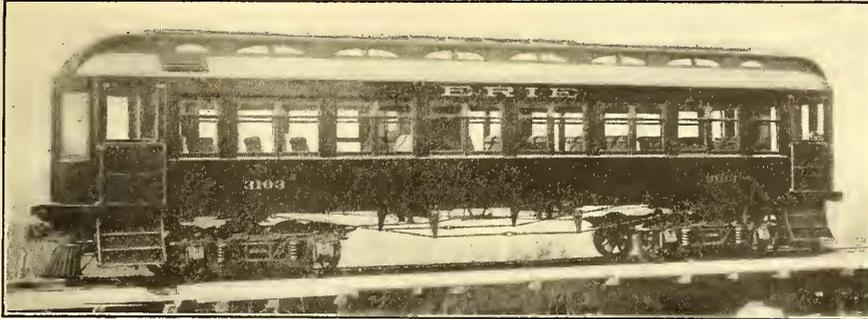
Sons, uses about 150 cars for the 33 miles of track comprising the system. The open and closed cars in use are from 12 ft. to 10 ft. in length, but the present car, which was ordered through Thebaud Bros., of New York, is but 8 ft. in length. The seats and backs of the car are upholstered in leather; the interiors are of cherry and ash and the blinds which make up the equipment are of the same material. The length of the car over crown pieces is 14 ft. The truck used is remarkable on account of its short wheel base, which is but 4 ft.

CARS FOR ROCHESTER DIVISION OF THE ERIE

MORE SEMI-CONVERTIBLE CARS FOR MOBILE, ALA.

As the progress in the electrification of steam roads is being watched with much interest, the cars recently built by the St. Louis Car Company for operation on the Rochester division of the Erie Railroad, now being equipped with

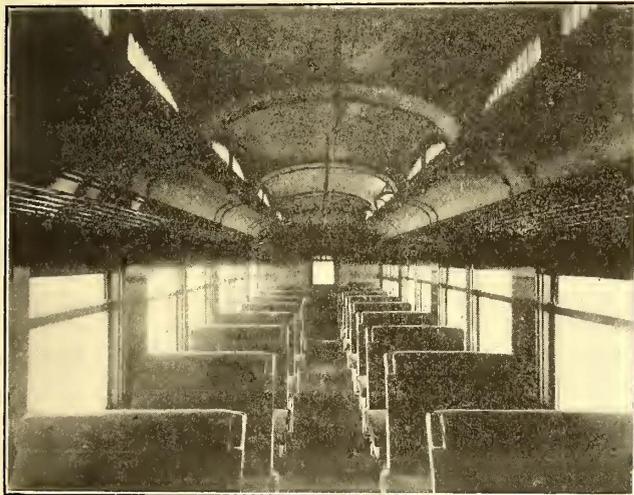
An article in the STREET RAILWAY JOURNAL of April 7 of last year commented upon the strong favor in which the semi-convertible car was held in Mobile, the article going on to describe both single and double-truck cars of the Brill type which had lately been placed on the lines. The American Car Company has now completed an order of six 30-ft. 10-in. double-truck semi-convertible cars of the same type for the Mobile Light & Railroad Company, and in addition there is now in course of construction at the St. Louis works six single-truck cars of the same character. Over the vestibules the double-truck cars measure 40 ft. 10 ins.; width over the sills, including sheathing, 8 ft. 2 ins. The other dimensions are: Height from the floor to the ceiling, 8 ft. 1/4 in.; height from the track to the under side of the sills, 2 ft. 10 ins.; size of the side sills, 4 3/4 ins. x 7 3/4 ins.; end sills, 5 1/4 ins. x 6 7/8 ins. The same kind of truck is employed



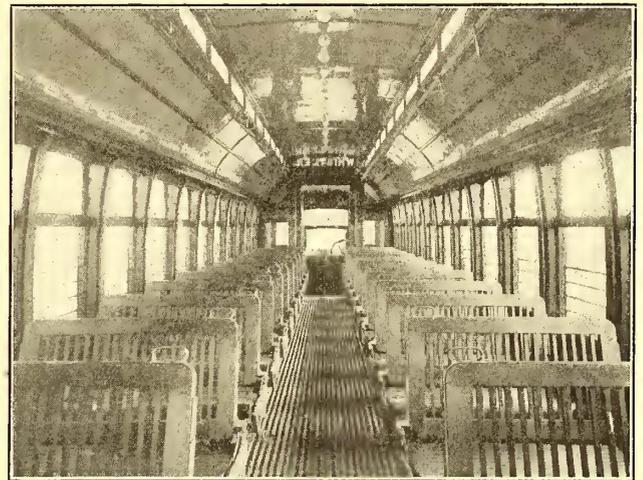
EXTERIOR OF ELECTRIC CAR FOR ERIE RAILROAD

electricity, will no doubt be of special interest. Combination passenger and baggage and passenger and smoker types were built. They measure 51 ft. 4 ins. in length over all and

height from the track to the under side of the sills, 2 ft. 10 ins.; size of the side sills, 4 3/4 ins. x 7 3/4 ins.; end sills, 5 1/4 ins. x 6 7/8 ins. The same kind of truck is employed



INTERIOR OF ELECTRIC CAR FOR ERIE RAILROAD

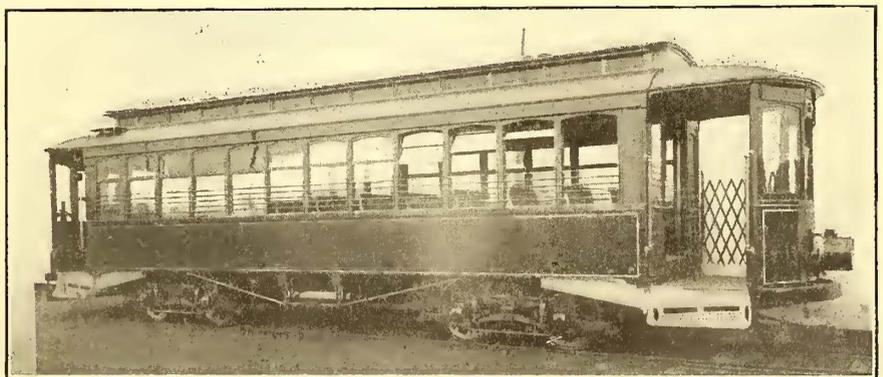


INTERIOR OF NEW SEMI-CONVERTIBLE CAR FOR MOBILE

are 8 ft. 8 ins. wide. The vestibules are provided with trap doors closing the step openings and end doors. The motorman's cab is formed in the left side of the vestibule by swinging open a door which is hinged to one of the front vestibule posts. When this door is swung open it extends across to the door post of the car body and separates the motorman's cab from the remainder of the platform. When closed this door folds back over the control apparatus. Immediately behind the motorman is a switch cabinet lined with transite and provided with an iron door, which contains the pump, light and control fuses.

The interior of the car is finished in mahogany. The ceiling is of the semi-empire type and the deck sash are glazed with leaded art glass. The rattan seats of the smoking compartment, and plush ones in the passenger compartment are of the St. Louis Company's reversible type with pedestal bases and automatic foot rests. The heater wires are in pipe conduits, and the light wires in asbestos molding.

as formerly, namely, the No. 27-G with a wheel base of 4 ft. 6 ins. The weight of the car and the trucks without the



APPEARANCE FROM STREET OF THE MOBILE CAR

motors is 28,000 lbs. The interiors are finished in cherry; the seats are of Brill make and of the slat type. It will be noticed that the lights are strung singly down the center of the car, and not in clusters, as is ordinarily done in car lighting.

LEGAL DEPARTMENT*

OBLIGATION TO REPAVE

In the Legal Department of this journal for Sept. 26, 1903, treating of "Police Power and Roadbeds," a test was suggested for the validity of ordinances imposing obligations upon street railway companies. "If the company be merely required to perform acts in and about its tracks and roadbed which are rendered necessary by the existence of the track, the burden so imposed is legitimate. If, however, it be attempted to shift upon a street railway company a duty of paving or cleaning, which has no essential relation to the roadbed, and which would exist if there were no railway, the ordinance must be condemned." We said at the time that all the authorities were not reconcilable in support of such test, but that it ought to be generally accepted as the proper one.

The tendency of the most recent cases upon the duty to repave must be reckoned with; certainly the courts seem disposed to hold street railway companies responsible for doing their full share in keeping up with the march of improvement. In *Mayor, etc., vs. Harlem Bridge, etc., Ry.* in the New York Court of Appeals (New York Law Journal, Nov. 26, 1906), it was held that the provisions of the charter of a street surface railroad requiring the company to pave between its tracks and for 1 ft. outside thereof, apply to an extension of its lines, constructed pursuant to an amendment of the original act, although the amendatory act was silent on the subject of paving.

It was further held that a charter provision requiring the company "to keep the surface of the street inside the rails and for 1 ft. outside thereof in good and proper order and repair and conform the tracks to the grades of the streets or avenues as now they are or may hereafter be changed by the authorities" imposes a duty upon the road to cooperate with the city authorities in keeping its part in a condition corresponding with the rest of the street, even though that necessitates the laying of a new pavement by the company.

In the opinion the court discusses previous cases arising in the courts of New York and other States, and the whole trend of the discussion is toward the liberal construction of charters and other statutory provisions so as to recognize the right of municipalities to compel street railways to keep the parts of the street occupied by them in conditions appropriate to the progress of the community.

A still more radical decision in the same line was that by the Supreme Court of Pennsylvania in *City of Reading vs. United Traction Co.* (64 Alt., 446). The suit was by the city of Reading against one of its street railway companies to recover the cost of paving with asphalt the spaces between the rails and to the limit of the sills. The street pavement had not previously been of asphalt, but the jury found that that sort of paving had become necessary and proper, and that the portion of the street used by the defendant had been out of repair. It was laid down that the portions of the street occupied by the railroad must be kept in order by it, although there was no express contract or statutory direction to that effect, and the company was held liable to reimburse for the expense of placing the street in and about the tracks in good repair and reasonable correspondence with the rest of the street, through the use of a new form of pavement, in the absence of any contractual provisions to the contrary. This case would seem to extend the previous common law rules on the subject.

* Conducted by Wilbur Larrimore, of the New York Bar, 32 Nassau Street, New York, to whom all correspondence concerning this department should be addressed.

CHARTERS, FRANCHISES AND ORDINANCES

ILLINOIS.—Injunction—Prosecution for Crimes—Municipal Corporations—Street Railroads—Regulations—City Ordinances—Prosecutions for Penalties—Municipal Ordinance—Invalidity—Remedy at Law—Multiplicity of Suits.

1. A court of equity has no jurisdiction to interfere with prosecutions for criminal offenses, whether under a statute applicable to the State at large, or under an ordinance in force only in a particular municipality.

2. Chicago Municipal Code, Secs. 1958, 1959, as amended Oct. 23, 1905, requiring street railways under penalty to furnish sufficient cars to prevent overcrowding, to keep them above a certain average temperature, to keep the track in such condition as to prevent unnecessary noise and jarring, etc., was within the power conferred on the city by Cities and Villages Act, art. 5, Sec. 1, cl. 42 (Hurd's Rev. St. 1905, c. 24, Sec. 62), giving cities power to regulate the occupation of street railway companies.

3. Chicago Municipal Code, Secs. 1958, 1959, as amended Oct. 23, 1905, requiring the running of a sufficient number of street cars to prevent overcrowding, the furnishing of heat therein, etc., was within the police power of the city.

4. The mere invalidity of a city ordinance, under which certain street railway companies were prosecuted to recover penalties for violation thereof, affords no ground for the issuance of an injunction to restrain such prosecutions.

5. Where the invalidity of a city ordinance under which many suits for separate penalties were brought against certain street railway companies had not been determined at law, and its invalidity was uncertain, such railroads were not entitled to maintain a bill of peace to restrain the prosecution of all the suits but one.

6. Where two street railway companies in different parts of a city furnished practically all the street railway service thereof, they were not entitled to maintain a suit in equity to restrain a large number of prosecutions for violations of a city ordinance regulating such service, and to have the ordinance declared void because the maintenance of such bill would prevent a multiplicity of suits, for the reason that there were other persons and corporations operating street railway lines in outlying districts, interested in the proceedings but not charged with a violation of the ordinance.—(*City of Chicago vs. Chicago City Ry. Co.* et al., 78 N. E. Rep., 890.)

INDIANA.—Eminent Domain—Railroad Right of Way—Damages—Benefits—Trial—Instructions—Misleading Instructions—Future Damages—Extent of Right to Use of Property—Railroads—Right of Way—Use—Compromise Verdict.

1. In a proceeding to condemn land for an interurban electric railway, no deduction should be made for benefits accruing to the landowner from the construction and operation of the road.

2. In a proceeding to condemn land for a railroad right of way, the court charged at defendant's request that if the jury found inconvenience and danger to the owner of the adjoining land and his family in crossing the track and right of way to exist, they might consider the same in estimating damages. There was evidence on all the points suggested in the instruction, and the jury was charged, at plaintiff's instance, that they should find no damages for defendant until they could agree that a preponderance of all the evidence in the case justified them in believing that a particular sum would be a fair measure of compensation. Held that defendant's instruction was not objectionable for failure to expressly confine the jury's consideration of matters "shown by the evidence" to exist, and as authorizing the allowance of speculative and fanciful damages.

3. Where a railroad right of way was sought to be condemned diagonally through a farm consisting of 65 acres of land in one body, damages should be considered and assessed for the entire farm.

4. In a proceeding to condemn land for a railroad right of way, an instruction that if the jury believed that certain additional tracks and cars would be an additional damage to defendants, then the probability of the laying of such tracks and running of the cars was an element of damage for which they were entitled to award compensation, was not misleading for failure to require that the jury should believe such facts "from the evidence."

5. In a proceeding to condemn land for a railroad right of way, all damages present and future arising from the proper construction and operation of the railroad must be recovered,

and such damages not recovered in that proceeding cannot be recovered in a subsequent action.

6. Where an interurban railroad company condemned land for the right of way, it acquired the right as against adjoining landowners to construct additional tracks on such right of way, and to run any number of cars thereon in the proper management of its business.

7. Where, in a proceeding to condemn land for a right of way, the jury were directed to consider the difference caused by the appropriation between the cash market value of the remaining land immediately before the appropriation and its cash market value immediately thereafter; to consider the farm as it then was, and that the damages should be assessed for the farm as a whole, etc., another instruction that defendants had no right to lay water pipes or to construct private drains across the right of way without plaintiff's consent, which was an element of damage for consideration, was not objectionable for failure to confine the jury to the consideration of such pipes and drains as shown by the evidence to be reasonably and properly necessary in the use of the land for farming.

8. Where, in a proceeding to condemn land, the only issue was the amount of damages, it was not error to refuse an instruction that while each juror should be open to influence by argument of his fellow jurors, he should not, while holding an intelligent belief, agree to a compromise verdict which did violence to his belief, the court having charged at plaintiff's request that the burden of proof being on the defendants, the jury should not agree or find damages for defendants until they could find that a preponderance of all the evidence sustained the sum found to be a fair measure of damages.—(Union Traction Co. vs. Pfeil et al., 78 N. E. Rep., 1052.)

KENTUCKY.—Eminent Domain—Laying Tracks in Street—Injury to Property—Compensation—Appeal—Admission of Evidence—Harmless Error.

1. Evidence, in action for damages to property caused by laying car tracks in street in front of such property, examined, and held to justify denial of peremptory instructions for defendant.

2. In an action for damages to property caused by laying car tracks in street in front of such property, error, if any, in allowing witness to state how much the property was depreciated by the construction of the street car line in front of it, without confining them to its depreciation from the obstruction of egress and ingress, was harmless in view of instructions given allowing recovery of damages only if plaintiff was deprived of a reasonable use of the street as a means of egress and ingress to and from the property and limiting the amount of damages to such depreciation in value, if any, of the property in question as was due from the obstruction to the reasonable use of the street adjacent to such property for travel by vehicles in ordinary and general use to and from such property.—(Camden Interstate Ry. Co. vs. Stein, 97 S. W. Rep., 394.)

NEW YORK.—Easements—Acquisition by Prescription—Limitation of Actions—Commencement of Action—Effect—Persons not Parties.

1. An elevated railroad may acquire by prescription the easements of abutting owners.

2. An action by a tenant of an abutting owner against an elevated railroad for injuries to easements, brought within twenty years after the commencement of the operation of the railroad, does not interrupt the running of limitations against the owner, and he cannot after the expiration of more than twenty years from the commencement of the operation of the railroad maintain an action for injury to easements.—(Goldstrom vs. Interborough Rapid Transit Co. et al., 100 N. Y. Sup., 912.)

NORTH CAROLINA.—Railroads—Right of Way—Priority—Survey—Filing of Plat—Prior Location—Street Railroads—Incorporation—Attacking Validity—Collateral Attack—What Constitutes—Interurban Railway—Right of Way—Organization—When Complete—Issuance of Stock—Payment of Money—Railroads—Right of Way—Condemnation—Priority—Injunction—Ground of Relief—Actual Violation of Right.

1. Where grants of two railroad franchises are indefinite as to the exact route to be selected, the prior right will attach to that company first locating its line by defining and marking the route and adopting it by authoritative corporate action.

2. Where a right of way is clearly defined and is staked out by a company, and the route so marked is adopted by the company, the entry of an engineer and a survey is not necessary to

the location as against another company seeking the same right of way.

3. The requirement of Revisal 1905, Sec. 2600, that railroad corporations within a reasonable time file a map and profile of their route and right of way with the corporation commission, does not require such a filing as an essential of a completed location of the right of way as against another company.

4. A street railway by a directors' resolution adopted an abandoned railway roadbed as its right of way between two towns, staked out such roadbed, engaged agents to secure the necessary options, some of which were secured, and subsequently, by its directors, ratified and readopted the location as staked out. Held to constitute a prior location as against a railroad company afterwards surveying a line over the same roadbed and purchasing and condemning part thereof.

5. That the capital stock of a street railway company has not been issued, and that no money has been paid thereon, and that no part of the railway is constructed within a town, are matters not open to collateral investigation in injunction proceedings to determine the right of such company to a right of way as against a rival railroad company.

6. Under Revisal 1905, Sec. 1138, defining a street railway as including a railway operated between points in different municipalities lying near each other, or between the territory contiguous to the home municipality, and providing against an extension of more than 50 miles from the home municipality, it is no objection to the right of a street railway to locate a right of way between two towns that no part of its line has been constructed in any town.

7. Under Revisal 1905, Sec. 1140, providing that the persons associated shall constitute a corporation from the time of filing a proper certificate, and Sec. 1141, giving the signers of the certificate temporary power as directors, it is no objection to the obtaining of a right of way by a street railway that its capital stock has not been issued and that no money has been paid thereon.

8. A specific right granted by the franchise of a railroad to condemn abandoned rights of way does not authorize it to condemn an abandoned right of way on which there is a prior location by a street railway.

9. Where a railroad has no express grant to condemn a right of way already located by a street railway, and no necessity exists for such a proceeding, and such right of way is only sufficient for the laying of one track, the general power of condemnation is insufficient to authorize the condemnation of such right of way.

10. Injunction will lie to protect a street railway's located right of way from interference by another company which is seeking to acquire the same by purchase and condemnation, and whose engineers are surveying with a view to immediate occupation.—(Fayetteville St. Ry. vs. Aberdeen & R. R. Co., 55 S. E. Rep., 345.)

PENNSYLVANIA. — Street Railways — Franchises — Forfeiture.

Where a street railway company obtained a franchise from a township to lay its tracks on a public road, with a provision that, when required by the township, it would remove its track from the side to the center of the road, after the road has been constructed, the township cannot declare a forfeiture of the franchise on refusal of the railway company to so move the track, where it was impossible, because the abutting owners on one side of the road would not give their consent to the construction of the track in the center of the road.—(Millcreek Tp. vs. Erie Rapid Transit St. Ry. Co. et al., 64 Atl. Rep., 901.)

LIABILITY FOR NEGLIGENCE

ARKANSAS.—Street Railways—Injuries to Pedestrians—Contributory Negligence—Last Clear Chance—Evidence—Trial—Issues—Submission.

1. Plaintiff, a woman about forty years of age and very deaf, deliberately walked on defendant's street car track after she had looked and knew that a car was coming, her only excuse being that she thought she had plenty of time to cross and kept listening for the gong, but did not hear any. She paid no attention to the car after she saw it the first time until she "heard a confusion," and saw the car was upon her. Held, that plaintiff was guilty of contributory negligence.

2. In an action for injuries to a pedestrian by being struck by a street car, evidence held to sustain a finding that defendant's motorman discovered plaintiff's peril in time by the exercise of

ordinary care to prevent running her down, and that he failed to exercise such care, warranting a recovery, notwithstanding plaintiff's contributory negligence.

3. Where, in an action for injuries to a pedestrian by being struck by a street car, defendant asked for a peremptory instruction, which was properly denied, and then asked that the court submit the question of plaintiff's contributory negligence to the jury, defendant could not object that the court erred in failing to declare that on the undisputed evidence plaintiff was guilty of contributory negligence as a matter of law.—(Ft. Smith Light & Traction Co., vs. Barnes, 96 S. W. Rep., 976.)

CALIFORNIA.—Carriers—Injury to Passengers—Negligence—Appeal—Party Aggrieved—Contribution—Torts—Joint Wrong-Doers—Statutes—Appeal—Motion for New Trial—Review of Evidence—Trial—Findings—General and Special Findings—Consistency.

1. Where a passenger on a street car, free from contributory negligence, was injured in a collision between the car and a wagon of a third person, the negligence of the third person was no defense where the street railway company's negligence, in whole or in part, caused the injury, it owing to the passenger the highest care.

2. In an action for the death of a passenger on a street car in a collision between the car and a wagon of a third person, the evidence showed that the motorman saw the wagon approaching the track, but did not check the speed of the car till he was so close to the wagon that a collision was inevitable. Held that, though it might have been the duty of the driver of the wagon to have stopped until the car had passed, the motorman did not exercise the highest care toward the passenger because he failed to stop the car, though knowing that a collision would ensue.

3. In an action for the death of a passenger on a street car, in a collision between the car and a wagon of a third person, brought against the railway company and the third person, judgment was rendered against the company and in favor of the third person. Held, that the company was not a party aggrieved by the refusal to render judgment against the third person; there being no right of contribution between the co-defendants.

4. Code Civ. Proc. Sec. 709, providing that where property liable to an execution against several persons is sold thereon, and more than a due proportion of the judgment is satisfied out of the proceeds of the property of one of them, he may compel contribution from the others, etc., does not change the rule that there is no right of contribution between joint tort-feasors, but merely gives to a judgment debtor entitled to contribution the summary remedy of using the judgment itself to enforce contribution in the manner prescribed.

5. Where, in an action for negligence, plaintiff does not move for a new trial, the court, on appeal, cannot consider the question of the sufficiency of the evidence to show negligence.

6. In an action for the death of a passenger on a street car, in a collision between the car and a wagon of a third person, brought against the street railway company and the third person, the court found that the death of the passenger was not caused by the negligence of the third person, but solely by the negligence of the company. The court further found that the driver of the wagon saw the car approaching when it was about 125 ft. distant from the point of the accident and did not stop his team until too late. Held that, as the car was operated on a street, it could not be said that the driver of the wagon did not exercise reasonable judgment in determining that he could pass the crossing before the car would reach him, and a judgment in favor of the third person was authorized.

7. The finding of the ultimate fact prevails in support of the judgment, notwithstanding a finding of probative fact which tends to show that the ultimate fact is against the evidence.—(Forsythe vs. Los Angeles Ry. Co. et al. (L. A. 1733), 87 Pac. Rep., 24.)

GEORGIA.—Trial—Instructions—Conformity to Issues—Carriers—Injury to Passenger—Evidence—Admissibility—Instructions.

1. Where the plaintiff's declaration and the evidence in support of it tended to make a case of a wilful tort on the part of a street car conductor, committed on a passenger by forcibly pushing or kicking her off the car, and the evidence on behalf of the defended tended to show that after the car had stopped a sufficient length of time and signals had been given, and upon her failure to alight, it had moved on, she voluntarily stepped from

the car and was injured, it was error to so charge the jury as in effect to authorize them to find in favor of the plaintiff if she was not in fact wilfully ejected from the car, but was injured by reason of negligence on the part of the conductor in not allowing sufficient opportunity for a passenger to leave the car.

2. There was no error in allowing a witness to testify that on the street where the injury occurred there was a place where street cars stopped at the crossing.

3. There was no error in charging that the jury might consider whether or not the car ought to have stopped at a given point, in determining questions with reference to the circumstances under which the conductor and plaintiff may have acted, with reference to whether the circumstances would be such as to authorize a finding for punitive damages, and generally in considering the circumstances immediately leading up to and attending the occurrence.—(Savannah Electric Co. vs. McElvey, 55 S. E. Rep., 192.)

ILLINOIS.—Trial—Questions for Jury—Conflicting Evidence—Instructions—Action Against Carrier—Injury to Passenger—Carriers—Action—Instructions.

1. Where there is evidence fairly tending to prove the plaintiff's case, its weight and sufficiency are to be determined by the jury, though the court may be of opinion that the weight of the evidence is for defendant.

2. In an action against a carrier for injuries to a passenger, the court instructed that if the jury believed that defendant failed to use such care and diligence as required, and that "by reason thereof the plaintiff was injured as alleged in the plaintiff's declaration," there should be a verdict for plaintiff. Held, that the instruction was not erroneous on the theory that the words "as alleged in plaintiff's declaration" referred to the character of the injuries, and hence that plaintiff's right to recover was not limited to proof of the negligence charged in the declaration.

3. In an action against a carrier for injuries to a passenger, the declaration alleged negligence in managing and controlling the car and in causing it to start suddenly and violently, and the court instructed that in order to entitle plaintiff to recover he must prove by a preponderance of the evidence that he was in the exercise of ordinary care, and if the injury resulted from an accident, and not from the negligence of defendant, the verdict should be for defendant, and the court also instructed that it was the duty of defendant to do all that human care, vigilance, and foresight could reasonably do to prevent an accident to plaintiff. There was no evidence introduced to prove any negligence, except that charged in the declaration. Held, that the instructions were not erroneous, on the ground that the jury might have understood that they could find for defendant, if they believed the cable machinery was defective or out of repair.—(Chicago Union Traction Co. et al. Lowenrosen, 78 N. E. Rep., 813.)

ILLINOIS.—Carriers—Street Railroads—Injuries to Passenger—Contributory Negligence—Position—Standing on Step—Appeal—Intermediate Appeal—Questions of Fact—Conclusiveness—Injury to Passengers—Care Required—Evidence—Weight and Sufficiency—Damages—Mental Suffering—Trial—Instructions—Damages—Applicability to Issues—Personal Injuries—Earning Capacity—Evidence—Negligence of Motorman—Instructions—Direction of Verdict—Assumed Risk.

1. Where a street car on which plaintiff was riding at the time of his injury was so crowded that plaintiff could not secure a safer place than the step on which to ride, whether plaintiff was guilty of contributory negligence in riding on the step was for the jury.

2. In an action for injuries to a passenger on a street car, whether plaintiff could have secured a safer place to ride than on the step, and was therefore guilty of contributory negligence in riding there, was a controverted question of fact, the determination of which by the Appellate Court was conclusive on a further appeal to the Supreme Court.

3. It is the duty of a street railroad company, as a matter of law, to use the highest degree of care and caution consistent with the practical operation of the road, to provide for the safety and security of passengers while being transported.

4. In an action for injuries to a passenger, plaintiff is only bound to prove his case by preponderance of the evidence, and not beyond a reasonable doubt.

5. A passenger who suffered bodily injury as the result of an accident for which the carrier was liable, was entitled to recover for such mental suffering as was the natural and inevitable result of his injuries.

6. Where, in an action for injuries to a passenger, a declaration alleged that plaintiff had been obliged to expend divers large sums of money, amounting, to wit, to the sum of \$1,000, and had obligated himself to pay out large sums of money, to wit, \$1,000, an instruction authorizing consideration of any necessary expense plaintiff may have been put to "or may have obligated himself to pay," in and about plaintiff's treatment for his injuries, was not objectionable as beyond the issues, in so far as it authorized consideration of expenses plaintiff had obligated himself to pay.

7. Plaintiff's thumb and little finger were torn off and the hand so injured and lacerated as the result of defendant's negligence that it was almost useless. Plaintiff was a machinist, and the year prior to his injury had earned \$900 at his trade, but had been unable to work at his trade since the injury, and his capacity to perform any kind of labor had been permanently impaired. Held, that such facts were sufficient to justify a recovery for depreciated capacity to earn money in the future.

8. Where, in an action for injuries to a passenger on a street car, it was a question for the jury whether the motorman was negligent in failing to guard against collision with a wagon, though it was conceded that after the wagon left the track it halted, swerved, or even backed a few inches, an instruction that, if, after the wagon had left the track a sufficient distance to permit the car to pass in safety, and after the forward end of the car had passed the rear of the wagon, without notice to those in charge of the car, the horse suddenly backed the wagon so that it came in contact with the side of the car and plaintiff was thereby injured, the jury should find defendant not guilty, was properly refused.

9. Where an instruction directs a particular verdict if the jury finds certain facts and conditions, the instructions must embrace all the facts and conditions essential to such verdict.

10. The law of assumed risk is inapplicable to an action for injuries to a passenger on a street car caused by a collision between the car and a vehicle.—(Chicago Consolidated Traction Co. vs. Schritter, 78 N. E. Rep., 820.)

INDIANA.—Evidence—Judicial Notice—Functions of Domestic Corporations—Carriers—Injury to Passenger—Action—Complaint—Sufficiency—Trial — Action—Instructions—Assumptions—Damages—Mental Anguish—Personal Injuries.

1. The courts will take judicial notice that a company organized and operating a street railway under the laws of the State is a carrier of passengers.

2. Burns' Ann. St. 1901, Sec. 346, provides that an objection that the complaint does not state a cause of action is not waived by failure to object by demurrer or answer. In an action against a street railroad company for injuries, the complaint alleged that defendant was a corporation engaged in operating various lines of street railroads in a certain city; that plaintiff was riding on "one of the cars of the defendant's road," which was a "passenger car, or one used for the carriage of passengers"; that she desired to leave the car at a certain street, and, before it arrived there, "she sounded the electric bell provided to be sounded by passengers to announce their desire to leave the car"; that the car was known as an open, or summer, car, with seats running from side to side, and with a running board to "assist passengers" in getting on and off; and that plaintiff was a passenger on the car. Held, that after verdict and judgment on the merits, objections to the complaint on the ground that it did not charge that defendant was a carrier of passengers, that there was no allegation that defendant owned the car, that it was not alleged that the car was a passenger car, or one used to carry passengers, that it did not allege that the car was under the control of defendant, and that it did not appear that plaintiff paid or offered to pay any fare, were untenable.

3. In an action for injuries, an instruction that plaintiff was entitled to just compensation for being deprived of freedom of action and social meeting and intercourse with her friends, "which you shall believe from the evidence in this cause she would have enjoyed, but for the receipt of such injuries, so far as under the evidence you shall find that she has been and will be deprived of such freedom of action and meeting," was not objectionable on the ground that it assumed that plaintiff had been deprived of her freedom or friends.

4. In an action for personal injuries, plaintiff is not entitled to

recover for unhappiness resulting from impaired freedom of action and from being deprived of social intercourse with friends.—(Indianapolis St. Ry. Co. vs. Ray, 78 N. E. Rep., 978.)

IOWA.—Trial—Instructions—Reference to Evidence—Application to Evidence—Street Railroads—Collision with Vehicle—Action—Evidence—Admissibility—Regulations as to Right of Way—Action for Injuries—Instructions—Evidence—Admissibility — Negligence — Imputed Negligence—Appeal—Harmless Error—Trial—Issues.

1. In an action for personal injuries, it was error for the court to suggest in an instruction that the jury should take into consideration certain facts constituting circumstances from which negligence might be inferred, and omit reference to facts favorable to defendant.

2. In an action against a street railroad for the death of a member of the fire department in a collision between a hose wagon and a car, an instruction that the jury must consider whether the motorman was negligent in not stopping or checking the speed of the car, if he could have stopped it, was erroneous; there being no question under the evidence as to the ability of the motorman to stop the car or check its speed in time to have avoided the accident, but the question being whether he was negligent in not doing so.

3. In an action against a street railroad for the death of a member of a municipal fire department in a collision between a hose wagon and a car, while the wagon was crossing the track, it was proper to admit in evidence a section of the city ordinances providing that apparatus of the fire department responding to an alarm should have the right of way.

4. Where a section of a city ordinance provided that the apparatus of the fire department should have the right of way while going to and at any fire, and another section provided that the cars of a street railroad company should be entitled to the track, and that in all cases where any team should meet or be overtaken, the team or vehicle should give way to the car, the former section was controlling as to the right of way as between a street car and fire apparatus responding to an alarm.

5. Where, in an action against a street railroad for the death of a member of a municipal fire department in a collision between a hose wagon and a car, a city ordinance giving fire apparatus the right of way while going to and at any fire was admitted in evidence, it was not error to set out the ordinance in an instruction in which the jury were informed as to the legal effect of it.

6. In an action against a street railroad for the death of a member of a municipal fire department in a collision between a hose wagon and a car, it was proper to refuse to admit in evidence on behalf of plaintiff rules of the fire department intended for the guidance of members thereof and issued only to them.

7. In an action against a street railroad for the death of a member of a municipal fire department, who was riding on a hose wagon, in a collision between the wagon and the car, the negligence of the driver of the wagon was not imputable to decedent.

8. In an action against a street railroad for the death of a fireman in a collision between a hose wagon and a car, a witness was interrogated as to the distance within which a car could be stopped with the use of a different kind of controller than that used, but subsequently, on the request of counsel who introduced the witness, his testimony was stricken, and the jury instructed to disregard it. After the witness had fixed a shorter distance than that fixed by the expert witnesses previously testifying, he changed his testimony so that it substantially accorded with that of the other witnesses. Held, that under the circumstances, there was no error resulting from the admission of the testimony of the witness.

9. In an action against a street railroad for the death of a fireman in a collision between a hose wagon and a car, it was not error to refuse an instruction that, in determining whether plaintiff's intestate was guilty of contributory negligence, the jury should not take into account the instinct of self-preservation, where the attention of the jury was not in any way called to such doctrine.—(McBride vs. Des Moines City Ry. Co.)

KENTUCKY.—Appeal—Verdict—Conflicting Evidence—Review—Carriers—Street Cars—Injuries to Passenger—Time to Alight—Stopping Places—Contributory Negligence—Damages — Personal Injuries — Instructions — Nervous Shock—Erroneous Instructions—Necessity of Request—

Right to Object—Trial—Duty of Court—Witnesses—Evidence—Admissibility—Rebuttal—Conclusions.

1. Where there was a conflict of evidence on practically all the controverted points in a case, a judgment for plaintiff would not be reversed for the reason that the verdict was contrary to the evidence.

2. Where the servants of a street car company in charge of a car, saw plaintiff in the act of alighting when the car had stopped at a switch, it was their duty not to start the car until plaintiff alighted in safety, though a regular stopping place had been established only a short distance further on.

3. Where a passenger, on the stopping of a street car at a switch, left her seat intending to alight, but before she reached the platform or steps for that purpose the car was again in motion, and she persisted in getting off while the car was in motion, and was injured, she was guilty of contributory negligence, precluding a recovery, unless the peril in which she placed herself was known to those in charge of the car, and they might have stopped it in time to have prevented her injuries.

4. In an action for personal injuries, an instruction that, in estimating the damages, the jury may consider plaintiff's physical pain and mental anguish suffered in the past and which will probably be suffered in the future, and any disability, partial or permanent, in plaintiff's right arm, and expenses incurred for medical attendance and nursing, also the nervous shock occasioned by the injury, was erroneous in allowing for pain and mental anguish and also for nervous shock; but the jury should have been instructed to allow such sum as would reasonably compensate her for physical and mental suffering endured, or which she will probably endure, for loss of time, reasonable expenses, and for the permanent impairment of her ability to earn money, that may have been caused by the negligence of defendants, not to exceed the amount claimed in the petition.

5. Where an instruction given on the measure of damages was incorrect, the fact that defendant did not request an instruction on such subject did not deprive it of the right to object to such instruction on appeal.

6. Though a trial judge is required by Civ. Code Prac. Sec. 317, subsec. 5, only to give instructions when asked by the parties, if unasked he undertakes to do so, it is his duty to see that the instructions given are correct.

7. Where an instruction is offered by either party which is defective in form or substance, the court should prepare or direct the preparation of a proper instruction on the point covered by the instruction requested.

8. Plaintiff, after being injured while alighting from a street car, was taken to the store of K., and defendant, in an action for her injuries, proved by certain witnesses that they went into the store while plaintiff was there, and that she made to them or in their presence certain statements that her injuries were caused by her own negligence in stepping from a moving car. Held, that evidence of K. that he did not hear plaintiff make such statements, but that he did hear her say she was attempting to get off the car when it was starting again, was admissible in rebuttal.

9. In an action for injuries, a witness was asked if he heard plaintiff make certain statements attributed to her by witnesses for defendant, in a certain store. He answered that he did not, but did hear her say she was attempting to get off the car when it started again, "that would indicate that the car had stopped." Held, that the part of the answer quoted was objectionable as a conclusion of the witness, and was not responsive.—(South Covington & C. St. Ry. Co. vs. Core, 96 S. W. Rep., 562.)

KENTUCKY.—Appeal—Verdict—Conflicting Evidence—Carriers—Injury to Passenger—Evidence—Character—Contributory Negligence—Injuries to Passengers—Actions—Evidence—Trial—Instructions—Refusal—Carriers—Commencement of Relation—Contributory Negligence—Damages—Personal Injuries.

1. A verdict will not be interfered with on appeal, unless it is palpably against the evidence.

2. Where, in an action for injuries to a street car passenger, defendant claimed that she attempted to get on the car while in motion, evidence that plaintiff had been frequently seen to get off and on street cars while in motion was inadmissible.

3. Where, in an action for injuries to a street car passenger while attempting to board a car at a point other than that marked for the stopping of cars, whether the car in fact stopped to permit plaintiff to get aboard was disputed, evidence that

defendant's cars stopped at points on the line other than the place indicated by a sign in question was admissible.

4. Where, in an action for injuries to a street car passenger while attempting to board a car at a point other than that marked as a stopping place by a sign, plaintiff claimed that the car stopped to receive her as a passenger which was denied, evidence concerning the propriety and necessity of stopping defendant's cars at regular stopping places indicated by signs was inadmissible.

5. Where, in an action for injuries to a passenger by the sudden starting of a car as she was attempting to board the same, the instructions given clearly presented the only issue in the case, which was whether the car did or did not stop to receive plaintiff as a passenger, it was not error for the court to refuse to charge that defendant's liability would attach only in the event its employees in charge of the car started the same when they knew that plaintiff was endeavoring to board it.

6. A carrier owes no duty whatever to a person intending to become a passenger, until she has become a passenger by either getting on, or attempting to get on, the car after it has stopped for the purpose of permitting her to board it.

7. It is in general not negligence per se for a passenger to attempt to board or alight from a moving street car.

8. In an action for personal injuries, an instruction that plaintiff, if entitled to recover, should receive such sum as should fairly compensate her for her injury, and that, in estimating the injury done, the jury should allow plaintiff compensation for any pain suffered by her, mental and physical, and any further sum which would fairly compensate her for the loss of her foot, was erroneous; the jury being confined to such a sum as would fairly compensate plaintiff for the value of time lost, for reasonable expenses incurred, for physical and mental suffering caused by the injury, and for any reduction of her power to earn money.—(Lexington Ry. Co. vs. Herring, 96 S. W. Rep., 558.)

KENTUCKY.—Street Railroads—Persons Near Track—Injury Avoidable Notwithstanding Contributory Negligence—Signals.

1. In an action for the death of a boy struck by a street car, plaintiff, as administratrix, can recover, if decedent got on the track or was approaching it far enough ahead of the car for the motorman, in the exercise of ordinary care, to have seen him in time either to stop the car or signal its approach and avoid the injury, and he failed to do so, though the boy was negligent.

2. A street railway company is not liable for death of a boy, where he was standing about 8 ft. from the track and suddenly ran across the track immediately in front of the car, too late for the motorman to avoid striking him, though he did not sound the bell when he saw the boy standing near the track.—(Louisville Ry. Co. vs. Edelen's Adm'x., 96 S. W. Rep., 901.)

KENTUCKY.—Carriers—Injury to Passenger—Question for Jury—Damages—Excessive Damages—Personal Injuries—Action—Instructions.

1. Where a passenger on a street car, a girl 13 years of age, had with her a bundle which was a large one for a girl of her size, and while she was alighting with it and had one foot on the ground and one on the step, the conductor, who was watching her, caused the car to be started, whereby she was injured, it was proper to submit the question of gross negligence to the jury.

2. Where, in an action for injuries to a girl 13 years of age, it appeared that the accident resulted in inflammation of the sciatic nerve and atrophy of adjacent parts, so that she was confined to her bed for some time and suffered intensely, and at the time of the trial walked only with a crutch, and it appeared that she had never been well since the accident, though before that she was a strong, healthy child, a verdict for \$6,500 was not excessive.

3. In an action against a street railroad for injuries to a passenger, a girl 13 years of age, it appeared that she had with her a bundle which was a large one for a child of her size, and that, while she was alighting with it and had one foot on the step and one on the ground, the car was suddenly started by the conductor, who was looking at her; and the court instructed that it was the duty of defendant's servants not to start the car until plaintiff had an opportunity to alight therefrom with reasonable safety, and that if, when she was in the act of alighting and exercising ordinary care, defendant's servants suddenly started the car before she had an opportunity to alight with reasonable safety, and by reason thereof she was injured, she

was entitled to recover. Held, that the instruction was not erroneous, on the ground that the court should have told the jury that it was the duty of the conductor not to start the car until plaintiff had a reasonable opportunity to alight therefrom with safety; the evidence not showing any unreasonable delay on the part of plaintiff, and the jury being required to find, as precedent to a recovery by plaintiff, that the car did not start until she had an opportunity to alight by the exercise of ordinary diligence.—(Louisville Ry. Co. vs. Owens, 97 S. W. Rep., 356.)

MASSACHUSETTS.—Carriers—Street Railroads—Injuries to Passengers—Negligence.

Plaintiff was injured as the result of an explosion or burst of flame from the controller on defendant's street car, in which she was a passenger. Defendant claimed that the flash was an ordinary flash from the controller, which could not be prevented by any means yet devised or any care which could be exercised. There was other evidence, however, that the flash was more than an ordinary controller flash, and that it lasted 15 to 20 seconds, lighted the whole front vestibule, and filled the car with dense smoke. Held, that such facts were sufficient to warrant an inference of negligence on defendant's part.—(Gilmore vs. Milford & U. St. Ry. Co., 78 N. E. Rep., 744.)

MASSACHUSETTS.—Death—Action for Causing—Street Railroads—Negligence—Incompetent Servant—Evidence—Negligence of Employees.

1. In an action against a street railway company for the death of a pedestrian struck by a car, the facts that the motorman did not continuously observe decedent while crossing the street, that he failed to give any warning of the approach of the car, and that he did not more promptly apply the brake for the purpose of stopping the car, do not charge the company with negligence in retaining an incompetent servant, without further proof of previous misconduct showing unfitness, within Rev. Laws. c. III, Sec. 267, authorizing a recovery for the death of a person caused by the negligence of a street railway company.

2. In an action against a street railway company for the death of a pedestrian struck by a car, it was shown that the gong was not rung, that the velocity of the car exceeded the specified rate of speed, and that the motorman did not exercise ordinary care in his general observation of the entire area of the street from curb to curb. Held, not to show gross negligence, within Rev. Laws, c. III, Sec. 267, authorizing a recovery for the death of a person caused by the gross negligence of the servants of a street railway company.—(Moran vs. Milford & U. St. Ry. Co., 78 N. E. Rep., 736.)

MASSACHUSETTS.—Carriers—Street Railroads—Protection of Passengers.

Nearly all day on July 4, 1905, one O. had been discharging a cannon loaded with blank cartridges from his yard toward the street on which defendant's street railway was operated. When the cannon was fired a jet of flame and smoke extended as far as the sidewalk, but several feet short of defendant's tracks, and defendant had no reason to anticipate any danger to its passengers from such source. About 5:30 p. m. plaintiff, a passenger on defendant's street car, was struck and injured by a wad shot by O. from the cannon. Held, that the street car company was not negligent in failing to anticipate danger to passengers from such source, nor in failing to ascertain whether the cannon was properly loaded or pointed.—(Ormandroyd vs. Fitchburg & L. St. R. Co., 78 N. E. Rep., 740.)

MASSACHUSETTS.—Carriers—Street Railroads—Place to Alight—Streets—Safety—Warning.

1. A public street in a town is not to be regarded as a passenger station for the safety of which a street railway company is responsible, when used by passengers as a place to alight.

2. Plaintiff, a passenger on a street car, alighted at night from the "sidewalk side" of a car and was injured by stepping into a gutter between the car track and the sidewalk, which gutter was similar to those ordinarily maintained in streets in country towns. Held, that the conductor of the car was entitled to assume that plaintiff was familiar with the existence of the gutter, and was therefore not guilty of negligence in failing to warn her of its existence.—(Thompson vs. Gardner, W. & F. St. Ry. Co. (two cases), 78 N. E. Rep., 853.)

MICHIGAN.—Property—Ownership—Evidence—Sufficiency—Admissions—Estoppel—Pleading—Appeal—Discretion of Trial Court—Rehearing—Surprise.

1. On an issue as to whether certain rails sold by the president of a street railroad in his individual capacity were the property

of the president or of the corporation, evidence considered, and held to warrant a finding that the rails belonged to the corporation.

2. Where the president of a street railroad company sold certain rails in his individual capacity, and the company sued to restrain the removal of the rails by the purchaser, the fact that that president had included the rails in a memorandum of assets made by him and furnished to those negotiating to purchase a controlling interest in the road amounted to an admission against him.

3. An equitable estoppel must be pleaded.

4. The Supreme Court will not review the action of the trial court on an application for a rehearing in equity on the ground of surprise by the production of certain evidence and newly discovered evidence relative thereto unless an abuse of discretion clearly appears.—(Saginaw Suburban R. Co. vs. Connelly, 109 N. W. Rep., 677.)

MICHIGAN.—Carriers—Street Railroads—Injury to Passenger—Negligence—Evidence—Damages—Personal Injuries—Excessive Verdict—Witnesses—Credibility—Trial—Instructions—Preponderance of Evidence—View of Premises.

1. Evidence in an action for injury to a passenger on a street car held sufficient to go to the jury on the questions whether he was thrown from the car as it was going round a curve, and whether there was negligence.

2. In an action for personal injury, resulting in a person in perfect physical and mental health becoming a physical and mental wreck, a verdict for \$17,000, which testimony tended to show was not in excess of the present worth of his earnings based on his expectancy of life, is not excessive.

3. Witnesses for plaintiff having testified that plaintiff offered them a suit of clothes if they would testify in his behalf, plaintiff may show by his testimony and that of such witnesses that he did not attempt to influence them to tell anything but the truth, and that such promises had not affected their testimony.

4. To instruct that the number of witnesses has nothing to do with the case in the determination of the question of preponderance of the evidence is error.

5. The refusal of the court, in an action for injury to a passenger claimed to have been thrown from a street car as it was rounding a curve, to direct a view of the premises, and to accept an offer "to take the court and the jury on that curve and arrange to make, with the court and jury, the turn of the curve on that car," is in the discretion of the court.—(Dupuis vs. Saginaw Valley Traction Co., 109 N. W. Rep., 413.)

MISSISSIPPI.—Nuisance—Action for Damages—Question for Jury—Exercise of Legal Rights—Eminent Domain—Injury to Property not Taken—Damages—Invasion by Smoke—Defenses.

1. In an action for damages to plaintiff's property, resulting from noise, smoke and cinders, where the evidence showed that the property of plaintiff was damaged in the manner alleged by the plants of defendant and by a railroad company, it should have been left to the jury to determine defendant's liability.

2. Where a corporation, in operating a plant, maintains a nuisance, damaging private property, it cannot claim exemption from liability because it is operating under public authority conferring the right to conduct its business.

3. Const. Sec. 17, providing for compensation to be first made in a manner to be provided by law, while intended for formal condemnation proceedings, is equally protective of the owner of private property, when no condemnation is had and his property is damaged by public use.

4. Due compensation is what will make the owner whole pecuniarily for appropriating or injuring his property by any invasion of it cognizable by the senses, or by interference with some right in relation to the property, whereby its market value is lessened as the direct result of the public use.

5. Though people live in cities, they are entitled to enjoy their homes free from damaging results by smoke, soot, and cinders, sufficient to depreciate the value of their property, in addition to rendering their occupancy uncomfortable.

6. If the damage to plaintiff's property from the nuisance complained of was not caused by the plant of defendant since it acquired it, but before, and there has been no continuing cause of damage, whereby depreciation of value has been maintained, there is no liability; but if damage was done during former ownership, and the cause is continued, whereby the restoration of value has been prevented, the fact of the former damage is no defense.—(King vs. Vicksburg Ry. & Light Co., 42 S. Rep., 204.)

MISSOURI.—Street Railroads—Operation—Negligence—Contributory Negligence—Question for Jury.

1. The running of a street car at a speed of 20 miles an hour without warning signals as it neared a street crossing was negligence.

2. Plaintiff approaching a street railroad track at a crossing saw a car approaching the crossing at a distance of 450 ft., and, though his wagon could not cross and pass beyond danger of collision in less than from 40 to 45 ft., drove on the track without giving further attention to the car. Held, in an action for injuries sustained in a collision, that he was guilty of contributory negligence.

3. In an action for injuries sustained in a collision between plaintiff's vehicle and a car, held a question for the jury whether defendant was negligent under the "humanitarian" doctrine.—(Cole vs. Metropolitan St. Ry. Co., 97 S. W. Rep., 555.)

MISSOURI.—Street Railways—Control and Operation—Collision with Animals—Negligence—Evidence—Sufficiency—Question for Jury.

1. In an action for the killing of horses by being struck by a street car, positive testimony of several witnesses that there was no signal light burning on the car is not to be set aside merely because the motorman swore to the contrary.

2. In an action for the killing of horses through being struck by a street car, evidence examined, and held sufficient to take to the jury the question as to whether the car could have been stopped after the motorman could have discovered the wagon on the track.—(Cross vs. St. Louis Transit Co., 97 S. W. Rep., 183.)

MISSOURI. — Carriers — Street Railways — Contracts — Breach—Regulation Routeing Cars—Ordinances.

1. At an intersecting street, plaintiff, a passenger, was offered a transfer to another car, which was at hand, ready to carry him to his destination, four blocks north, but plaintiff refused the transfer, stating that if he had known the car was not going to his place of destination, as indicated thereon, before he boarded it, he would have taken another car; the car being transferred en route to another track in order to make up lost time. Held, that there was no actionable breach of the carrier's contract to transport plaintiff to destination.

2. St. Louis city ordinance No. 21,113, Sec. 1760 D. legalized the routeing of cars on defendant's street car line, in existence Aug. 28, 1902, and provided that no change of the routeing should be thereafter made without the written consent of the Mayor, president of the Council, and supervisor of street railways. It also provided that a car should not be turned from its established route except in cases of unavoidable accident or when according to schedule, it was about to be turned into a car house. Held, that such ordinance did not prohibit the diversion of a car from its regular route for the purpose of making up time that had been unavoidably lost, to restore it to schedule, and get the usual space ahead of the car that was following, though it necessitated a transfer of passengers.—(Dryden vs. St. Louis Transit Co., 96 S. W. Rep., 1044.)

MISSOURI. — Carriers — Passengers — Injuries — Negligence—Evidence—Presumption—Question for Jury—Admissibility.

1. In an action against a street railway by a passenger for injuries received through being struck by a missile thrown by a bystander, no presumption of negligence on the part of the defendant arises from the mere fact of the injury.

2. In an action against a street railway by a passenger for injuries received by being struck by a missile thrown by a bystander, plaintiff testified that he was seated near the front of the car, and that as the car approached the corner, where by ordinance it was required to stop, he saw a man standing between the tracks, making violent motions with something in his hands. His next recollection was of transactions after the injury. Another witness testified to seeing some one throw a missile through the front vestibule of the car. Held insufficient to take to the jury the question of the company's negligence.

3. In an action against a street railway by a passenger for injuries received through being struck by a missile thrown by a bystander near a street corner, where the car was by ordinance required to stop, plaintiff's evidence, offered to show prior assaults on the car for failure to stop at such corner, was not so framed as to exclude sporadic assaults occurring during a period of years, or as to show a frequent occurrence thereof, indicating future repetition. Held properly rejected as too indefinite and not bringing home to the company facts indicating danger to its passengers.—(Woas vs. St. Louis Transit Co., 96 S. W. Rep., 1017.)

MONTANA.—Appeal—Harmless Error—Exclusion of Evidence—Subsequent Admission—Judgment—Conformity to Verdict—Amount—Interest.

1. In a proceeding for the condemnation of a right of way across a mining claim, plaintiff offered in evidence a written offer made by it to construct a tramway across the right of way for the better working of the claim. Subsequently the manager of plaintiff testified, without objection, to the same offer, in substance, as well as to an offer to do other work, preventing damage to the right of way. Held, that any error in excluding the written offer was harmless.

2. Code Civ. Proc., Sec. 1102, provides that, when a verdict is found in an action for the recovery of money, "the jury must also find the amount of the recovery." In a proceeding for the condemnation of land the jury were instructed to find damages as of the date of the summons, and to allow interest thereon from the time of the actual occupation of the property by the railway. The verdict found specific sums for specific items of damage, and concluded, "the total amount awarded to the answering defendants being \$1,200." Held, that the court was not justified in rendering judgment for such sum, with interest from the date of the occupation.—(Butte Electric Ry. Co. vs. Matthews et al., 87 Pac. Rep., 460.)

NEBRASKA.—Carriers—Injury to Passenger—Negligence—Burden of Proof—Shifting of Burden—Instructions.

1. In an action for damages against a street railway company for a personal injury caused by the alleged negligent starting of one of its cars when the plaintiff, a passenger, was in the act of alighting, the defense being a general or special denial, the burden of proof never shifts, but remains with the plaintiff to prove that the injury was received substantially as alleged.

2. When, in an action for damages for a personal injury inflicted while the plaintiff, a passenger, was in the act of alighting from a street railway car, the evidence is conflicting as to where the plaintiff alighted, an instruction that "plaintiff became a passenger of the company, and continued to be its passenger up to and including the act of alighting at his proper stopping place" is erroneous.—(Lincoln Traction Co. vs. Brookover, 109 N. W. Rep., 168.)

NEW YORK.—Master and Servant—Injuries to Servant—Negligence—Safe Place to Work—Evidence.

1. Deceased was killed by being thrown from a hanging scaffold under an elevated railroad structure, by a collision between a truck and the scaffold. The scaffold was suspended from the elevated structure only a short distance above the tops of the surface cars, and it was impossible for men to work thereon and keep watch for approaching vehicles. Held, that the elevated railroad company was guilty of negligence in failing to provide a watchman to warn approaching vehicles of the scaffold.

2. Where intestate was thrown from a suspended scaffold underneath an elevated railroad by a collision between a truck and the scaffold, evidence of the truck driver that he had no notice of the scaffold either before or after the accident, that he had no warning not to proceed, that no person signaled to him, and that he did not see any watchman there on that day, was sufficient to justify a finding that no watchman had been provided.—(Sheridan vs. Interborough Rapid Transit Co. et al., 190 N. Y. Sup., 821.)

OHIO.—Carriers—Injury to Passengers—Contributory Negligence—Instructions.

1. A carrier of passengers is bound to exercise the utmost practicable care and diligence to secure the safety of the passenger, but a duty of reasonable care for his own safety as well rests upon the passenger himself.

2. It is negligence, as matter of law, for a passenger traveling on a rapidly moving railroad car to intentionally and needlessly project his arm, or a part thereof, out of the window of the car.

3. In a suit against an interurban electric railway company for injury to a passenger by reason of his arm being struck by a car passing upon an adjoining track, it is not error for the court to instruct the jury that if they find that there were four iron bars extending horizontally across the window of the car, equally distant from each other, the top one approximately 12 ins. from the window sill, and that plaintiff while sitting in the car permitted his arm, or any part thereof, to extend or project out beyond or over the rods, and that said act directly contributed to the accident, the plaintiff would be guilty of contributory negligence and cannot recover.—(Interurban Ry. & Terminal Co. et al. vs. Hancock, 78 N. E. Rep., 963.)

TEXAS.—Street Railroads—Injuries to Travelers—Care Required—Action—Instruction.

In an action for injuries to a traveler caused by a street car striking his wagon from the rear, an instruction that it was the motorman's duty to use care to look on each side of his car to see that no persons were about to get on the track, and that no conditions or circumstances presented themselves which would evidently compel persons then in his view passing along the street to go on the track in front of the car, was erroneous, as imposing on defendant a greater burden than the law required.—(Metropolitan St. Ry. Co. vs. Kirkpatrick, 94 S. W. Rep., 1092.)

TEXAS.—Carriers—Injury to Passenger—Evidence—Admissibility—Instructions—Contributory Negligence.

1. In an action against a street railway for injuries to a passenger who jumped from a car while riding on the front platform, it was error to permit the conductor and motorman to testify that they had no idea that, if a horse fell down in front of the car, the passenger would become frightened and jump off, and that no one had ever told them or said anything to them to make them believe she would do so.

2. In an action against a street railway for injuries to a passenger, evidence that the car was going "very fast" and "mighty fast" was sufficient to render it error to exclude an ordinance limiting the rate of speed of a street car to 7 miles an hour.

3. In an action against a street railway for injuries to a passenger, an instruction that defendant owed the duty "to exercise that high degree of care for the reasonable personal safety of passengers which a prudent person would use," etc., was improper by reason of the use of the word "reasonable."

4. In an action against a street railway for injuries to a passenger who was riding on the front platform, and, becoming frightened, jumped from the car, it was proper to submit to the jury the question of the passenger's contributory negligence in taking a position on the front platform.

5. In an action against a street railway for injuries to a passenger who jumped from a car while riding on the front platform, the court instructed for plaintiff, if the motorman ought reasonably to have anticipated that as a result of his negligence, if any, there was danger of the passengers becoming so frightened as to jump from the car. In another paragraph the jury were authorized to find for plaintiff, if they found defendant guilty of negligence in maintaining its track in the condition alleged, and if they believed that it ought reasonably to have been anticipated by the defendant that such an injury to some passenger on some of its cars might probably result as a consequence. Another paragraph stated that, if a very prudent and competent person, exercising the degree of care owed by the defendant, could not reasonably have anticipated that an injury to a passenger on a car, occasioned as plaintiff's injury was occasioned, might result as a consequence of such negligence, they should find for defendant. After receiving the charge the jury asked the court whether "reasonable anticipation" referred only to the particular accident or generally to all accidents that might occur to those riding on the front of a car, and whether it referred to both the motorman and management, or to only one and which, to which the court replied that, even though the jury should find that the agents of defendant charged with maintaining the track were negligent, yet, if they further believed that if a very prudent and competent person charged with the same duty and exercising the degree of care owed by defendant could not reasonably have anticipated that, as a result of the negligence, a horse might fall in the street, etc., and a passenger jump from the car, a verdict could not be returned for plaintiff. Held, that the instructions were erroneous as on the weight of the evidence, as giving undue prominence to the fact that defendant must have been able to anticipate the accident before it would be liable, and in that the jury were probably led to believe that, before defendant would be liable, the motorman must have anticipated the precise injury and person to whom it would have happened.—(Moore vs. Northern Texas Traction Co., 95 S. W. Rep., 652.)

VIRGINIA.—Street Railroads—Injuries to Person on Track—Contributory Negligence—Evidence—Sufficiency—Trial—Reasoning Case After Close of Evidence.

1. In an action for injuries to one struck by a car while walking on the track, the court instructed that, if persons generally walked on the track at that point it was the duty of defendant to exercise reasonable care to discover persons so using the track, and that if defendant's servants, in the exercise of a proper lookout, failed to observe plaintiff's persistence in remaining on the

track, and did not then exercise all reasonable care to avoid an accident, defendant was liable. Held that the instruction was erroneous, because if defendant's servants exercised proper care they had discharged defendant's duty, and it was not liable, though plaintiff's presence was not observed.

2. The court instructed that if the injury was caused by the negligence of defendant's servants and without any greater want of ordinary care and caution on the part of the plaintiff than was reasonably to be expected of him under the circumstances, plaintiff was entitled to recover. Held, that the instruction was erroneous, since if plaintiff failed to exercise that ordinary care and caution to be expected of him under the circumstances, and such want of care contributed to the injury he was not entitled to recover.

3. In an action against a street railway for injuries to one struck by a car while walking on the track in the nighttime, evidence considered, and held insufficient to warrant a finding of a failure of proper care to furnish necessary lights on the car.

4. The evidence for both parties having been closed there was no error in refusing to permit plaintiff to offer witnesses to prove facts concerning his case in chief, where it did not appear that the witnesses had been absent or ill, or that there was any surprise, accident or mistake.—(Wilkie vs. Richmond Traction Co., 54 S. E. Rep., 43.)

WASHINGTON.—Carriers—Injuries to Passenger—Negligence.

Where a person reached the rear platform of a street car, and attempted to board it after the signal to start had been given, and, failing to board, received the injuries complained of, the company was not guilty of negligence, where the conductor was at his proper station, and did not see before the car was started that the person intended to board it.—(Woodman et al. vs. Seattle Electric Co., 85 Pac. Rep., 23.)

WASHINGTON. — Appeal — Instructions — Argumentative Language—Harmless Error—Trial—Weight of Evidence—Damages—Personal Injuries—Future Medical Treatment—Impairment of Mental Faculties.

1. Where, in an action for injuries to a passenger, the jury saw plaintiff, knew his exact condition, heard him testify, etc., defendant was not prejudiced by an argumentative instruction that if a corporation injures a person so as to make him an object of pity to his fellow men and an object of ridicule to the thoughtless and unfeeling, and deprives him of the comfort and companionship of his fellows, defendant should respond in damages, etc.

2. Where a complaint for injuries to a passenger alleged damages for medical services incurred in the sum of \$100 and for loss of earnings in the sum of \$450, instructions that the jury, if warranted by the evidence, might allow damages to plaintiff for medical services for which he had become liable, or had obligated himself in an amount not exceeding \$100, and, if warranted by the evidence, might allow damages for loss of time not exceeding \$450, merely limited the recovery to the amount alleged, and were not erroneous as an intimation that there was evidence sufficient to warrant a finding for the amount stated for medical services and loss of earnings.

3. Where a number if not all the physicians testified that it might be, or probably would be, necessary for plaintiff to have further medical treatment, the court was justified in permitting the jury to make an allowance to plaintiff for probable future expenses for necessary medical treatment.

4. Where there was evidence both of a permanent impairment of plaintiff's health and also of an impairment of his mind, evidencing a lack of mental vigor and inability to give intelligent, successful, and conservative attention to his business, which he had never experienced prior to the accident, and evidence that plaintiff might not ever fully recover, it was not error for the court to permit the jury to award damages as for the permanent impairment of plaintiff's mind.—(Cole vs. Seattle R. & S. Ry. Co., 85 Pac. Rep., 3.)

As an inducement to its employees to save money, the Columbus Railway & Light Company this year presented them with pass books on the Ohio Trust Company and the Citizens' Savings Bank, in the way of Christmas presents, \$1 being credited upon those of the single and \$2 on those of the married men. Accompanying the books was a letter in which it was stated that the company has no desire to impose an obligation upon the men to keep these accounts up, and if they prefer they may present the books and get the money. It is hoped, however, that all will keep them and keep up a savings account.

LONDON LETTER

Two important electric traction events took place in the metropolis last month, one being the opening of the newest underground electric railway and the other the opening of the London County Council tramways across Westminster Bridge and along the embankment to Blackfriars Bridge. The underground line, which has been recently opened, is another of the Yerkes group and is known as the Great Northern, Piccadilly & Brompton Railway. Probably it will soon receive a contracted name in the same way as the Baker Street & Waterloo Railway has been contracted into the "Bakerloo." The route of the new line and its equipment are described elsewhere in this issue.

While on the subject of tunnel railways, it may be of interest to note that there appears to be a strong effort at present to revive interest in the construction of a tunnel between England and France, from Dover to Calais. It is interesting that the scheme is backed on the one hand by the London, Chatham & Dover Railway, so far as the English portion of it is concerned, and by the Chemin de Fer du Nord, and a powerful body of French financiers, on the other. A great deal is at present appearing in the daily press regarding the scheme, which would entail an expenditure of about £16,000,000. There is nothing new in the idea, as it has been promulgated in previous years, but although a good deal of money was spent and some boring done, the plan was ultimately abandoned. Now that the entente cordiale between England and France is so assured, more determined efforts are being made to place the scheme in such a position that Parliamentary powers will be asked for it in an early session. The military fears are ridiculed by the backers of the proposition. Some of the greatest engineers in Great Britain and France are perfectly satisfied that the construction of such a tunnel is quite possible, and with the greatly enhanced experience of boring tunnels during the last twenty years, no insuperable difficulties are expected to occur. Such a tunnel would undoubtedly be extremely useful and would shorten the journey between London and Paris considerably. Baron Emile d'Erlanger, the chairman of the company, is quite confident that not only is the scheme practicable, but that it will be a paying one, and, in fact, figures out a handsome dividend even on the common stock.

It has been decided to make a strong effort to increase the importance and influence of the Tramway and Light Railways Association. Although an attempt at the consolidation of this association with the other two existing associations has proved futile, it is hoped that individual members of the other two associations will join this association. It is proposed to enlarge the membership considerably, and increase the annual subscription to two guineas. New offices have been taken at 35 Parliament Street, Westminster, and Mr. Benedict, who has for several years been the secretary of the association, has now retired in favor of a younger man. The Duke of Argyll has consented to be president of the association in future, and vice-presidents for the ensuing year will be as follows: Lord Vaux, of Harrowden; Lord Armstrong, Sir Joseph Baxter Ellis, Sir J. Clifton-Robinson, Sir Charles Petrie, Sir Charles Rivers-Wilson (past president), L. A. Atherley-Jones, Esq., K. C., M. P. (past president). The association has done considerable useful work in the past, and with the broadening out of its lines and the introduction of these influential men as officers it will undoubtedly enter on a much more useful career.

As stated at the beginning of this letter, the opening of the tramways on the Victoria Embankment has formed another important item in the progress of the London County Council in equipping London with a convenient service of electric tramways. As hinted from time to time in these columns, the battle for permission to run tramways on the Embankment has extended over a period of many years. It was only a few months ago that the Royal consent was given to the scheme which had been passed by the House of Lords and the House of Commons. The first electric car across Westminster Bridge, continuing along the Embankment, performed its triumphant career only a few days ago, or rather a few nights ago, as it was just on the hour of 11 o'clock at night that the special trip was made. John Burns was specially prominent, and he was accompanied by Sir J. W. Benn, Dr. Macnamara, J. Allen Baker, J. Gilbert, Mr. Fell, the tramway manager, and a large party of friends. The trip from the south side of Westminster Bridge to the end of the route on the Embankment and back was successfully

performed amidst many congratulations by all present. The system has now been inspected by Colonel Yorke, of the Board of Trade, and the route thrown open to the public.

Already much patronage has been accorded to the new line, though it would appear that without the connecting link of Blackfriars Bridge, which will not be opened for about three years, there are almost too many cars on the Embankment. Without giving the matter very serious consideration one would think that it would not be necessary for the cars which go to the eastern portions of London, such as the Tower Bridge, Woolwich, etc., to come across Westminster Bridge or along the Embankment. No doubt this correction will be made in due time, as undoubtedly the eastern portion of the Embankment does not afford sufficient traffic for all these cars, and a quicker way of getting home can be secured than traveling by this circuitous route. The cars are undoubtedly, however, filling a long-felt want, and when the whole scheme is completed, will prove a huge success so far as convenience for the public is concerned. In the meantime, it is interesting to note that the City Corporation has just granted the contract to Sir Wm. Arrol & Company for the widening of Blackfriars Bridge at the cost of about £200,000. Wm. Arrol & Company are well known as the contractors for the Forth Bridge, the Tay Bridge and the Tower Bridge, as well as many other important engineering structures, so that the work could not be in better hands. The opening of Westminster Bridge and the Embankment will afford tremendous relief at the southern end of Westminster Bridge, where, since the opening of the electric tramways a few years ago, a state of severe congestion has existed. Instead of having to shunt at the end of the bridge, the cars will continue on their way across Westminster Bridge and up the Embankment, so that the dead end of Westminster Bridge will be entirely eliminated. The shunting will, of course, have to be done elsewhere, but on the Embankment, near Blackfriars Bridge, there is ample room for this work. When Blackfriars Bridge is opened, the formation of the circular route will make the work considerably easier. Other work in connection with the London County Council tramways is proceeding apace, and on the northern side the tramways from Clerkenwell to Poplar are almost finished, and many new cars have already been ordered for use on this service when completed. The work in the St. Pancras district will also be commenced before long, although the borough of St. Pancras is putting much trouble in the way of the London County Council by insisting upon the underground conduit instead of the overhead system as proposed by the London County Council.

With regard to the large power scheme of the London County Council, referred to frequently in these columns, there does not appear to be much to add to what has been said already, except the fact that the electric supply bill, which has been prepared by the Parliamentary Committee for introduction to the House of Lords in the next session, has now received the formal approval of the London County Council. One new feature has, however, become apparent, that the bill has been so drafted as to leave it open to the London County Council to decide what to do with these powers when secured, so that the discussion as to whether the Council, should it obtain these powers, should work this tremendous scheme as a whole, or endeavor to augment the facilities, which at present exist, does not now come up. In a few words, the object of the bill is to supply electrical energy in the County of London, in certain parts of Essex, Kent, Surrey and Middlesex; an outlay of four and a half million pounds spread over seven years will be necessary, and the acquisition of the electrical undertakings of the metropolitan borough councils within five years from the passing of the bill, and of the undertakings of the private companies in the year 1931.

This bill, of course, will not go unopposed, as the various private electric supply companies in London have joined issue in the matter, and will promulgate a bill in Parliament themselves to try and secure practically the same rights as asked for by the London County Council bill. The Administrative County Company, whose bill was defeated last year in Parliament, also intends to offer a new bill, but has altered its condition. It is now seeking to secure powers to produce electricity in bulk and to sell to the existing borough councils. The whole subject, therefore, is an extremely interesting one, and it remains to be seen what Parliament will do with it. The solution is undoubtedly difficult, and with the London County Council elections, which take place next year, it seems

almost impossible to know what will be the ultimate result.

Arthur Ellis, electrical engineer and tramways manager of the Cardiff City Council, recently prepared a report on the applications made by private companies for the privilege of running motor omnibuses in Cardiff. Naturally, Mr. Ellis brings strong arguments to bear on the vital importance of preventing outside motor omnibus companies from being granted any privileges for running in the streets of the city, where there are already good tramway facilities. He would not object, however, so much to private companies being permitted to operate on the outside suburbs, provided that they would work in conjunction with the tramway department, and act as feeders to the tramway system. Should the Council not approve of that plan, he suggests that the corporation should buy a limited number of buses to put on certain approved routes in the outlying districts. The Council has the report under consideration, and it is not at all likely that privileges will be granted to outside omnibus companies for the present, except in a very limited degree on the outskirts. As the scheme of providing twelve or fifteen motor omnibuses to be operated by the Council itself involves a considerable sum, it is doubtful whether this plan will be adopted either. The whole thing is interesting, however, as showing the determined attack of motor omnibus companies, and also the opposition of corporation officials to interference with their existing rights.

The Manchester tramways committee has not yet satisfied its men by the revised system of carrying parcels, and objections have been placed before the committee by the general secretary of the tramway men's union. This official writes that it is not fair to cast responsibility for the parcels upon conductors of ordinary tram cars, who certainly have already enough to do. The cars are not made for parcels and at busy hours of the day there is hardly sufficient room for passengers without providing room for parcels. If the parcel delivery business was maintained, punctuality could not be ensured, and it is easy to imagine that parcels left on the platform could easily be lost, damaged or stolen while the conductor was collecting fares on the top of the car. He maintained that the proper method of handling a parcels carrying system would be by having special cars for the purpose managed by special men. The subject is still under consideration by the committee.

The Birmingham Corporation has now opened another of its electric tramway routes, which has been constructed for some time. This route commences in Albert Square and proceeds to Bordesley Green. It is about $2\frac{1}{2}$ miles long. The contractors for the new line were Sir John Aird & Company, and for the overhead equipment, Dick, Kerr & Company.

At the last half-yearly meeting of the London & North-Western Railway brief details were given of the new electric line, which this company proposes to construct from Euston to Watford. A Parliamentary notice is now published of a bill for next session to enable the company to carry out this and other works. Starting from beneath the present terminus at Euston, the new railway will run below the existing main line until open country is reached at Kilburn, and for the remainder of the distance will be formed partly by widening the existing way and partly by the construction of an independent route alongside. The total distance will be about 16 miles. The trains on the new railway are doubtless expected to yield a return sufficient to pay interest on the capital expended, but quite as important is the fact that the main line will be freed from suburban and local traffic, and can be wholly devoted to long-distance trains, whether passenger, goods, or mineral.

A scheme for the electrification of the Central Railway has been suggested to the Isle of Wight County Council. In a report to the Council the Parliamentary and railway committee, which had under consideration the proposal that the Council should acquire and work the railways, urged that any plan which would be calculated to improve the existing state of affairs as regarded the railways should receive every support.

At a recent meeting of the tramways committee of the Newcastle Corporation, a discussion took place regarding the system adopted since the inauguration of the tramways of dividing amongst the tramway employees the proceeds of the annual sale of articles left in tramcars. It was ultimately decided to put a stop to the practice, and further discussion will take place to decide what shall be done with the money realized.

The possibilities of a through service of tramcars between Leeds and Bradford have, it is thought, been brought nearer realization by an invention of Mr. Spencer, the manager of the Bradford Tramways, and Dr. Dawson, assistant engineer. The

invention is an extensible axle truck, and it is claimed for it that it overcomes the difficulty caused by the different gages of the rails of the Leeds and Bradford systems. A trial truck has been fitted at the Thornbury Tramway works, where a special track has been laid down for trial runs. Here the 4-ft. rails of the Bradford tramways are gradually extended until each rail is moved outward $4\frac{1}{4}$ ins. and the track thus becomes the 4-ft. $8\frac{1}{2}$ -in. gage of the Leeds tramways. This changing from 4 ft. to 4 ft. $8\frac{1}{2}$ ins. is effected in a distance of about three yards in the trial track in the sheds, and the truck runs over it in an extremely easy and smooth fashion.

Leyton recently inaugurated an important system of municipal electric tramways, the total amount expended on which is £300,000, of which nearly one-third went towards purchasing the rights of the two tramway companies in the district. Arrangements have been made for inter-communication with the West Ham tramway, and the effect of this will be that people will be able to board a train at Bow Bridge, which is the eastern extremity of the metropolis, and ride direct to Clapton and the fringe of Epping Forest. When linked up with the Waltham-Finsbury Park and new Southgate.

Sir Francis Cory-Wright, chairman of the light railways committee of the Middlesex County Council, recently opened the new electric tramway from Wood-Green to New Southgate by driving the first car over a portion of the route. Representatives of the county and local authorities were present. Wood-Green has now direct tramway communication with Tottenham, Finsbury Park and new Southgate; and the Enfield line is being laid.

It is rumored that the Liverpool overhead railway will probably be absorbed before long by the Lancashire & Yorkshire Railway Company. The company dates from 1888, when it was incorporated to construct the overhead railway authorized by the Mersey Docks and Harbor Board Acts, and further extensions were authorized four years later, the railway now being worked by electricity. Never a very great financial success, the severe competition of the Liverpool Corporation Tramways has gradually reduced its earning powers till for the past two years no dividend has been paid on the common stock.

A. C. S.

WAGE INCREASE ON P. S. C.

Announcement was made last week of the general increase in the wages of the motormen and conductors in the employ of the Public Service Corporation of New Jersey, the increase to date from Jan. 1. A general circular, issued over the signatures of President McCarter and General Superintendent Stanley, announced the change. This circular follows:

North Jersey Street Railway Company; Jersey City, Hoboken & Paterson Street Railway Company; Public Service Corporation of New Jersey (lessee).

Office of the General Superintendent.

Bulletin Order No. 1358.

December 27, 1906.

To Motormen and Conductors:

The board of directors has this date authorized the following rates of wages for motormen and conductors, to take effect Jan. 1, 1907:

Grade 1. Motormen and conductors who have been continuously in the service over ten (10) years will receive twenty-three (23) cents per hour.

Grade 2. Motormen and conductors who have been continuously in the service five (5) years and up to ten (10) years will receive twenty-two (22) cents per hour.

Grade 3. Motormen and conductors who have been continuously in the service one (1) year and up to five (5) years will receive twenty-one (21) cents per hour.

Grade 4. Motormen and conductors in service up to one (1) year will receive twenty (20) cents per hour.

This increase is made with the belief that this substantial way of recognizing meritorious service will result in motormen and conductors using their best endeavors to perform their duties toward the public and the company courteously, honestly and efficiently, and that the best possible class of labor will be encouraged to enter and remain in the service.

Approved:

(Signed) Thos. N. McCarter, President.

(Signed) Albert H. Stanley, General Superintendent.

SOUTHERN PACIFIC ELECTRICAL PLANS

General Manager Calvin, of the Southern Pacific Company, has given out the following statement concerning the proposed electrical work on the east side of San Francisco Bay: "The contracts have been let for the electrification of the local roads to the Fourteenth Street terminal in Oakland from the end of the Alameda Mole, and also to the High Street terminal in Alameda and the present terminal at Melrose, and for the construction of an electric power house in the triangle formed by the parting of the Alameda and the Oakland and Melrose tracks at Alameda Point, where the round-house and turntable are now standing. It is our intention to change the Seventh Street local and the other local lines from the Oakland pier, so as to also be operated by electric power, as soon as we get through with the electrification of the local system starting from the Alameda Mole. The contracts which we have given out for the latter purpose involve an expenditure of \$1,881,600. The cars are being constructed in the East. Everything is being rushed to a finish, and as soon as the equipment is ready for service these lines will be operated exclusively by electric power.

"We expect that the new lines will be in operation in July or at the latest in August next. The tracks now used by steam traction will be used by trains propelled by electric motive power. The report that the Webster Street track in this city would be abandoned from Second to Fourteenth Street and diverted on Franklin Street, is incorrect. All that needs to be changed on the present Webster Street track is the bonding of the rails to fit them for electric operation, and a large part of that has already been done for the operation of the block signal system now in use. Our plans regarding the future use of the terminal property at Fourteenth Street and Franklin have not yet been completed, and it would be premature to say anything about them, for we do not desire in any of the changes anticipated to be made to misinform and mislead the public. As to the reports that we intend to extend the electric railway system along Franklin to Twentieth Street, I may say that it is premature. Nothing has been yet decided about the extension of the system from Franklin and Fourteenth."

The Southern Pacific Company has filed an application with the War Department for permission to widen the Oakland Mole from its present area of 50 acres, by making a fill, which will increase the surface area by 27 additional acres. This application has been sent by the authorities at Washington to the United States Harbor Line Board, at San Francisco, for a report on its advisability. Maj. William Hart, of the engineer corps, has called a meeting, to be held Jan. 8, at the rooms of the California Promotion Committee, for the public consideration of this application. Some time ago the Key Route people made a request to the War Department for permission to build a mole and fill in a large tract on the water front for the construction of an extensive mole and basin for foreign ships. This application was denied on the ground that the proposed fill would interfere with the tidal currents, but permission was granted to the Key Route people to build a mole and ship basin on concrete piers, and that company will proceed with the construction on these lines.

OHIO QUESTIONS SETTLED BY RAILROAD COMMISSION AND COURTS

Two rulings by the Ohio Railroad Commission and a decision by the Ohio Supreme Court have set at rest questions that have frequently bothered traffic and operating officials of the electric railway systems of the State. The rulings of the Railway Commission are the outgrowth of the recent informal conference held by the Commission with the executive heads of the Ohio traction lines.

At this meeting the Commission was asked if the law relative to the issuance of special rates and free transportation was applicable to interurban roads as well as steam roads, and the Commission replied that it was. The commission was then requested to make a ruling on this subject that would serve to relieve the traction officials of embarrassment, when they are called upon to refuse free transportation. One of the rulings just announced is in response to this request.

It states specifically that the law relating to the issuance of special rates and free transportation, governs all classes of railroads, electric as well as steam, and fines for the violation of these provisions can reach as high as \$10,000 for each case. The

ruling also requires the traction lines of the State to file a report with the Commission by the first Monday in February of each year, showing all passes, mileage books and transportation issued at other than regular rates.

This ruling will assist many of the electric lines of the State to drop a large free list. These lists include many passes that were issued incident to the promotion and construction of the various roads, and the officials have been unable to annul them. In the future the traction lines will not be able to furnish transportation legally to any but those designated in the law as follows: Employees and their dependents, officials of the companies and their families, officials of other railroad companies in exchange for like favors, ministers of the gospel, agents of incorporated colleges and charitable societies, when traveling on the business of such colleges or societies, destitute and homeless persons and for an attendant in the case of live stock shipments.

The other ruling of the commission was on a question, also discussed at the conference with the traction officials, relating to the proper caution to be taken by traction companies at steam road crossings. The order requires that all cars must be stopped at least 10 ft., and not more than 50 ft., from the crossings, while the conductor or some other trainman goes ahead and makes sure the track is clear. The conductor or trainman is ordered to make certain that all is right before he signals the car to go ahead. The managements of the traction companies are directed to see that this order is rigidly obeyed, and to have printed copies of it conspicuously displayed in every car.

During the discussion of this question at the conference it was discovered that widely divergent rules on this subject were in effect on the various roads of the State, and it was deemed advisable to have a uniform rule governing this vital feature of operation. The rules of some roads required the stops to be made 100 ft. from the crossing, others designated 50 ft., while still others designated no distance at all, leaving that to the judgment of the men in operation of the cars. The Commission holds that 100 ft. is too far away to stop, as a clear track could easily be obstructed while the car was making the distance. On the other hand, it holds that the car should stop at least 10 ft. from the crossing. Before issuing the above order the members of the Commission personally investigated the working of the rules in effect by watching various crossings at Dayton and other points. They all said they found the rules, if any existed, obeyed in a very lax manner.

The decision of the Supreme Court of Ohio was that interurban roads, whose franchises provide for the sale of round-trip tickets, must sell round-trip tickets on the cars as well as at the stations. The decision was in the case brought by the prosecuting attorney of Stark County against the Canton-Akron Traction Company, which decided some time ago to withdraw from sale on cars all round-trip tickets, and confine such sales to the ticket offices of the company.

NEW ENGLAND STREET RAILWAY CLUB MEETING

Railway signaling was the subject of a paper by Jacob B. Struble, of the Union Switch & Signal Company, at the regular meeting of the New England Street Railway Club on Dec. 27. The larger part of the paper was given to a comprehensive discussion of various systems of manual and block signals as used on steam railroads. President Paul Winsor presided. Mr. Struble described the types of signal mechanism now in use in a broad way, and summarized the important features of semaphors, disc, telegraph block, controlled manual, home, distant and automatic signal practice. The upward inclination of the semaphore arm is being favored by some engineers instead of the downward slant for the safety indication. The track circuit automatic block system is probably the best, all things considered, and with alternating-current differential coils in the track circuit, the two rails can both be used to carry return currents back to the power house. The staff system has a valuable field of usefulness on single tracks where the traffic is not too heavy.

Mr. Struble stated that although many able minds are at work on the problem of signaling for electric interurban railways, an entirely satisfactory system has, in his judgment, not yet been developed. The conditions are so varied with respect to intervals and movements in each direction that it is hard to meet all the requirements and to be sure of positive indications in counting cars in and out of a block. A short discussion favorable to the general use of signals was held at the conclusion of the paper.

CONVENTION OF THE INDIANA ENGINEERING SOCIETY

The final plans are being made for the convention of the Indiana Engineering Society, to be held on Thursday, Friday and Saturday, Jan. 17, 18 and 19, in Indianapolis. The full program of the meeting, however, has not been arranged. The part of it that is now available includes among its papers the following of interest to street railway companies: "Paving Between Street Car Tracks and Rails," by B. T. Jeup, civil engineer, Indianapolis; "Interurban Railway Engineering," by R. P. Woods, chief engineer of the Indianapolis & Western Railway; "Advantages of Electrical Inspection," by R. F. Daniel, chief city inspector for the insurance organizations; "Electric Car Braking," by Prof. R. T. Plumb, Perdue University. Prof. W. F. M. Goss, of Perdue University, also has promised a paper, but the subject of it has not been given out. The social features of the convention include a banquet, smoker and entertainment tendered to the out-of-town members by those resident in Indianapolis, also an excursion to points of interest if time can be found for it on the program. The banquet will be given the first evening of the convention. The society includes among its members civil, mechanical, electrical, mining and chemical engineers in all their various sub-divisions. Charles Carroll Brown, 408 Commercial Club Building, Indianapolis, Ind., is secretary of the society.

TRANSIT AFFAIRS IN NEW YORK

John B. McDonald, the contractor for the New York subway, has submitted to the Rapid Transit Commission a plan for a loop to connect the Brooklyn, Williamsburg and Manhattan bridges and land passengers from Brooklyn in the financial district by running a two-track subway down Nassau Street to Water Street. In submitting the plan Mr. McDonald said he would guarantee that it would prove to be a thoroughly practical operating system. He said that it would cost about \$10,000,000, and would obviate the necessity of building one of the longer routes. He said that it would take the place of one of the routes the building of which would cost about \$25,000,000. It is understood that the Belmont interests are backing Mr. McDonald. Controller Metz objected to the route because in going from Bedford and Flushing Avenues, it crosses in a straight line to the Williamsburg Bridge Plaza, cutting diagonally through residence streets in old Williamsburg. He has asked that the route be changed so as to take it down Bedford Avenue to Division Street, following streets instead of cutting through private property. Mr. McDonald said that the new subway to Brooklyn would carry not more than 20,000 passengers an hour. That, he said, was about the capacity of any two-track system, and that was about what his proposed new two-track loop system would do. Chief Engineer Rice said that probably 85 per cent of the Brooklynites who came to Manhattan did not go above Fourteenth Street, and he thought that the new loop plan would carry a very large traffic.

The important announcement was made last week that the city authorities and the officials of the Pennsylvania Railroad have come to an agreement as to the terms for the franchise to be granted to the Connecting Railroad, this after three and one-half years of discussion. When the company found its progress blocked by the refusal of the Board of Aldermen to grant the franchise except on impossible conditions, the Pennsylvania publicly announced its desire to obtain a fair hearing by legislation taking the franchise-granting power from the Aldermen and placing it in the hands of the Board of Estimate. On Nov. 16 of last year, after the new legislation had become effective, the company renewed its application before the Rapid Transit Commission, accompanying it, as usual, with voluminous accounts of its plans, together with maps, drawings, etc. On March 1 of this year the plans and contract committee made a report of a form of franchise, under which a flat payment of \$100,000 was to be made to the city, together with annual payments of \$25,000 for ten years and \$50,000 for the next fifteen years. At the end of the twenty-five years the rate of the compensation to the city was to be readjusted. Under other clauses of this proposal the company agreed to assume every charge of any nature arising from the carrying out of its plans, thus relieving the city of all expense. The company felt then, and publicly stated, that the annual rates were too high in view of

the great benefit the building of the road would indirectly confer upon the city, and the risk to the company in its undertaking.

The preparatory work, including the permit from the United States Government to build a bridge to span both the Harlem and East River, and the legislative permit to cross Ward's and Randall's Islands, and the purchase of \$2,000,000 of private property for right of way, have all been completed, and plans and specifications are soon to be ready for bidders. The completion of the work will bring Brooklyn and Queens, by way of Greenville and Bay Ridge, and the car ferry between those points, and by means of the bridge over Ward's and Randall's Islands, in direct communication with all parts of the West and South.

Joseph H. Hoadley, former president of the Manhattan Transit Company, has taken title to the property on the north-west corner of Beekman and Water Streets, New York, and announced his intention of turning it over to the Manhattan Transit Company. This gave rise to a report that the company would bid for the right to build and operate the Fourth Avenue (Brooklyn) subway to Fort Hamilton, part of one of the seven routes approved by the Rapid Transit Commissioners and the Board of Estimate. This report Mr. Sheehan later confirmed. In addition to planning the construction of the Fourth Avenue subway the Manhattan Company, according to Mr. Sheehan, is in the field to construct a tunnel under the East River.

IMPORTANT ELECTRIC PROJECTS IN JAPAN OFFER OPPORTUNITIES TO AMERICANS

The early construction of three electric tramways in the northern portion of the Japanese island of Kyushu is under contemplation. The first, to be built from Moji to Kokura, a distance of 8 miles, estimated cost \$350,000; the second, from Moji to Yawata, 12 miles in length, at a cost of \$500,000, and the third, one of 23 miles, between the important towns of Fukuoka and Kokura, at an estimated cost of \$1,250,000 gold. Consul C. B. Harris, of Nagasaki, suggests that American electric and railway supply houses send their catalogues, in the English language, to the Mayor and Chamber of Commerce of the cities of Nagasaki, Moji, Fukuoka, Kokura and Kumamoto, with the request that the catalogues be handed to the projectors of the lines under contemplation.

THE QUESTION OF T-RAILS AT COLUMBUS, OHIO

The question of whether the interurban railway systems entering Columbus, Ohio, shall be allowed to lay T-rails in the city, or be compelled to put up with the grooved rails, will probably be settled in the courts. This is a result of a controversy caused by an attempt on the part of the city engineer to compel the Indiana, Columbus & Eastern Traction Company to replace its T-rails on McDowell Street, an unimproved street, with grooved rails so that the city can proceed with a paving contract.

The matter was threshed out in two open meetings before the Board of Public Service, in which the railway interests were represented by several business and improvement associations of the city and J. L. Adams, general manager of the Western division of the Indiana, Columbus & Eastern, and the advocates of the grooved rail by City Civil Engineer Maetzel and Frederick L. Ford, city engineer of Hartford, Conn., in which city the subject of T-rails was considered in connection with a request for rights from the Consolidated Railway Company. At the close of the second meeting, Mr. Adams handed a written statement to the secretary of the Board of Public Service, which announced that his company refused absolutely to replace the T-rails on McDowell Street with grooved rails.

Fast limited passenger service from Zanesville to Indianapolis has been planned by the Indiana, Columbus & Eastern Company, and to make such a service safe the company will have to put on heavier cars with the standard depth of flange on the wheels, and these flanges cannot be operated over grooved rails. Thus the T-rail controversy is not only an important one to the city of Columbus, but effects improvements and the character of passenger and freight service all over the Schoepf system in Indiana and Ohio.

The company not only agrees to do its part in improving and paving the streets and putting in the special paving blocks next to the T-rail, but is willing to put up a terminal passenger station and make other improvements in Columbus, if its plans are not blocked by the city insisting on the grooved rail.

THE BOSTON TERMINUS OF THE CAMBRIDGE SUBWAY

One of the most important problems at present before the Boston Transit Commission is the determination of the Boston terminus of the new subway to be built soon in Cambridge. It is no easy matter to locate rapid transit routes in any large city, for, however well present needs may be determined, the requirements of the future are always more or less hidden by the uncertainties of urban development. Even larger interests must be taken into account than the immediate desires of operating railway companies and the supposed interests of the populations served. Problems of real estate valuation and depreciation, the concentration of business in the vicinity of important stations, and, above all, the relation of projected to both present and remote future routes must all be considered with great care. Points already favored by an overwhelming traffic are the very ones which every new line or transit desires to reach.

At a hearing recently held by the Boston Transit Commission a strong sentiment was shown in favor of terminating the Boston route of the Cambridge subway at the present Park Street station of the Tremont Street subway, instead of at Scolloy Square as previously suggested. Both the public and the Boston Elevated Railway Company favored the Park Street terminus. The precise route to be followed from the new West Boston Bridge to the present subway depends considerably upon the terminus selected, but the end of the route is the vital point at issue just now. All indications point to the continued use of the Park Street station as one of the principal traffic centers of the city. Traffic at Scolloy Square is now almost as dense as at Park Street during certain hours of the day; this station is nearest the financial district, and is the western terminus of the East Boston tunnel, but there is little evidence that the great majority of Cambridge passengers prefer to enter and leave their trains at any other point than Park Street. The original idea of operating through cars between East Boston and Cambridge via the East Boston tunnel, Scolloy Square and the Cambridge subway, seems to have been set aside as failing to meet any large public desire for transit. The termination of the Cambridge subway at Park Street, presumably in a sub-subway or parallel subway station, with a deep tunnel connection under Beacon Hill with the West Boston Bridge, appears to meet the situation, present and future, better than the old plans. It should be a much less expensive terminus beneath the Common at Park Street than beneath the business blocks and narrow streets adjoining Scolloy Square. The two proposed terminals are but 5 minutes' walk apart, but if the pressure of public need and desires is duly regarded in the light of possible future routes, the Transit Commission will probably decide most wisely if it settles upon Park Street as the terminus of the new Cambridge service.

EXECUTIVE COMMITTEE MEETING OF MANUFACTURERS' ASSOCIATION

A meeting of the executive committee of the American Street and Interurban Railway Manufacturers' Association was held Dec. 28, at 114 Liberty Street, New York City. Those present were Messrs. McGraw, Wharton, Hequembourg, Williams, Wilson, Martin, Garland (representing Mr. King), Evans, Heulings (representing Mr. Brill), Randall, Knickerbocker, Ellicott and Treasurer Baker. The treasurer rendered his report, which showed a balance in the treasury of \$4,049. Upon motion, Mr. Baker was tendered a vote of thanks for his administration of the affairs of the association, and the secretary was instructed to draw a letter to be sent to Mr. Baker, expressing the appreciation of the association for his valuable services. The president then announced that a formal release had been received from all liability in connection with the buildings at the State Fair Grounds at Columbus.

In the election of officers a nominating committee of three, consisting of Messrs. Randall, Knickerbocker and Martin, chairman, was appointed. This committee reported that it had taken a canvass of the members present and reported: James H. McGraw for president, F. C. Randall for vice-president, J. R. Ellicott for treasurer. These gentlemen were unanimously elected to these offices. C. C. Pierce, of Boston, was then unanimously elected chairman of the entertainment committee, and George Keegan was re-elected secretary. An auditing committee of three, consisting of Messrs. Evans, Chairman; Randall and McGraw, was appointed to audit the accounts for 1907.

NEW PUBLICATIONS

Was Sind und Wie Entstehen Entfindungen? (What are Inventions and How do they Originate?) A study in evolution, by Josef Löwy, engineer. Published by A. Hartleben, Vienna and Leipzig. 18 pages. Price, 1 mark (\$.25).

In these days when the once revolutionary theories of Darwin and Spencer have become almost commonplace, it is not surprising that the touchstone of evolution should be applied to so many arts and sciences. While the field of invention is one which at first sight does not seem to lend itself to such analysis, the author demonstrates that the art of invention is no exception to the rule. As an official of the Austrian patent office Mr. Löwy writes with authority on the subject. Despite the briefness of his booklet, he cites so many authorities and instances to prove his point that one leaves convinced that there is something more to invention than happy accidents. It cannot be claimed that a perusal of this work will help the reader to become an inventor, but it should do much good in deterring the ignorant experimenter from spending time and money before knowing the technical and commercial state of his field.

THE ANNUAL MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

As previously announced in the STREET RAILWAY JOURNAL the annual meeting and election of officers, together with the first annual dinner of the Central Electric Railway Association, will be held Thursday, Jan. 24, at the Claypool Hotel, Indianapolis. According to the detail program just announced, the business meeting and election of officers of the association will take place at the morning session at 10:30 o'clock. The following subjects will be discussed at the afternoon session: "Cost of Power for Rental Purposes." "Developing a Demand for Renting Power. Does it Pay?" "The Model Car for Long Travel." "Car Lighting." "Handling of Accidents and Claims."

A special feature will be made of the after-dinner program, many gentlemen high in the electrical world have been invited to attend together with gentlemen prominent in public life, and under the efficient direction of the toastmaster, Charles L. Henry, this portion of the meeting will be very elaborate.

The tickets for the dinner will be \$2.50 a piece, and each member of the association is at liberty to bring as many friends as he desires. It has been decided not to admit ladies to the dinner this year; also evening dress is not compulsory. The dinner will be served at 6:30 p. m., and that the committee may not be handicapped in any way and also that satisfactory arrangements may be made with the hotel people, it is requested that those planning to attend communicate with the secretary, at Indianapolis, on or before Jan. 15, regarding the number of tickets desired.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED DEC. 25, 1906

839,184. Railway Track Construction; Henry B. Nichols and George B. Taylor, Philadelphia, Pa. App. filed March 2, 1906. A rail support comprising a pair of cross-bonded channel irons, having a concrete filling, and short ties resting upon the concrete but secured to the channels.

839,216. Circuit-Closing Mechanism; Thomas W. Small, Cleveland, Ohio. App. filed May 17, 1905. A circuit-closing device, mounted adjacent the trolley wire, closes the circuit to signal mechanism within the car through insulated knobs on the arms of the harp, from which insulated wires lead through the trolley pole to said signals.

839,238. Extension Car Step; Edwin T. Wade, Magee, Miss. App. filed Aug. 17, 1906. A folding supplemental car step.

839,282. Curtain for Vestibule Cars; William H. Forsyth, Chicago, Ill. App. filed Oct. 15, 1906. A spring-actuated vesti-

bule curtain having a handle and catch and anti-friction means therebetween.

839,365. Protective Device for Signal Systems; Fred B. Corey, Schenectady, N. Y. App. filed Aug. 1, 1904. A cut-out magnet is operated by an excessive flow of current due to potential fluctuations in the track relays to prevent injury to said relays.

839,366. Air-Brake System; Fred B. Corey, Schenectady, N. Y. App. filed June 5, 1905. Consists in the combination with a straight air-brake system of a second train-line normally carrying air at reservoir-pressure, reservoirs on the several cars connected to this train line, pilot valves connected to and supplied with reservoir-pressure and arranged to operate when the reservoir-pressure falls below a predetermined amount, and a valve controlled by the pilot valve and arranged to disconnect brake cylinder from one train line and reservoir from the other and to connect reservoir and brake cylinder to each other.

839,505. Engineer's Alarm; Edward McClintock, Merriam Park, Minn. App. filed Sept. 20, 1905. Special trolleys are arranged adjacent to the usual track rails and circuits for various signal purposes are established in the locomotive cab.

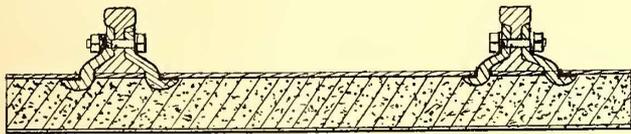
839,525. Railway Signaling System; Louis H. Thullen, Edgewood Park, Pa. App. filed Jan. 4, 1904. A signal system in which the track rails are energized by transformers which are interconnected in a special way so as to secure overlap signal features.

839,526. Trolley-Pole Head; William J. Wagner, East Bradford, Pa. App. filed Oct. 28, 1905. Opposing clamping members adapted to engage yieldably each other to embrace the trolley wire both in front and behind the trolley wheel, said clamping members having flaring ends whereby brackets and circuit breakers may be readily passed.

839,549. Railway Signal; Aricola L. Carpenter, Mount Vernon, N. Y. App. filed Sept. 19, 1905. An electro-pneumatic railroad signaling apparatus in which a piston is normally prevented from movement to close a circuit by the pressure of air in a chamber and a valve adjacent to the track rails is depressed by the car wheels to release the air from the chamber and close an alarm circuit.

839,601. Car Truck; Peter M. Kling, Allegheny, Pa. App. filed March 20, 1906. A car truck having an elliptic spring support consisting in part of four double elliptic springs diagonally arranged, so as to provide for the lateral and longitudinal swinging motion existing in six-wheel trucks.

839,630. Fare Register and Recorder; Wilfred I. Ohmer, Dayton, Ohio; John W. Hill, Providence, R. I.; David B. Whistler and John E. McAllister, Dayton, Ohio. App. filed May 24, 1906. Relates to improvements in a prior patent providing means whereby a complete record of each trip, including six different classes of fares is made, and a complete record of the total trips.



PATENT NO. 839,731

839,730. Frame or Reinforcement for Concrete Railroad Sleepers; Pierre Chaudy, Paris, France. App. filed Sept. 8, 1905. A metal framework designed to reinforce concrete.

839,731. Railroad Construction; John M. Collins, South Pittsburg, Tenn. App. filed April 27, 1906. Relates to means for securing the rails to a concrete-filled metallic tie.

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PERSONAL MENTION

MR. N. P. YEATMAN, for fifteen years secretary of the Nashville Railway & Light Company, is dead.

MR. J. S. PAUL, of Sharon, Pa., has been appointed general superintendent of all the lines of the Mahoning & Shenango Traction Company, with headquarters at Youngstown, Ohio.

MR. WINTHROP B. NYE, general superintendent of the Ray system of street railways, which has been purchased by the New York, New Haven & Hartford Railroad, severed his connection with the system on Dec. 31 to enter the employ of Mr. Joseph Gordon Ray, former general manager of the Ray system, as private secretary.

MR. J. T. HARMER has been appointed controller of the Worcester & Blackstone Valley Street Railway Company, Worcester & Southbridge Street Railway Company, Western Massachusetts Street Railway Company, Hartford & Worcester Street Railway Company, Berkshire Street Railway Company, Woro-noco Street Railway Company, with office in Boston, Mass.

MR. J. D. COLEMAN, secretary of the H. G. Vogel Company, was the guest of honor at a dinner given by the employees of the company Thursday evening, Dec. 20, in New York. During the evening Mr. Coleman was presented with a gold watch fob, which is an exact reproduction in miniature of an automatic fire sprinkler. The fob was a gift from the employees as a slight token of their appreciation.

MR. J. E. SEWELL has been appointed general manager of the properties operated by the Connecticut Railway & Lighting Company, which were taken over by the New York, New Haven & Hartford Railroad on Dec. 20. Mr. Sewell was in charge of the properties under the former owners. These properties will hereafter be operated under the title, "Lessees, Connecticut Railway & Lighting Company," and Mr. Sewell's headquarters will be in Waterbury.

MR. A. GABOURY has been appointed superintendent of the Montreal Street Railway and operating lines. Mr. Gaboury has been practically in charge of the department since last May, owing to the serious illness of the late Mr. Trudeau. Mr. Gaboury entered the service of the company as a conductor. In 1901 he was appointed assistant inspector, which was the occasion of the visit of the Duke of York to Montreal. In the same year he was put in charge of the Cote Street sheds and later he was named chief clerk of the St. Denis Street shops. On the return of Manager McDonald from Paris, in 1903, Mr. Gaboury was appointed claim agent. When last May the late Superintendent Trudeau had to retire, Mr. Gadboury was appointed assistant.

MR. S. L. RHOADES has resigned as general claim agent of the Philadelphia Rapid Transit Company, of Philadelphia, Pa., to become general supervisor of claims of the Casualty Company of America, with offices in New York. Mr. Rhoades is a native of Philadelphia and has been associated with railway claim departments since 1888. His first railway experience was in the claim departments of the West Chicago Street Railway Company and the West End Company, of Boston. Later he became connected with the claim department of the Philadelphia Rapid Transit Company, first as an investigator, later as an adjuster, then as assistant claim agent, and finally as claim agent. Mr. Rhoades is especially well known as the president of the American Association of Street Railway Claim Agents. He will be succeeded in the Philadelphia Rapid Transit Company by Mr. Harry G. Goshorn, now assistant general claim agent of the company.

MR. EDWARD G. BUCKLAND has been elected vice-president of the New York, New Haven & Hartford Railroad, and vice-president of the Rhode Island Company, and will make his headquarters in Providence. In his new position he will have direct charge of all of the Consolidated's interests in this section, including the newly acquired electric railway systems as well as the steam road. Mr. Buckland was born near Buffalo, N. Y., and graduated at Washburn College in 1887. He came from the West in 1889, and was with the law firm of Townsend & Watrous, of New Haven. When Mr. Townsend was appointed United States circuit judge for the District of Connecticut the firm name was changed to Watrous & Buckland. During this time Mr. Buckland was professor of law in the Yale Law School. President Clark, of the New York, New Haven & Hartford, appointed Mr. Buckland Rhode Island representative of the company in 1898. After Mr. Clark's retirement from the presidency Mr. Buckland held the position during the administration of Mr. John Hall, and when Mr. Charles S. Mellen was elected president Mr. Buckland's record for energy, capacity and tact led to his transfer to a wider field in New Haven.

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.

COMPANY.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Avail-able for Dividends.	COMPANY.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Avail-able for Dividends.
AKRON, O. Northern Ohio Tr. & Light Co.....	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	134,890 130,081 905,286 846,595	80,054 82,327 489,306 463,336	54,836 47,753 415,979 383,258	39,548 39,197 243,918 246,500	15,288 8,557 172,061 136,759	HANCOCK, MICH. Houghton County St. Ry. Co.....	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	19,353 16,540 222,794 168,770	*12,058 *11,422 *145,144 *169,712	7,295 5,118 77,653 †942	3,916 3,753 46,649 42,780	3,379 1,365 31,004 †43,722
BINGHAMTON, N. Y., Binghamton Railway Co.....	1 m., Oct., '06 1 " " '05 4 " " '06 4 " " '05	21,969 22,728 116,844 110,583	13,878 12,262 57,584 51,978	8,091 10,467 59,260 58,605	7,707 7,282 30,845 28,847	384 3,185 28,415 29,758	HOUSTON, TEX. Houston Electric Co..	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	51,251 46,324 578,779 499,754	*33,652 *27,166 *375,041 *299,885	17,600 19,158 203,737 199,870	7,792 9,015 95,533 104,260	9,808 10,143 108,204 95,610
CHARLESTON, S. C. Charleston Consolida- ed Ry., Gas & Elec. Co.....	1 m., Nov., '06 1 " " '05 9 " " '06 9 " " '05	56,774 53,549 488,933 456,061	34,722 30,489 303,725 271,519	22,053 23,060 185,209 184,542	13,017 13,167 117,000 118,050	9,036 9,893 68,209 66,492	KANSAS CITY, MO. Kansas City Ry. & Lt. Co.....	1 m., Oct., '06 1 " " '05 5 " " '06 5 " " '05	531,672 466,860 2,406,770 2,164,755	250,023 210,114 1,184,232 1,054,883	281,649 176,746 1,222,538 1,109,871	150,244 139,456 724,194 683,160	131,404 117,290 498,343 426,711
CHICAGO, ILL. Aurora Elgin & Chi- cago Ry. Co.....	1 m., Oct., '06 1 " " '05 4 " " '06 4 " " '05	109,738 100,948 502,821 451,656	59,154 53,907 250,070 222,086	50,584 47,041 252,750 229,570	26,158 24,450 100,809 97,743	24,425 22,591 151,941 131,827	LEECHBURG, PA. Pittsburg & Allegheny Valley Ry. Co.....	1 m., Nov., '06 8 " " '06	4,167 37,306	2,103 18,821	2,064 18,485	1,500 15,614	564 2,871
Chicago & Milwaukee Elec. R.R. Co.....	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	81,143 54,400 803,591 528,291	39,905 24,480 333,285 220,353	41,238 29,920 470,306 307,938	..... ..... ..... .....	..... ..... ..... .....	LEXINGTON, KY. Lexington & Interur- ban Rys. Co.....	1 m., Oct., '06 10 " " '06	46,482 443,551	27,895 283,930	18,587 159,621	..........	..........
CLEVELAND, O. Cleveland, Painesville & Eastern R.R. Co..	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	22,916 21,872 230,553 207,190	*12,848 *12,183 *123,203 *119,196	10,068 9,688 107,350 87,995	..... ..... ..... .....	..... ..... ..... .....	MANILA, P. I. Manila Elec. R.R. & Ltg. Corp., Ry. Dept. All Depts.....	1 m., Nov., '06 11 " " '06 11 " " '06	40,250 467,301 77,575 823,780	23,350 244,424 37,027 422,390	16,900 222,877 401,390	....................	....................
Cleveland & South- western Traction Co	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	54,286 46,254 593,419 495,687	30,532 25,900 334,962 287,706	23,754 20,354 258,458 207,981	..... ..... ..... .....	..... ..... ..... .....	MILWAUKEE, WIS. Milwaukee Elec. Ry. & Lt. Co.....	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	308,753 278,458 3,244,223 2,947,791	144,065 127,949 1,576,645 1,412,899	164,687 150,964 1,667,578 1,534,892	92,272 78,712 976,641 847,930	72,416 72,252 690,937 686,962
Lake Shore Electric..	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	69,730 71,141 734,536 660,209	*39,174 *41,118 *400,903 *359,838	30,556 30,022 333,633 300,372	20,450 20,404 204,203 204,042	10,106 9,618 129,429 96,330	Milwaukee Lt., Ht. & Tr. Co.....	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	54,330 45,962 646,602 560,664	23,352 18,856 252,381 232,996	30,978 27,106 394,220 327,668	28,797 22,409 296,298 232,506	2,181 4,697 97,922 95,162
DALLAS, TEX. Dallas Elec. Corp'n..	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	118,324 88,601 1,040,463 881,115	*75,070 *51,463 *662,385 *553,556	43,254 37,138 378,078 327,559	15,858 15,378 183,406 182,781	27,396 21,760 194,673 144,778	MINNEAPOLIS, MINN. Twin City R. T. Co...	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	473,821 420,981 4,691,259 3,903,669	226,436 192,938 2,177,485 1,771,088	247,386 228,043 2,513,773 2,132,581	114,758 103,208 1,118,911 1,000,217	132,627 124,835 1,894,862 1,182,364
DAVENPORT, IA..... Tri-City Railway & Lt. Co.....	1 m., Oct., '06 1 " " '05 7 " " '06 7 " " '05	143,434 120,179 946,900 829,465	85,182 80,954 574,389 532,655	58,252 39,225 372,511 296,810	28,087 173,511 170,178	30,165 198,999 95,693	MONTREAL, CAN. Montreal St. Ry. Co...	1 m., Oct., '06 1 " " '05	281,822 249,788	157,689 141,681	124,133 108,107	40,610 21,063	83,523 87,044
DETROIT, MICH. Detroit United Ry....	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	458,582 419,299 5,322,235 4,725,292	*315,693 *247,426 *3,222,278 *2,798,901	142,889 171,873 2,099,957 1,926,391	95,721 93,023 1,045,021 1,014,597	47,168 78,850 105,4936 911,794	NORFOLK, VA. Norfolk & Portsmouth Tr. Co.....	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	124,657 117,681 1,229,092 1,121,150	74,923 64,072 763,311 678,267	49,734 53,608 465,781 442,884	....................	....................
DULUTH, MINN. Duluth St. Ry. Co....	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	66,422 57,506 636,892 547,180	38,003 27,906 335,929 281,309	28,420 29,600 300,963 265,871	17,849 17,388 176,494 170,178	10,571 12,212 124,469 95,693	PHILADELPHIA, PA. American Rys. Co....	1 m., Nov., '06 5 " " '05 5 " " '05	216,621 198,243 1,255,349 1,143,655	....................	....................	....................	....................
EL PASO, TEX. El Paso Electric Co...	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	34,630 26,765 367,993 284,941	*27,126 *18,324 *255,554 *187,004	7,504 8,442 112,439 97,937	3,932 3,816 46,588 42,402	3,572 4,625 65,851 55,534	PLYMOUTH, MASS. Brocton & Plymouth St. Ry. Co.....	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	8,708 7,995 110,490 101,199	*5,892 *5,403 *70,244 *71,927	2,816 2,592 40,246 29,272	1,796 1,730 21,859 21,357	1,020 862 18,388 7,915
FT. WAYNE, IND. Ft. Wayne & Wabash Valley Tr. Co.....	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	93,492 80,993 914,671 781,697	55,787 48,625 564,793 483,577	37,705 32,367 349,878 298,120	..... ..... ..... .....	..... ..... ..... .....	SAVANNAH, GA. Savannah Electric Co.	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	43,835 49,907 622,077 575,758	*31,911 *31,752 *379,554 *341,322	11,924 18,155 242,523 234,436	11,300 10,642 133,920 126,739	624 7,513 108,603 107,697
FT. WORTH, TEX. Northern Texas Tr. Co	1 m., Oct., '06 1 " " '05 11 " " '06 11 " " '05	93,458 57,797 831,467 640,269	*63,202 *37,237 *528,191 *381,451	30,256 20,560 303,276 258,819	9,942 9,938 119,292 116,534	20,314 10,623 183,984 142,285	TAMPA, FLA. Tampa Elec. Co.....	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	39,385 34,586 461,731 398,526	*24,334 *18,731 *267,675 *234,004	15,050 15,855 194,056 164,522	1,882 1,885 3,138 22,705	14,868 13,970 190,918 141,817
GALVESTON, TEX. Galveston Elec. Co....	1 m., Oct., '06 1 " " '05 2 " " '06 12 " " '05	24,761 23,927 307,201 263,046	*16,481 *15,037 *186,578 *187,269	8,280 8,890 120,624 75,777	4,167 4,167 50,000 40,000	4,113 4,723 70,624 35,777	TERRE HAUTE, IND. Terre Haute Tr. & Lt. Co.....	1 m., Oct., '06 1 " " '05 12 " " '06 12 " " '05	75,968 57,336 780,976 614,617	*41,646 *37,813 *454,680 *402,638	34,322 19,523 326,296 211,980	13,502 10,430 153,991 119,445	20,820 9,093 172,304 92,535
GREENSBURG, PA. Pittsburg, McKeesport & Greensburg Ry. Co	1 m., Nov., '06 1 " " '05 11 " " '06 11 " " '05	13,440 12,564 168,751 198,131	6,779 7,057 87,745 90,474	6,661 5,508 81,006 107,657	..... ..... ..... .....	..... ..... ..... .....	TOLEDO, O. Toledo Rys. & Lt. Co.	1 m., Oct., '06 1 " " '05 10 " " '06 10 " " '05	176,900 165,511 1,688,034 1,573,293	*100,870 *82,256 *882,687 *801,906	76,090 83,255 805,347 771,387	42,507 42,826 423,961 425,020	33 40 381,3 346,367