Street Railway Journal

VOL. XXV. NEW YORK, SATURDAY, FEBRUARY 4, 1905. No. 5.

PUBLISHED EVERY SATURDAY BY THE

McGraw Publishing Company

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

BRANCH OFFICES:
Chicago: Monadnock Block.
Philadelphia: 929 Chestnut Street.
Cleveland: Cuyahoga Building.
London: Hastings House, Norfolk Street, Strand.

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

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

TERMS OF SUBSCRIPTION

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

Street Railway Journal (52 issues)..... $3.00 per annum

Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—February, August and November) $4.00 per annum

Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

Single copies, Street Railway Journal, first issue of each month, 20 cents; other issues, 10 cents.

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks 31 francs.

Single copies, first issue of each month, 40 cents; other issues, 15 cents.

Subscriptions payable in advance, by check or money order. Remittances for foreign subscriptions may be made through our European office.

Of this issue of the Street Railway Journal 8750 copies are printed. Total circulation for 1905, to date, 42,750 copies—an average of 8550 copies per week.

Instituting Reforms

Reforms in the direction of economy are often necessary in street railway operation, but those whose necessity will not readily be recognized by the public should be made gradually. Perhaps as an abstract proposition, nearly every fair-minded man will admit that a street railway company should be so operated as to show a fair profit on the investment. Practically he will use every objurgation in his vocabulary if on an interurban line his favorite car is taken off, or on a city line if the headway is changed from five to ten minutes, or from ten minutes to every quarter hour. Such changes as these are often absolutely necessary, but it is easy to see that there are favorable and unfavorable periods in which to put them in operation.

The present is perhaps an appropriate time to refer to this point, because this is the season for annual meetings. At these meetings many a director, especially if he is not a resident of the city in which the railway is located, will advocate strenuously for lower operating expenses. To his mind the schedule can often be cut in half to advantage, the employees' wages should be reduced, and "those monthly commutation tickets which were on sale last year to Lonesomeburgh should be withdrawn." Moreover, in his opinion, there are entirely too many passes out, and what's the use of paying out all you take in. Now, perhaps all of these criticisms have some foundation and some retrenchment is possible. But if all of the reforms are attempted at once, particularly if the road is known to be fairly prosperous, a storm will be raised by the former holders of passes, the commuter and the local passenger will feel aggrieved, retaliatory measures will be taken and the latter condition of that property will be worse than the first. Had, however, the railway company introduced the reforms gradually and selected some favorable time for their enforcement, the effect would not be so great. During the winter storms, for instance, when delays are unavoidable, or at other times when the traffic is light, a gradual lengthening out of the schedule is not very noticeable, but a period during which the company is being held responsible by the public for inadequate service is obviously not a desirable one to select for raising fares or reducing passes.

High Speed Railroading

Again at the beginning of a new year, we have to raise up our voices in lamentation that the day of high-speed electric traction seems to be still afar off. For more than a decade the 100-mile-an-hour train has been on the road, but it has not yet come around the curve. The feasibility of such speed has now been thoroughly demonstrated, but nothing is doing. It is a curious fact that the speed records on railways have stood, in some cases, for many years. One of the most notable of them, 53¼ miles in forty-seven minutes, on the Great Western line out of London, was made more than half a century ago. The records between New York and Buffalo and between Chicago and Buffalo were made nearly ten years ago, and the famous mile record of thirty-two seconds is still older. The actual running of a train from Chicago to New York in less than eighteen hours, in 1895, does not seem to have stimulated enthusiasm for fast trains, and in spite of all the cry about modern improvements and American supremacy in railroading, the fastest regular train in the world is in France, and on a run, by the way, longer than that of the Empire State Express. Electric locomotives for high speed were planned more than ten years ago, and we hear periodically of the great things that are to be done when the projected Jamboree & Jericho line is completed. But it never is completed; something happens; the city fathers of Jamboree are convinced that the road will involve public danger, or Dodge & Hedge, the distinguished bankers, who underwrote the bonds, fail for 11 cents on the dollar. Anyhow, the road is not built, and it next appears as

projected between Syzygy and Cacptch, somewhere or other on the Bulgarian frontier, only to go through the same dreary cycle of sorrows. It is positively worse than that 5-acre meteorite that falls every two or three years somewhere in Mexico or Southwestern Texas. Meanwhile the running time between New York and Washington holds to the same old figures, some of the fast express trains are pulled off the westbound lines and the electric roads stay in the same conservative rut. After the Zossen tests, things began to look up a bit, but nothing has actually come of them. It would certainly seem that some progress should have been made in ten years, but they have slipped by and there is nothing to show for it.

Of course, one of the real difficulties is the relative unimportance of half-way measures. It signifies little to cut half an hour off the running time between New York and Washington or Boston. It could be done with the greatest ease, but it would make small difference to anybody, since the saving in time is so insignificant. But get down to the 100-mile-an-hour basis, or somewhere near it, and the saving in time would amount to something practically. That would mean reaching either of the cities named in less than three hours, including stops, and would give a free business day in either place. On the longer distances the gains would be even more important. A twelve-hour train to Chicago means only about 80 miles an hour actual average, which leaves ample margin below speeds demonstrably possible.

The electrical supply of power for such a feat is, of course, a big undertaking, and the first try at big speed can scarcely be expected over so long a distance. But the point of the matter is that, with all the resources now at the command of mankind, nothing has yet actually been done above what might have safely been predicted as regards speed half a century ago. Of course, the general improvements in railroading have been enormous within that period, and we are duly thankful for them, but the growth in speed has not been commensurate with the rest of the improvement. Will improvement come soon? A decade since, we should have unhesitatingly answered in the affirmative, but as time goes on we hesitate. In one of H. G. Wells' clever stories, he relates how a far-sighted engineer, scoffed at by the public, insisted in laying out a broad road structure, with a special way for vehicles running over 100 miles an hour, and how, in the passage of years, the prophecy came true. Perhaps the automobile on a first-class roadbed may push the speed records up a peg and shame the backward railways into action. Certainly every experiment at high speed shows clearly that reaching it is far less difficult than had previously been imagined. We understand clearly enough the practical and material difficulties that stand in the way of building a high-speed electric road in this country. The effect of such a road when in operation upon general railway operation would be so tremendous that it could not be long withstood. Anyone who tries to get a right of way for such a purpose will have the fight of his life, with every railroad influence concentrated against him. Frankly, we think the first great step will probably be taken abroad, where there are autocracies that can have their way in spite of "vested interests." In due time the first step will be taken, and then things will begin to move. It cannot be that travel is to remain permanently at or near the present range of speeds. Time is too valuable to waste in transit, and now that it is well understood that high speeds are feasible, they must come in due season. Steamship speeds have steadily risen in spite of relatively much greater difficulties, and when the whole world hits up its pace, travel on the rail cannot stay at its present rate of deliberation.

The Cost of Car-Storage Facilities

"What shall we do with our out-of-season cars?" is a problem that forces itself at least twice a year upon the attention of those companies whose properties happen to be located North of the Mason and Dixon line, where the annual range of temperatures makes a double equipment of summer and winter cars almost imperative unless some form of convertible car is used. On the smaller roads, the problem is usually solved, perhaps as satisfactorily as any other way, by building the operating car house sufficiently large to store the duplicate cars in one section or in an adjoining bay. But on the larger systems, where the value of the out-of-season equipment runs into the hundreds of thousands of dollars, this becomes only a makeshift solution at the best. The fire underwriters have acquired an unfortunate habit of tacking on a few per cent to the already overburdened insurance rate whenever they find large values in car equipments grouped within confined space. Then, too, the cost of erecting what are termed "operating barns," as they are now usually built, is so high that it would seem to be an unnecessary expenditure of money to build them large enough for storing the double equipment during the off season; just as it would be to build a modern office building to include sleeping quarters for all those doing business in the building, when dwelling accommodations can be secured so much cheaper and better in less expensive buildings.

In this connection, the suggestion made by D. F. Carver in his article describing the Plank Road storage house of the Public Service Corporation, published elsewhere in this issue, is of more than passing interest. Mr. Carver believes that entirely aside from the question of insurance, it is cheaper to build two smaller car houses—one for operating and one for storage—than it is to erect one large house combining operating and storage facilities. His proposition is based on authentic statements of costs obtained after wide investigation of actual experience. The figures have been reduced to a cost-per-cubic-foot basis, a method of comparing the cost of buildings which is used extensively by steam roads, although its advantages up to the present time do not seem to have been recognized fully by managements of electric roads.

The proposition in a nutshell is just this: Assume an electric road owning 100 cars, half of which are for summer and half for winter service. It will have fifty cars to store during the off season. Granted that it has been decided to build two houses, one for operating fifty cars and one for storing fifty cars. The operating house to accommodate fifty equipments will have to contain, roughly, 760,000 cu. ft., and if built with approved steel truss roof construction, with brick walls (but no fire walls), with shops, waiting rooms, men's rooms, depot master's office, plumbing, etc. (but disregarding track work and real estate, as these do not enter as factors into the problem before us), the building will cost $0.0616 per cubic foot, or approximately $46,800. A building for the exclusive purpose of storing cars, consisting essentially of heavy brick walls and approved slow-burning timber roof construction, divided into bays by heavy fire walls of brick, with not over three tracks to the bay, with no pits or heating arrangements, and exclusive of track and real estate, will cost $0.042 per cubic foot, or for a fifty-car house with cubical contents of roughly 520,000 cu. ft., the total cost of the building will be approximately $21,800. The cost of the two separate buildings will be therefore $68,600. Now, what will be the cost of an operating house the same as regards detail of construction, finish and completeness as the smaller operating house before mentioned, but large enough to accommodate 100 cars? It must be borne in mind that the cost

per cubic foot for a house of the operating type will decrease within certain limits as the size of the house is increased, while the cost per cubic foot for the storage house will remain nearly constant, inasmuch as the building will consist essentially of narrow parallel bays, the number of which can be added to almost indefinitely without changing the cost per cubic unit. On the other hand, there will be considerably more lost space in the peaks of the roof in the larger operating house by reason of the longer spans required, so that one house with capacity for 100 cars will enclose cubical contents nearly 40 per cent greater than the combined contents of the two separate houses. According to Mr. Carver's figures, the one large house will contain at least 1,720,000 cu. ft. of contents, and it will cost to build $0.059 per cubic foot, or $101,000, as against $68,600 for the two separate buildings.

As a matter of fact, it is not urged that every company under the given conditions can save $30,000 in cost of car house construction as between the two methods, because there enter into the equation, as into all questions having to do with electric railway practice, the modifying factors of local influences. However, it is believed there are few conditions where a saving will not be evident. Be this as it may, the figures contain enough to furnish food for some good sober thought.

Special Safety Precautions

The operation of an interurban railway system, while involving, as we have many times pointed out, the same general methods and precautions as any other railway system, is subject to difficulties which are rather peculiar to itself and which demand special treatment. As interurban lines have grown in length, speed and traffic, these difficulties have become acute and deserve the very careful consideration of every manager. Perhaps the chief basic difference between modern interurban service and ordinary railroading, as respects safe operation, is the very much greater number of operating units characteristic of the former. Where a minor steam line would run ten trains a day an interurban line would, during the busy hours, run as many cars per hour, with a nearly corresponding increase of danger from collisions, assuming the same proportion of human carefulness. The single cars have nearly as great speed as would the trains, and while they can certainly be stopped more promptly than the trains, they are more difficult to hold to a rigorous schedule, and are thus more likely to be running on precariously close headway. Cars running on, say, ten-minute headway, even upon a double-tracked road, have comparatively small leeway, and in thick weather, as experience has shown, are apt to get closer than is conducive to safety. On a single-track road with turn-outs the risk is proportionately greater. There have been a good many forms of block signals devised to meet these conditions, some of them embodying excellent features, but in interurban service an absolute block system which tries to meet every exigency of traffic would sometimes prove very inconvenient, and a permissive system is apt to leave a good many loopholes for entering accidents.

A double-tracked road fully equipped with a block signal system is certainly less liable to collisions than any other, but under existing conditions the number of such roads is necessarily limited, and one of the most serious questions that comes before the manager is the preservation of an adequate system of safety appliances on ordinary roads. In the ordinary routine of operation things go smoothly enough, but when traffic presses and extra cars have to be run the situation is different. To begin with, on either a single-track or double-track line there is no danger of collision between cars. If they run, say, on ten-minute headway, and hold to it and obey orders at turn-outs, everything will go smoothly. It is when this regularity is departed from, as it now and then must be, that trouble is likely to begin. It seldom happens that cars collide in clear weather. It is in fog or storm, or in coming at night around a blind curve or over the crest of a grade that they get too close and sometimes cannot be stopped in time. It takes several hundred feet to bring a heavy interurban car to a standstill, and it is easy enough to get within that range of another car in a storm or a fog. It strikes us that there is need of a far freer use of visible and audible signals than is usual under such circumstances. Systematic use of a powerful red rear light, automatically duplicated when the car is stopped, would many a time warn the following motorman to keep his car under control. Rear lights are, of course, now used to a certain extent, but in a dark night it is not easy to estimate the distance or to tell whether or not the car is under way. Another thing which could be done with small trouble and expense would be to install at blind curves and grades signals for day and night, worked by track instruments several hundred feet away on each side, just as highway crossing signals are often worked on railroads. Protection of this sort can be put just where it is needed and can gradually be added to as the traffic increases. Some roads already use such devices, but they certainly are not employed anywhere nearly as systematically as they should be to secure the best results. Still another desirable plan is to double-track such curves, as is done quite frequently in the Middle West.

Audible signals, too, are very much neglected on electric lines. Air whistles there often are, to be sure, but they are generally far from being powerful enough to answer the purpose fully. In thick weather a signal should be sufficiently penetrating to be heard some distance to be effective. We remember seeing a few years ago an electric horn worked on the buzzer principle that would have roused Rip Van Winkle. A pair of these, differing radically in pitch, installed on each car, one for use on the up run and the other on the down run, would serve a very useful purpose. Blasts when nearing curves in the fog, and when slowing down or stopping, would avert many a close call. And the same scheme would considerably lessen the accidents at street crossings, where passengers not infrequently get off one car and pass squarely in front of one coming up on the other track. A short blast at nearing a car stopped and discharging passengers would warn many a victim of his own carelessness. One looks several ways at once for a gong, while a distinctive track signal tells its own story at once. Given good local protection by special signals, audible signals for use in a fog and good air brakes, any intelligent motorman ought to be able to keep his car out of trouble. Running at full speed without signals is simply looking for trouble. On some roads with heavy grades danger of a car getting out of control is considerable in slippery weather, and there is a good deal to be said in favor of track brakes, which are often suggested but rarely used. It is perhaps an open question whether they could advantageously be substituted for ordinary brakes in regular service, but as emergency devices they have no small merit. Every road really has requirements of its own to insure safety, and it is the part of wisdom to look them over and to meet them at every point. Not every road can be given the safety precautions of a trunk line railway, but that is no reason why danger spots at curves and grades should not be eliminated. An intelligent attention to detailed protection will greatly reduce the danger of accidents, and it is generally neither difficult nor expensive.

THE STREET AND INTERURBAN RAILWAY SYSTEMS AT TERRE HAUTE, INDIANA

Heretofore the greater part of the development of interurban lines in Indiana has been in the eastern portion of the State. There is, however, one city in the western section which is fast developing into an interurban center. This is Terre Haute. Two interurban lines already lead out of the city to the east and north, another will be built west to Paris, Ill., within a short period, and several others are contemplated. The tracks of the extension west to Paris will pass over the Wabash River on the new steel bridge now being erected by the county at a cost of $271,000.

The reason for this rapid development is not difficult to discover. A population of 60,000 is claimed for the city alone, and within a 30-mile radius there are 250,000 people. In 1900, the population of the city was 36,673. The phenomenal growth in the last four years has been due directly to the natural resources in the surrounding section and to the facilities offered by the several railroads for shipping to central markets. Within a radius of 30 miles there are more than 2000 square miles of coal fields, and over 1600 carloads of coal are sent out daily. An inexhaustible supply of water may be obtained by drilling to a depth of about 80 ft., one of the distilleries pumping 8,000,000 gals. per day from its own wells. Thus both fuel and water, the two requisites of manufacturing plants, are easily obtained. The abundance of coal, which may be purchased as low as 60 cents per ton, has attracted from the eastern portion of the State many factories which were recently compelled to seek other locations because of the failure of natural gas. The factories of the city alone employ almost 10,000 men, and their yearly products are valued at $30,000,000.

Eleven railway lines branch out from the city in all directions, furnishing direct routes to the larger cities for the shipment of the manufactured products and coal. Chicago is 178 miles distant; Cincinnati, 187 miles; St. Louis, 168 miles, and Louisville, 161 miles. Freight loaded for any of these cities one day arrives at its destination the following morning. With such natural resources, together with the central location, the city and surrounding country bid fair to become so thickly populated as to support an extensive interurban railway system.

ORGANIZATION AND HISTORY

The street railway systems of the city and the two interurban roads out of the city—the Clinton line to the north, and the Brazil line to the east—are operated by one company, known as the Terre Haute Traction & Light Company, of which Gardner F. Wells is resident manager. This is one of the several Western railway systems controlled by Stone & Webster, of Boston.

The system had its origin in the Terre Haute Street Railway Company, organized in 1866. It is interesting to note that the price paid for the flat rails at that time was $108 per ton. In 1889 it changed ownership and electric traction was adopted. A short time later, the system attracted considerable attention from the fact that it reconstructed its tracks in the city with shanghai T-rails. This construction was so unusual at the time that it was the subject of a paper read by Russell B. Harrison, then president of the road, before the thirteenth annual convention of the American Street Railway Association, held at Atlanta, Ga., in 1894. The road may also be remembered as the first to use the Westinghouse No. 12 railway motors, some of which are in service at the present time.

POWER STATIONS

The power stations are in charge of H. E. Smith, chief engineer of the system. There are three separate power houses—a new steam turbine plant known as the Mulberry Street station, the original station of the Terre Haute Traction Company at Ninth and Cherry Streets, and a station at Brazil.

THE MULBERRY STREET STATION

The new station, which ultimately will be enlarged to furnish power for the entire system, is located in the western portion of the city, on the banks of the Wabash River, two blocks north of Wabash Avenue. A general view of the station is shown in Fig. 1. It has been the intention of the management for some time previous to erect a new station at a future date, but the overloaded condition of the Cherry Street plant, brought about last winter by the increased commercial load, hastened its construction. The location was chosen because of the facilities for

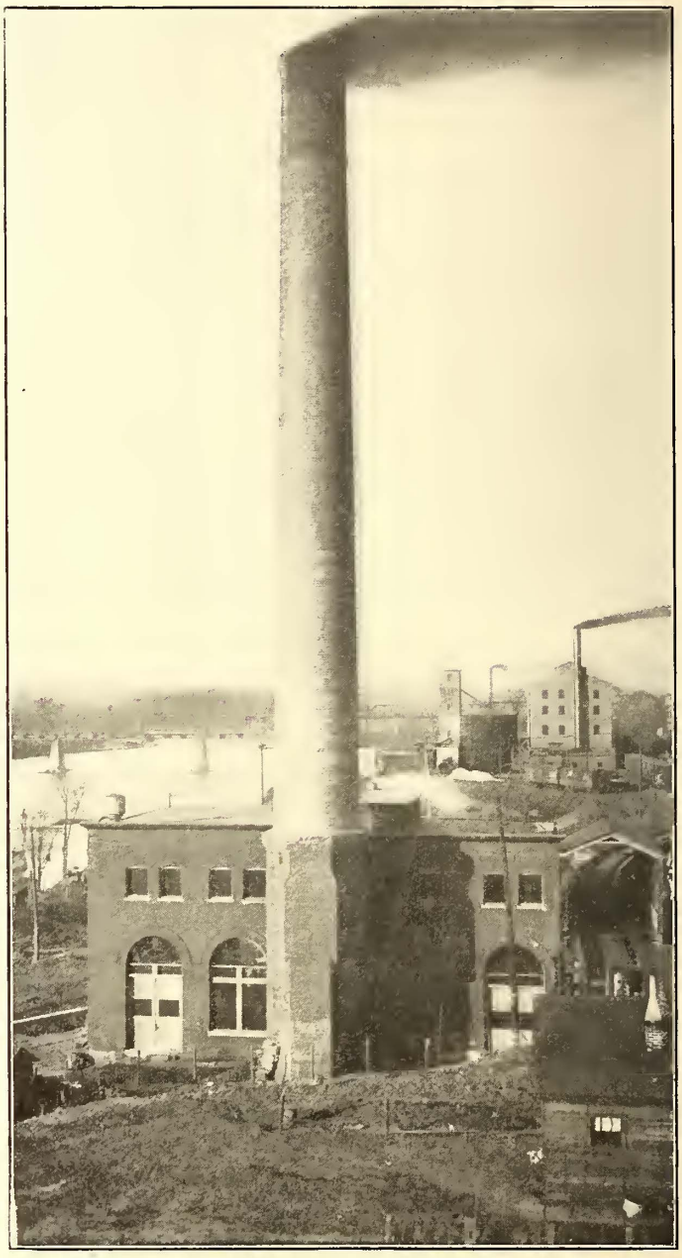


FIG. 1.—MULBERRY STREET STATION FROM THE SOUTH

obtaining condenser water, which is drawn from the Wabash River, and because of its convenience to the railways. Although it is now on the side of the city opposite to that of the interurban development, when the proposed new extension west to Paris, Ill., is completed, it will be reasonably near the center of the system.

While the station is a modern one in every particular, its chief point of interest lies in the fact that it is a steam turbine plant. At the present time but one turbine is installed, this being of 500-kw capacity. The building, however, has been constructed with the view of installing another of 1500-kw capacity whenever the service demands it. The structure, which measures 80 ft. 6 ins. x 50 ft. 5 ins., consists of a steel

framework supporting the steel truss roof. Figs. 2 and 3 show the plan and section of the station. The south wall is built up permanently of brick. The other enclosing walls are of corrugated iron, and are temporary because of anticipated additions to the building. A brick wall built into the steel columns separates the boiler and engine rooms. The roof, which is divided into two sections at this division wall, is of tar and gravel laid on 2-in. hard pine planking. This in turn is supported by channels resting on the roof trusses. A monitor built in the boiler room roof affords proper ventilation.

The floors of the building are all of concrete except that under the northern portion of the engine room. This is temporarily of wood. The boiler room rests directly upon the ground. The concrete floor of the engine room, which is immediately over the basement, is 4 ins. thick, and is built in between 25-lb. 10-in. I-beams, placed 3 ft. 8 ins. apart. The basement floor is also of concrete. As the river frequently rises above the floor of the basement, the walls are all waterproof. Any leakage taking place will drain to a sump, from which it will be pumped through the condenser water return mains to the river.

The chimney was built by M. W. Kellogg & Company, of New York. The method of constructing the concrete foundation may be observed in Figs. 4 and 5. This foundation is octagonal in shape, and at the bottom measures 22 ft. across, narrowing by four steps to 16 ft. 2 ins. at the top. The octagonal section continues to a height of 40 ft. above the base. Circular construction then begins, this being 14 ft. in outside diameter, with walls 20¼ ins. thick. The walls decrease in thickness by steps, and at the top, 165 ft. above the base, they are 7½ ins. thick. The bottom of the flue opening, which measures 5 ft. 6 ins. wide x 9 ft. 3 ins. high, is 21 ft. 6 ins. above the base.

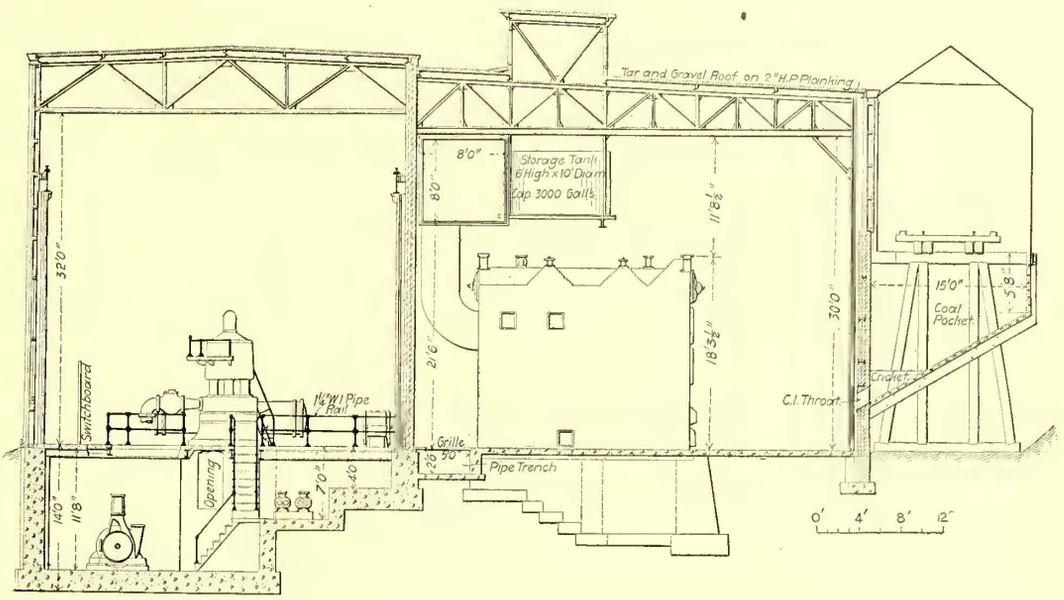


FIG. 2.—CROSS SECTION OF POWER STATION

The boiler room contains two Cahall horizontal water-tube boilers, equipped with superheaters. They are rated at 520 hp each, and are guaranteed to raise 15,600 lbs. of steam per hour to a pressure of 150 lbs., and to a temperature of 515 degs. F., corresponding to a superheat of 150 degs. A total of 11,000 sq. ft. of heating surface is provided and 175.12 ft. of grate surface. They are supplied with Crosby steam gages with 12½-in. dials, and Reliance low-water alarm columns. A spur from the tracks of the Vandalia Railroad passes over a trestle several hundred feet in length and along the east wall of the boiler room. Built into the trestle immediately beneath the track is a coal bunker of 120 tons capacity. This trestle and track is well shown in Fig. 7. The boiler room wall forms one side of the bunker, and through this wall are several chutes with cast-iron throats, as shown in Fig. 8. A steel car placed immediately under the chutes receives the coal and conveys it to the boilers. At the present time the ashes are removed through the ash doors of the boiler front. The future plans, however, contemplate an ash pit beneath the floor, from which the ashes will be removed by means of a car running in a tunnel. The flue gases pass from the boilers upward through individual flues to the main smoke flue, which measures 8 ft. square. This goes directly to the chimney. Dampers are placed in both the individual flues and the main flue. To the north of the boilers are located the feed-water heater and the feed-pump. The latter is of the duplex piston type, with cylinders 7½ ins. x 4½ ins. x 10 ins. The position of the

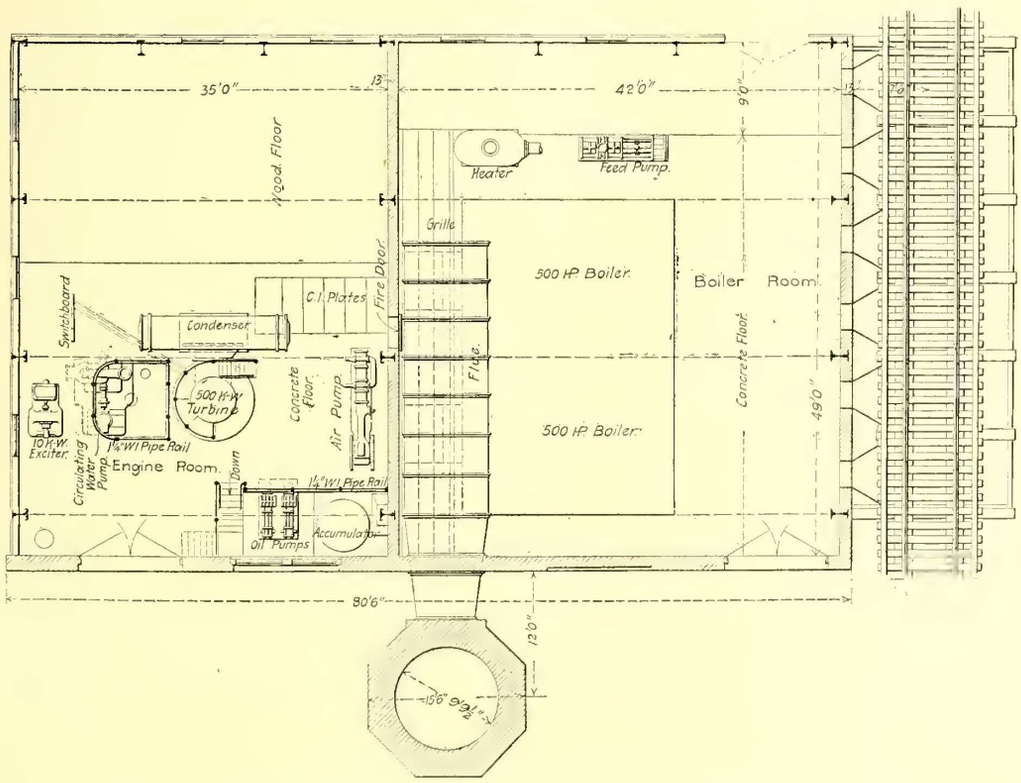


FIG. 3.—PLAN OF MULBERRY STREET POWER STATION

boilers, feed-pumps and heater is shown in Fig. 9. The boilers deliver steam to an 8-in. flanged header, supported by brackets to the division wall between the boiler and engine room. From this, a 6-in. main descends to the turbine, as shown in Fig. 10. The steam line for the auxiliaries is taken off from the main line just before it enters the turbine. A

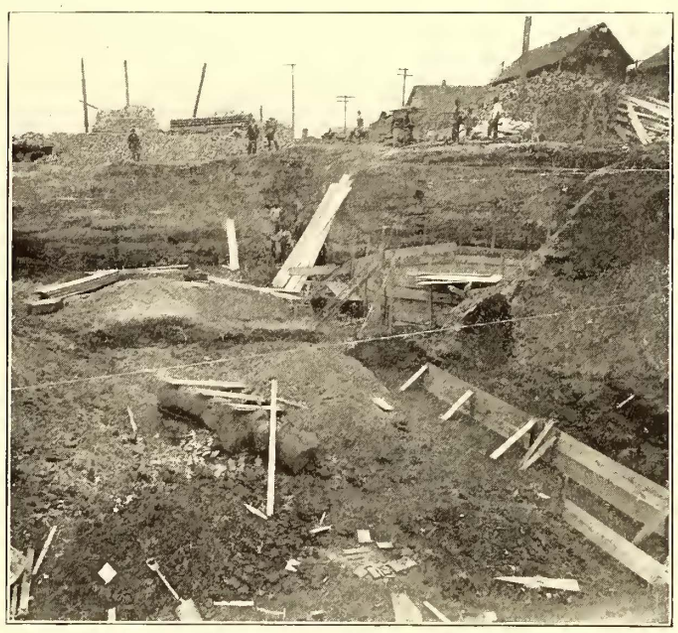


FIG. 4.—EXCAVATION, SHOWING BASE OF CHIMNEY

branch from this goes directly to the dry vacuum pump, while the main auxiliary steam pipe descends to the basement, where the condenser circulating pump and other auxiliaries are located. The turbine, of 500-kw capacity when run non-condensing, is of the Curtis type, built by the General Electric Company. It runs at 1800 r. p. m., and the speed is guaranteed

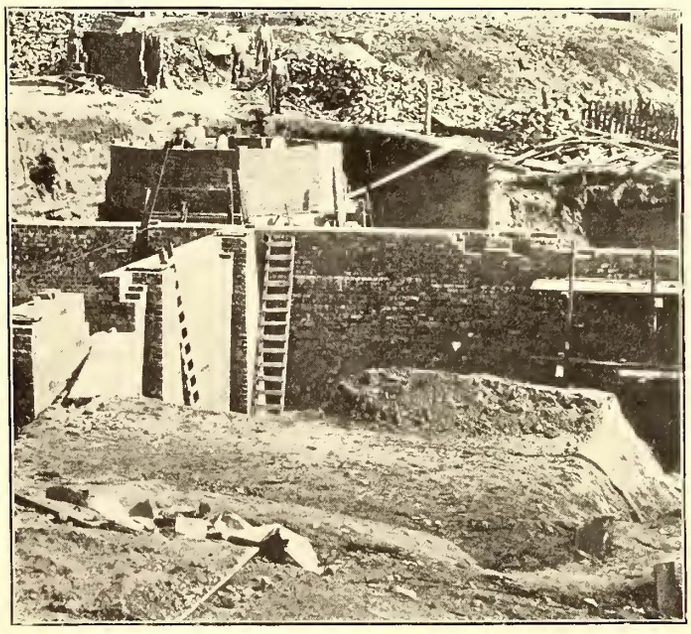


FIG. 5.—FOUNDATION WALLS FOR NEW STATION

to vary not more than 4 per cent with sudden fluctuations of load, and with reasonable fluctuations not more than 2 per cent. With 150 lbs. pressure at the throttle and condensing with 2 ins. absolute back pressure in the condenser, the turbine will operate at full load on 21 lbs. of dry steam per kw-hour. At half load, the guaranteed consumption is 23 lbs., and at 50 per cent overload, 21½ lbs. These guarantees reduced to horse-power give 15.66 lbs. at full load, 17.15 lbs. at half load and 16.03 lbs. at 50 per cent overload. The turbine and generator combined stand 12 ft. 4 ins. high above the base, and have a diameter of 7 ft. 8 ins. at the base. The weight of the combined unit is 40,000 lbs. It sets on a brick foundation, which extends into the basement underneath. An opening in this permits the removal of the step bearing. A pressure oiling system is provided for the bearings. Two special duplex, outside packed, plunger pumps, shown in Fig. 11, force the oil from a storage tank into a high-pressure piping system of 1½-in. brass pipe.

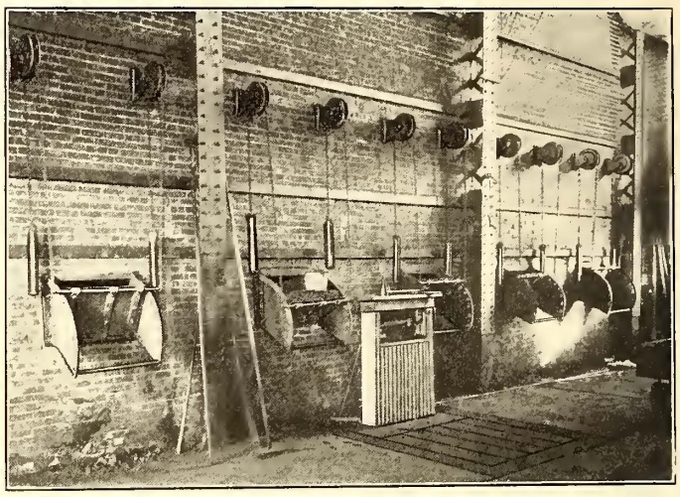


FIG. 8.—CHUTES FROM BUNKERS IN BOILER ROOM

Through ⅜-in outlets this system supplies the top bearing and the step bearing of the turbine. After passing through the bearings, the oil returns by gravity to the storage tank. The oil is maintained at a pressure of 180 lbs. The high-pressure system is connected with what is termed an accumulator, the base of which is shown to the left of the oil pumps. This assures the pressure being kept constant, and also gives a reserve

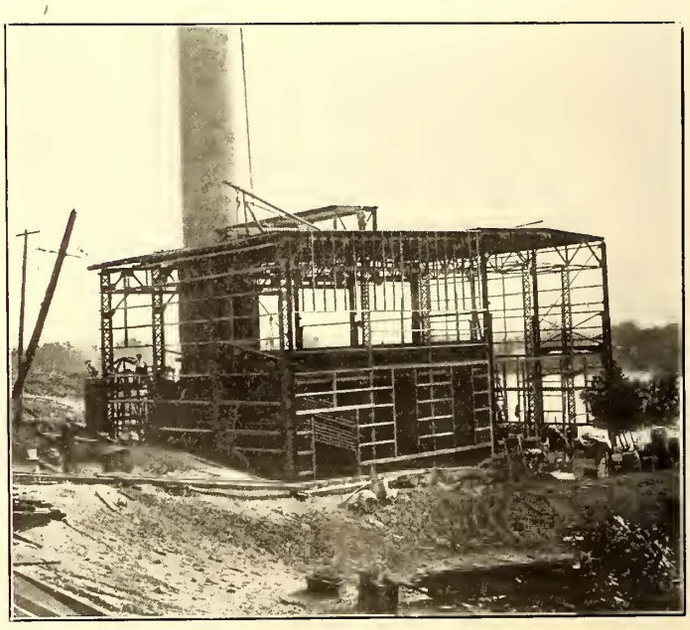


FIG. 6.—FRAMEWORK OF THE MULBERRY STREET POWER STATION IN PROCESS OF ERECTION

capacity in case of failure of the oil pumps. It consists of an upright piston standing 18 ft. high. Over this is fitted a long cylinder with an outside diameter of 18 ins. The cylinder is weighted down with weights, according to the pressure it is desired to maintain. The high-pressure pipe enters at the base of the piston, and the oil pressing against the upper end of the movable cylinder is raised to any predetermined height. When

this height is reached, the supply of steam is automatically shut off. Should the cylinder fall below a predetermined height, more steam is admitted to the pump. In case the pump in service fails for any reason, the piston, by falling a few inches further, will admit steam to the second pump. Should both pumps fail, the oil in the accumulator will operate the system for almost an hour. The accumulator was built by R. D. Wood & Company.

A relief valve placed on the high-pressure piping is set for 600 lbs. The return or low-pressure oil piping consists of extra heavy cast-iron pipe, the whole piping system being constructed to withstand a pressure of 450 lbs.

The exhaust from the turbine is either direct to the condenser or through a 12-in. main which, descending immediately to the basement (Fig. 12), leads to a free exhaust, rising through the roof at the southwest corner of the building. The condenser, of the Alberger counter-current surface type, with 2000 sq. ft. of condensing surface, is placed on the main floor immediately north of the turbine. A horizontal two-stage dry vacuum pump, a hot-well pump and a centrifugal circulating pump complete the condensing outfit. The condenser will maintain a vacuum of not more than 2 lbs. absolute pressure when condensing 12,000 lbs. of steam per hour, a sufficient amount of condensing water at 70 degs. being supplied. The condensing surface consists of 844 seamless brass tubes, each ¾ in. in diameter. These

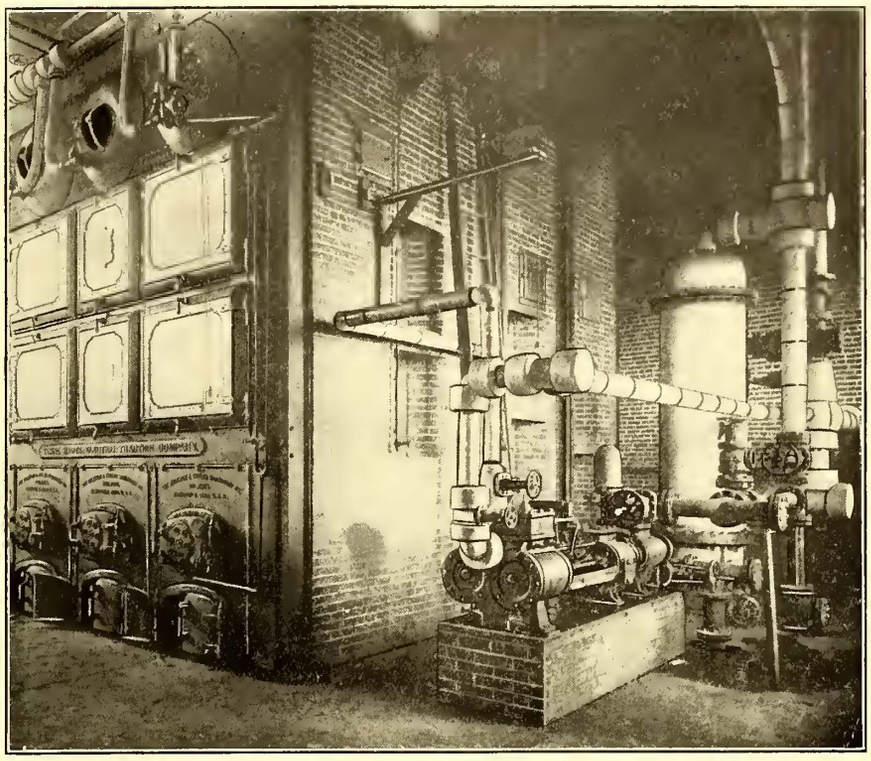


FIG. 9.—BOILERS, FEED-PUMP AND HEATERS IN THE MULBERRY STREET POWER STATION

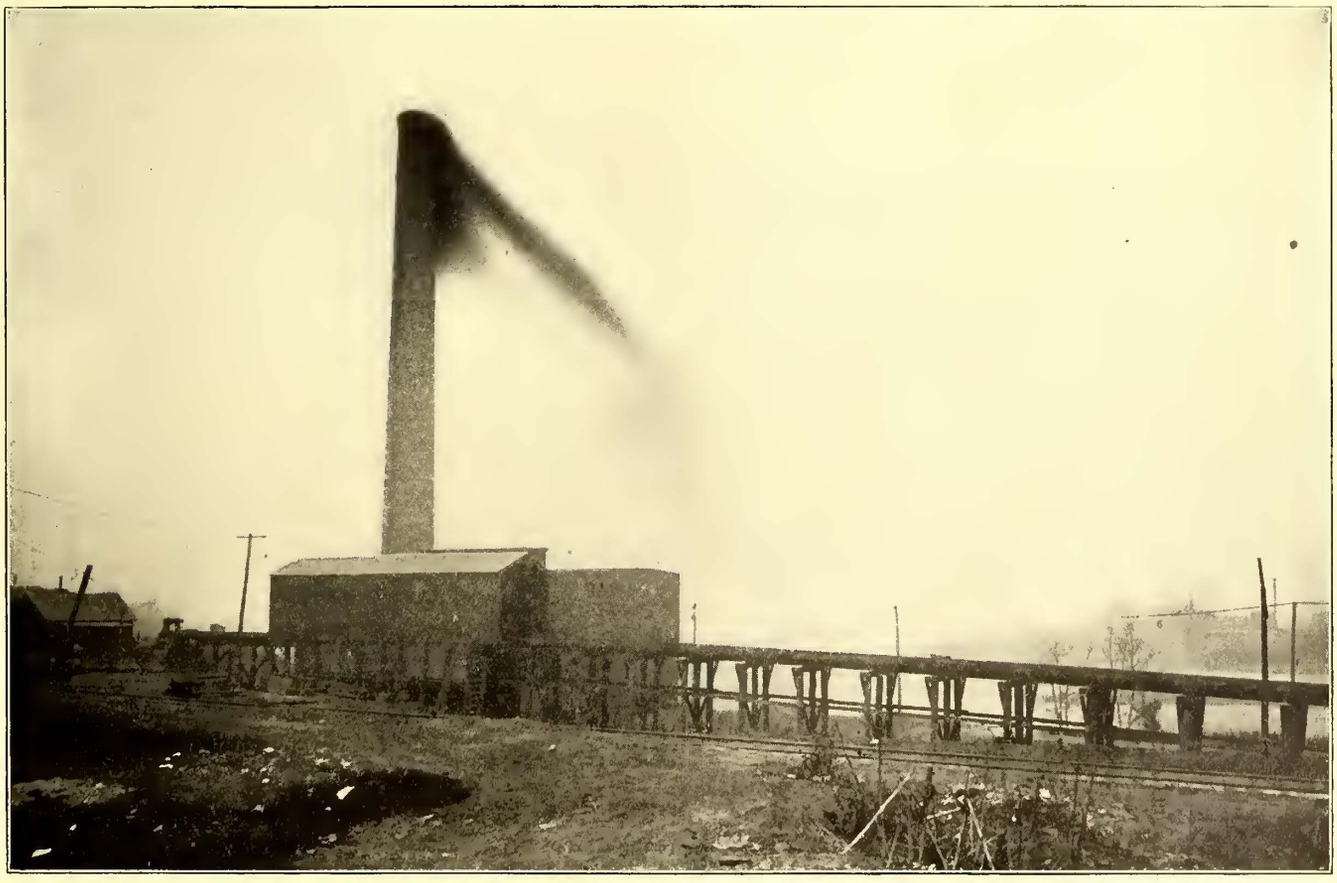


FIG. 7.—MULBERRY STREET STATION FROM THE EAST, SHOWING TRESTLE APPROACH AND BUNKERS

are so secured in the tube sheets as to permit of the attendant expansion and contraction. Steam is admitted at the bottom of the condenser. The circulating water is piped in at one end and at the top. It makes three passes through the tubes, leaving at the bottom. The water, in its last pass through the tubes, comes in contact with the tubes exposed to the entering steam. The condensed water falls downward over the tubes to the hot well. From this it is removed, by a double-acting piston pump of the submerged type, to the main storage reservoir. This hot-well pump is automatically controlled by a float in the hot well. A two-stage Alberger rotative dry vacuum

pump (Fig. 13), located on the engine room floor near the wall of the boiler room, maintains a vacuum in the condenser. The pump consists of a steam cylinder and two vacuum cylinders mounted on a Y frame. The fly-wheel shaft carried two eccentrics, one of which operates the balanced steam valve, the other

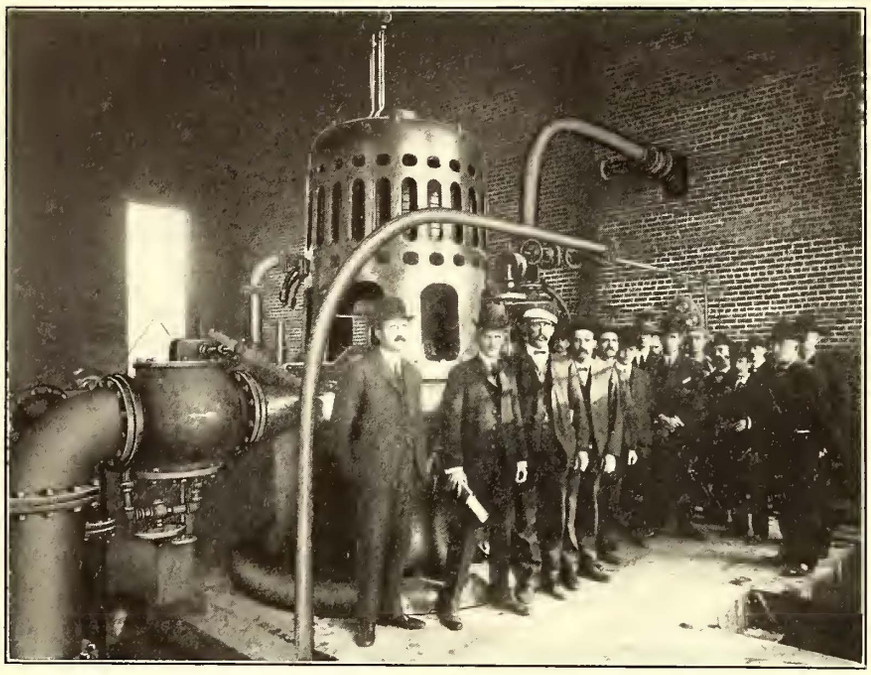


FIG. 12.—THE 500-KW STEAM TURBINE IN COURSE OF ERECTION

the semi-rotary air induction valves in one of the vacuum cylinders. A throttling governor controls the speed. As previously stated, the condenser water is obtained from the Wabash River. The hot and cold well is located near the water's edge, about 80 ft. west of the plant. The current of the river sweeps over toward the shore at this point, forming quicksand rose up from the bottom and completely filled the excavations. The pipes, as laid, are supported by cross timbers between piles driven on each side. The ends of the pipes are protected by a pile driven on the up-stream side.

The construction of the hot and cold well is not illustrated here, nor are the details of the double screens in the hot well. It is worthy of note, however, that the latter are so constructed that they may be readily lifted out for cleaning. Both lines of pipe, that from the cold well to the rotary pump and that from the condenser to the hot well, are 24 ins. in diameter and are of cast iron. For a portion of the distance they are placed above the ground. As they are above the frost line, no check valve was placed in the supply pipe. This necessitates starting the dry vacuum pump first and pulling water into the system before the rotary pump will operate. This causes considerable delay, and it may eventually be deemed advisable to put in a check valve.

The circulating pump, Fig. 14, which is located in the basement, is of the centrifugal type, and is direct connected to a 9-in. x 9-in. vertical engine provided with a fly-ball governor. The pump has a 10-in. discharge and a 12-in. suction pipe, which divides to enter the pump on each side of the volute. The top of the volute is provided with the necessary connections for priming. The pump is built to work satisfactorily with a suction of 20 ft. and a discharge head of 15 ft. In its present location, the center line of the intake is 19.6 ft. above the low-water mark of the river, which is 436.40 ft. above the sea level. A large duplex pump, located in the basement near the centrifugal pump, supplies the necessary make-up water.

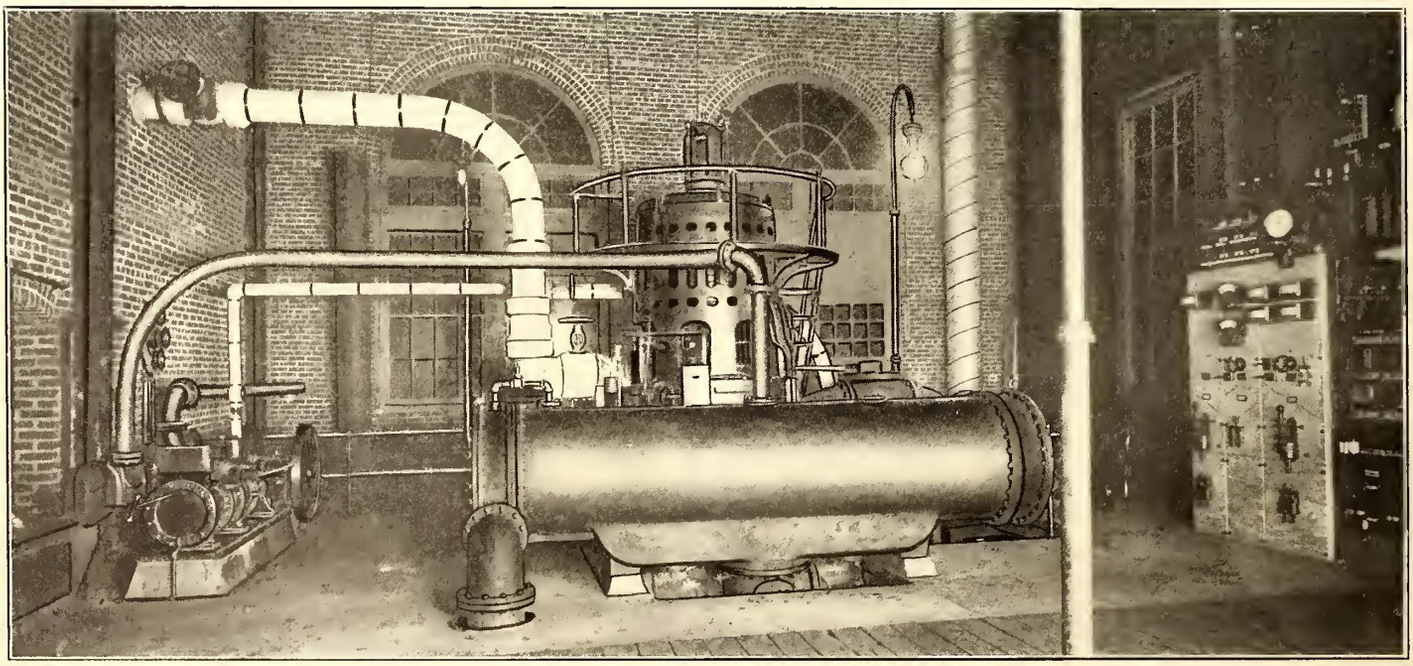


FIG. 10.—GENERAL VIEW OF OPERATING ROOM, SHOWING TURBINE AND CONDENSER

a deep hole, into which the intake pipe is laid. The intake and discharge pipes, which are 30 ins. in diameter, run from the bottom of the hot and cold well and extend a distance of about 30 ft. into the river. Considerable difficulty was experienced in laying them. A coffer dam of the usual type was built out into the river and excavation made. Several times, when the excavations were completed and the pipes were ready to be laid, This is pumped direct from the condenser discharge to the storage tank. The same pump is used to empty the drainage sump in the basement. By closing and opening the proper valves, shown in Fig. 14, water is pumped from the sump into the condenser discharge. Thus the pipe, which, in supplying make-up water, was the suction, becomes the discharge. The exhaust from the several auxiliaries is lead to the heater in the

boiler room. A by-pass around the heater is provided, however, and the exhaust may be passed direct to the atmosphere through a riser passing out the boiler room roof.

The generator immediately above the steam turbine is a four-pole, three-phase, 60-cycle machine, generating current at 2300 volts. With a continuous full load, the guaranteed temperature rise will not be above 40 degs. C. The machine will not be injured by a 100 per cent overload applied momentarily. The maximum rise in voltage when full non-inductive load is thrown off, is 8 per cent, the speed and excitation remaining constant. A 10-kw direct-driven motor-generator set furnishes the necessary current for exciting the generator. This is located near the west wall of the building. A quarter-phase induction motor drives the 125-volt, four-pole dynamo. In starting the plant, current for the induction motor is obtained from the Cherry Street station, over the wires which are also used for lighting the engine and boiler room. This current, at 2300 volts and 60 cycles, is stepped down to 220 volts by means of two single-phase type H transformers placed in the basement.

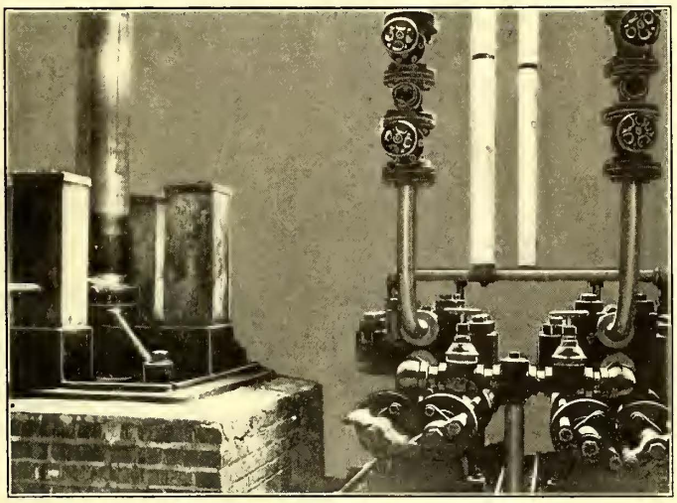


FIG. 11.—OIL PUMPS AND BASE OF ACCUMULATOR IN THE BASEMENT IN THE MULBERRY STREET POWER STATION

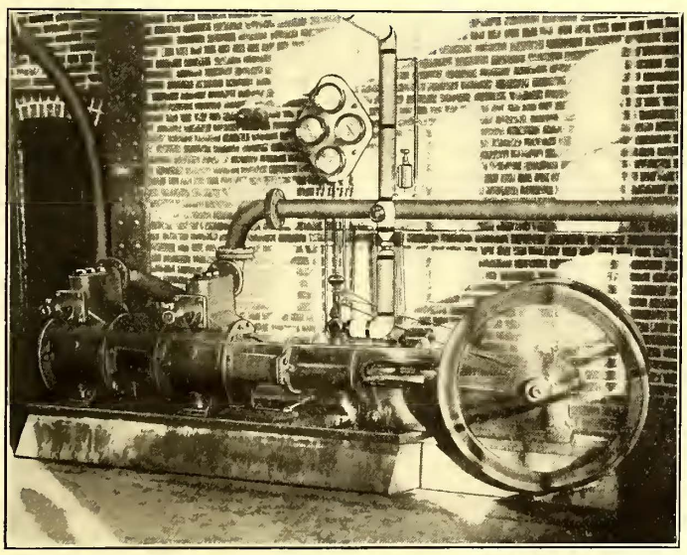


FIG. 13.—DRY VACUUM PUMP

The switchboard (Fig. 15), all the apparatus of which is of the General Electric make, and which is shown in the accompanying engraving, contains three panels of blue Vermont marble. The one on the left is mounted with the necessary instruments and switches of the motor-generator set. The central panel controls the generator, while the one on the right is for the load. The exciter panel carries a 25-amp. Thomson astatic ammeter, a 2500-volt oil switch and an overload relay. A 15-amp. Thomson recording wattmeter mounted on the back of the board measures the energy input of the exciter set. On the generator panel is mounted a 300-amp, two-pole, single-throw knife switch, a 175-volt Thomson astatic voltmeter and a 400-amp. ammeter. The load panel is equipped with an overload relay, a 300-amp. type F, four-pole oil switch, power factor ammeter, indicating wattmeter, and two 200-amp. ammeters, one in each phase. A 150-amp. recording wattmeter measures the total output. A single set of series transformers furnish current for the several measuring instruments, while another set of potential transformers provides low voltage current for all the voltmeters and wattmeters. From the load panel four 0000 cables carry the current direct to the switchboard of the Cherry Street station. Over the same pole line smaller wires are carried from the Cherry Street station for lighting the new station and operating the induction motor of the exciting set when the turbine of the new station is started. In bringing this pole line to the station, the poles were so placed as to not interfere with the contemplated extensions to the building. The station was erected by the Columbia Improvement Company, of Boston, O. A. Bridges having charge of the work.

The rapidity with which the plant was constructed is rather creditable to those in charge. The several accompanying photographs show the rapid progress. The first one (Fig. 4), taken May 14, shows the excavating not yet finished. Fourteen days later, May 28 (Fig. 5), the foundations were almost completed. On July 9 (Fig. 6) the framework of the building was up and the chimney erected. On Nov. 5 the plant was operated under load.

THE CHERRY STREET STATION

The station at Ninth and Cherry Streets is the largest of the three. It is located just to the rear of the present freight depot, which was formerly the car houses and the repair shops. The stacks from the several boilers and the roof of the power house may be seen in Fig. 16, which is a reproduction from a photograph of the Terre Haute freight depot. This station, with the assistance of the current obtained from the new turbine plant, in addition to operating the street railway system, furnishes current for all the electric power and lighting of the city of Terre Haute. In addition, an extensive system of steam heating mains, which supply heat to the business section of the city, leave the station. Although the station has been recently overhauled, it cannot be considered a modern one. However, it contains several features of interest.

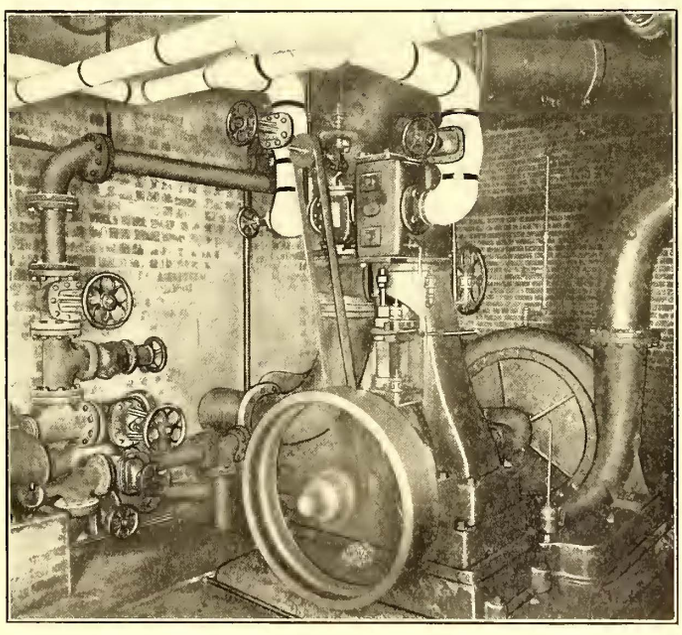


FIG. 14.—ENGINE-DRIVEN ROTARY CIRCULATING PUMP

Coal is hauled to the station in wagons from the neighboring railroad yards. Tracks are provided for hauling this in cars, but the added expense of operating the conveyors at night, the

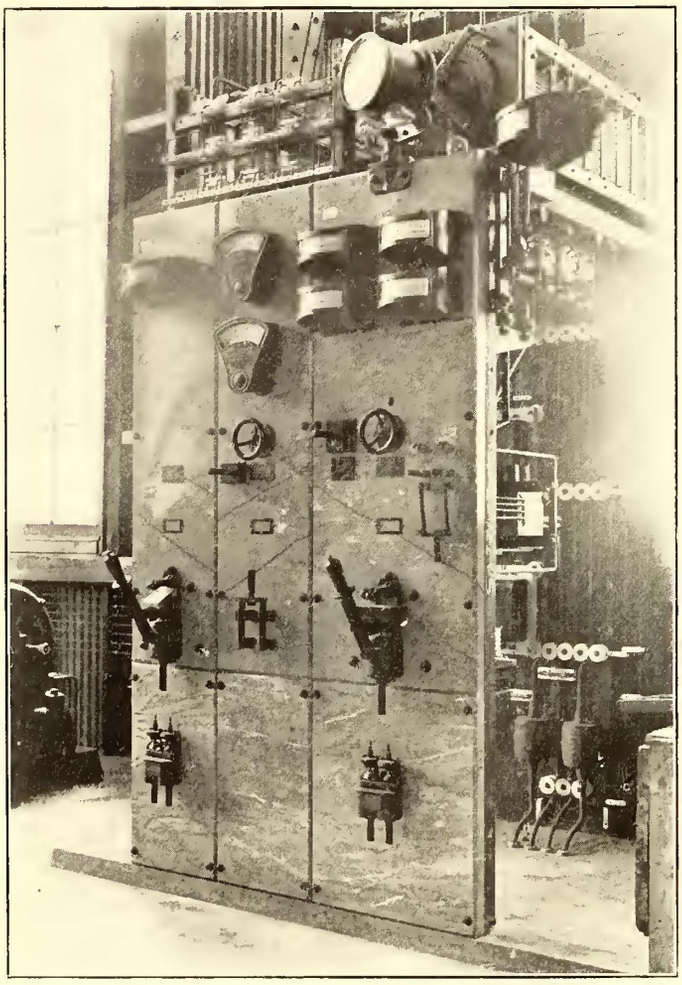


FIG. 15.—THREE-PANEL SWITCHBOARD IN MULBERRY STREET POWER STATION

only time the coal car could be operated without interfering with schedules, and other attendant expenses, make it advisable to employ wagons. Before reaching the receiving hopper, the wagons pass over a platform scales and the coal is weighed. A Hunt bucket conveyor of about 15 tons capacity per hour elevates the coal to overhead bunkers, which have a total capacity of 280 tons. The bunkers are divided into separate sections for each boiler, so that different grades of coal may be burned in the several furnaces. The same conveyors carry the ashes to an overhead bunker. An ash car (Fig. 22) receives the ashes from the bunker through a chute leading into the alley. The boiler room contains seven Cahall vertical water-tube boilers of 250 hp each, and two Climax vertical boilers, each of 500 hp, giving a total of 2750 boiler-hp for the station. All the boilers are equipped with Roney mechanical stokers, driven by Westinghouse engines. The stokers are arranged in three independent sets, two of these being in connection with the Cahall boilers. The boiler feed-water is obtained from the city water mains. Before passing to the boilers, however, it goes through a process of filtration and softening, this being that of the Industrial Water Softening Company of New York, the plant having a capacity of 5000 gals. per hour. In this system the chemicals, which precipitate the scale-forming solids, are introduced in two separate tanks. The paddles stirring the mixtures are operated by a water wheel, this being turned by the water entering from the city mains. Large settling tanks receive the mixture, and from these the treated water is pumped to a receiving tank by a motor-driven triplex pump located in the engine room. From the receiving tank the water flows by gravity to the four Dean feed-pumps. After passing through heaters, where it is raised to a temperature of 210 degs., the water enters the boilers. Each boiler is connected through an 8-in. bend to a 16-in. steam header, from which the separate engines are supplied. In all, there are seven generating units, five of which are located in the main engine room (Fig. 17), while the remaining two, which are belted, occupy an adjoining room. Non-condensing engines are used entirely, the exhaust being utilized in cold weather in the steam-heating system previously referred to. Four of the units generate alternating current used for power and lighting in the city, and for operating the sub-station on the Clinton interurban line. The current for the sub-station, generated at 2200 volts, 60 cycles, two-phase, is carried to a transformer sub-station located 600 yds. distant. It is here stepped up to 11,000 volts by means of Scott connected two-phase to three-phase transformers, and is transmitted as three-phase current over a high-tension line, consisting of three No. 4 aluminum wires, to the sub-station at Atherton, 11 miles distant. Here it is stepped down to 360 volts by two three-phase to two-phase 125-kw transformers, and passes to a 200-kw, 550-volt rotary converter. The direct-current generators consist of a 300-kw, 550-volt Westinghouse generator direct connected to a 450-hp Fitchburg simple non-condensing engine; a 300-kw, 550-volt General Electric generator to a 500-hp Armington & Sims engine, and a 200-kw, 550-volt Westinghouse generator belted to a 250-hp Westinghouse compound engine. For the alternating-current machines, two exciter units are provided. These consist of two 25-kw generators. One is direct connected to a 50-hp Westinghouse induction motor, the other being driven by a Westinghouse compound engine.

The oil from the several machines in the power house drains to a filter in the basement. This consists simply of three tanks, arranged one above the other, the oil flowing from the top of one tank to the one immediately below it. Two small duplex

FIG. 16.—FREIGHT DEPOT, WITH CHERRY STREET POWER STATION IN THE REAR

pumps then elevate it to a storage tank above, from which the distributing system leads to the oil cups of the several machines.

THE BRAZIL STATION

The station at Brazil is likewise used for city power and

lighting service, in addition to railway work. The boiler room contains seven horizontal tubular boilers, having a combined capacity of 660 hp. The engines are all belted to generators of different types. Of these, four, having an aggregate of more than 300-kw capacity, are for direct current at 550 volts. The alternating-current machines include one 200-kw and one 100-kw, 2200-volt Wood alternators. It is intended eventually to generate all the power for the system at the new turbine station on Mulberry Street, which, as has been stated, is so constructed as to permit of future enlargement.

CITY SYSTEM

The city is about equally divided by Wabash Avenue, extending east and west, which is laid with a double track. Single tracks branching off at several of the cross streets completely cover the city. The Wabash Avenue line continues east, forming the interurban line to Brazil. A continuation of the North Thirteenth Street line operates to Clinton. A twelve-minute schedule is maintained on all the city lines, each car usually having a run which takes it from the northern to the southern part of the city, or vice versa.

CARS

In all, there are eighty-six cars on the system. This number includes a snow-plow, a cinder car, a line car, two freight and express cars, and closed motor cars ranging in size from those of 16-ft. bodies to the interurban coaches on the Clinton or north line, which are 49 ft. over bumpers. There are twenty-three ten-bench open motor cars for regular city service, while for interurban work and for handling crowds in the city on special occasions there are six fifteen-bench cars of the same class. The standard closed city car, which has a 22-ft. body, and the standard ten-bench open car for city service are shown in Figs. 18 and 19. The cars operated on the Brazil or east interurban line were built by the Laconia Car Company. There are six of these, each 46 ft. 8 ins. over bumpers, 8 ft. 4 ins. over sills, and having a seating capacity for forty-six people. They are equipped with Brill 27-G trucks.

The three cars on the Clinton or north line (Fig. 20) were built by the John Stephenson Company, and are somewhat larger. They measure 49 ft. over bumpers, 8 ft. 9 ins. over sills, and seat fifty-two people. The four Westinghouse 38-B motors by which they are driven are mounted on St. Louis Car Company M. C. B. trucks, and are operated by means of K-14 con-

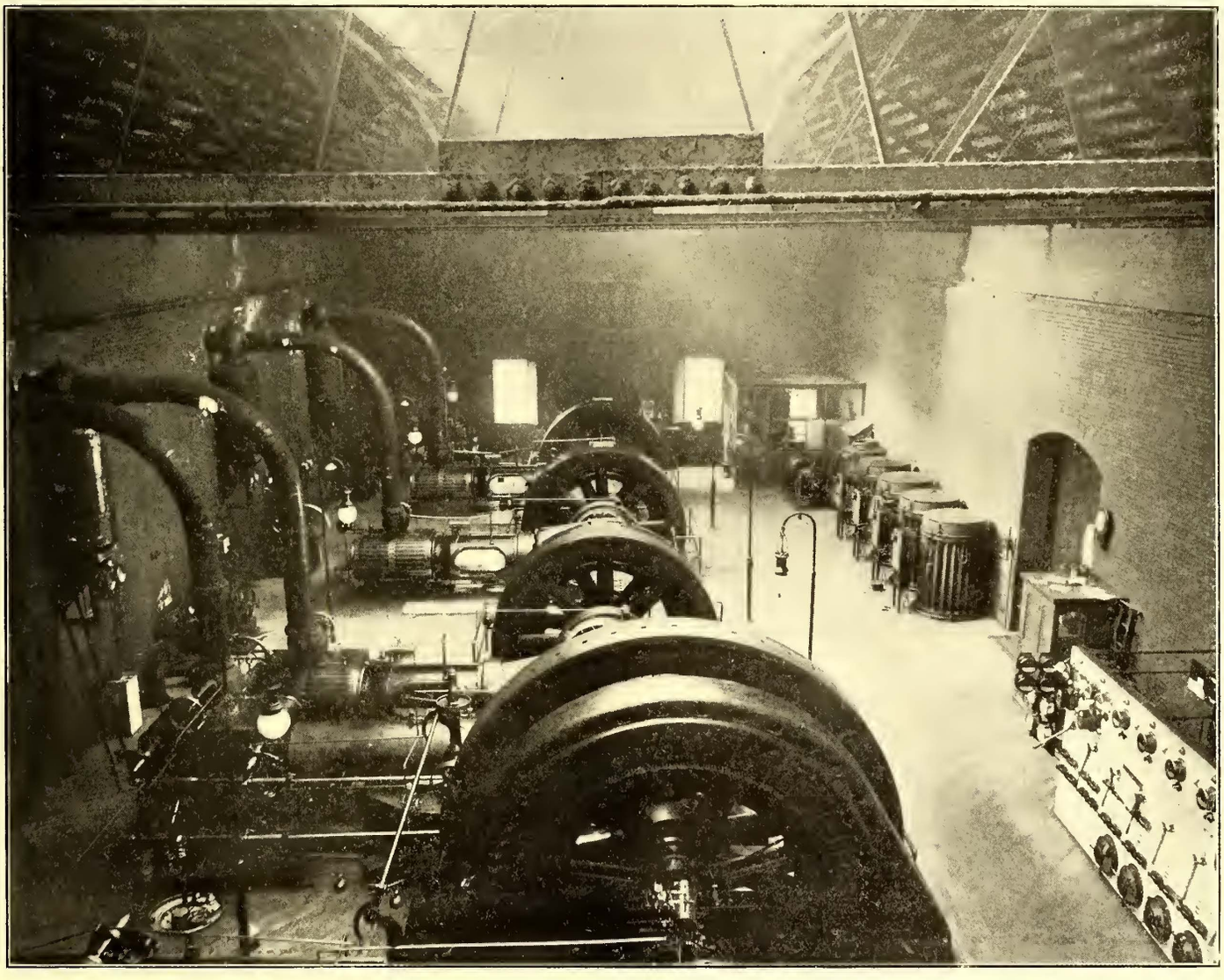


FIG. 17.—ENGINE ROOM OF CHERRY STREET STATION, FROM THE WEST

trollers. The engraving (Fig. 21) shows one of the two freight and express cars. These were built in Terre Haute by the American Car & Foundry Company, being 32 ft. 9 ins. in length, 6 ft. 11 ins. in width, and the bodies are 7 ft.. in height. The cinder car, previously referred to (Fig. 22), used in conveying ashes from the Cherry Street power house, is equipped with cabs at each end. Wood uprights support the two trolley bases. All the longer cars are provided with two trolleys, and the city, as well as the interurban cars, are equipped with controllers at each end, so that they may be operated in either direction, there being no loops at the ends of the lines.

Wilson trolley catchers are provided on both city and interurban cars. Wagenhals electric headlights are used on the interurban lines. The style of sign in use on all cars is plainly shown in the engraving of the standard open city motor car (Fig. 19). This is manufactured by the company, and was

designed by Mr. Wells, the resident manager of the system. The overhanging hood not only protects the painted sign, which may be easily removed for the insertion of a different one, but it also serves as a reflector for the two 16-cp lamps placed inside of it.

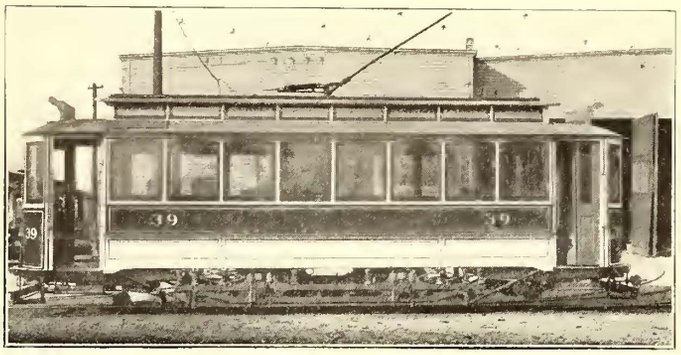


FIG. 18.—STANDARD CLOSED CITY MOTOR CAR

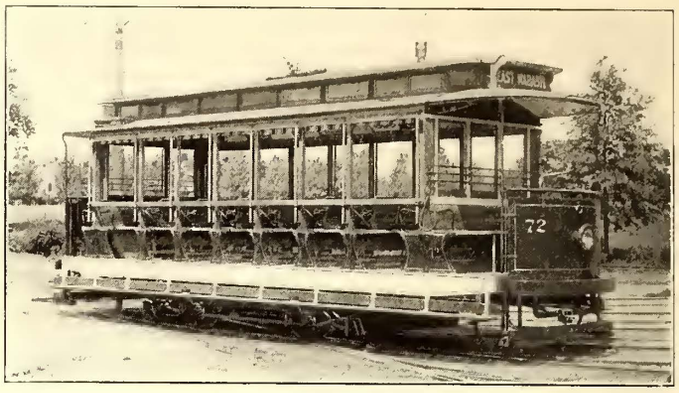


FIG. 19.—STANDARD OPEN CITY MOTOR CAR

INTERURBAN SERVICE

The interurban line running east extends to Harmony, a small town east of Brazil, and 19.17 miles distant from Third Street and Wabash Avenue, Terre Haute, which is the western terminus of the run. Over the portion of this line between Brazil and Harmony, probably the first interurban service in Indiana was inaugurated on July 15, 1893. A schedule with cars at one-hour intervals is maintained. This requires three cars, three hours being consumed in making the round trip.

FIG. 21.—STANDARD EXPRESS AND FREIGHT CAR

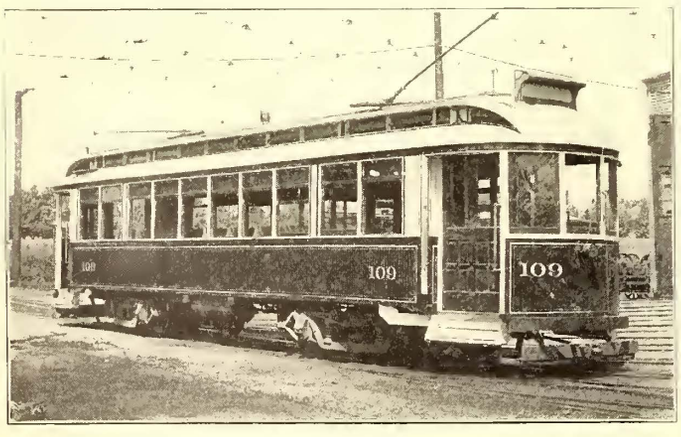


FIG. 20.—INTERURBAN CAR ON THE CLINTON LINE

The actual run to Brazil, 15.685 miles from the western terminus, requires but one hour, but to allow the cars to leave Brazil on the hour, it is necessary to consume one hour in making the round trip between Brazil and Harmony. The first car leaves Terre Haute at 4:45 in the morning. This runs through to Harmony. The car leaving Terre Haute at 5 o'clock runs to Brazil only, and leaves there on the return trip at 6 o'clock. Immediately behind it follows the car which has previously gone through to Harmony. This arrangement is affected for the accommodation of miners employed in the several coal mines between Brazil and Ermandale. At Ermandale the rear car turns back to Brazil, arriving there in time to leave on the regular 7 o'clock schedule. After this, the regular hourly schedule is maintained throughout the day and until 11 o'clock at night. Late in the afternoon, however, two extra trains are run to return the miners along the line to their homes in Brazil and Harmony.

In addition to the passenger car schedule, a freight and express car makes two round trips on the line each day. The interurban line north extends 16 miles to Clinton. Only two cars are required to maintain a one-hour schedule. On this line, too, a freight train makes two round trips a day. On Sundays it is necessary to double the schedule on the interurban lines to accommodate the increased travel.

INTERURBAN CONSTRUCTION

The interurban line to Brazil, which has been in operation since Sept. 1, 1900, was originally known as the Brazil Rapid Transit Company. The track is laid with 60-lb. standard T-rails in 60-ft. lengths, the joints being bonded with Chase-Shawmut bonds. The maximum grade on the line is 6 per cent, while the sharpest curve is of about 65-ft. radius. The track is well ballasted with gravel obtained from the company's pit near Williamstown. Bracket type of line construction is used except in towns and villages, where the trolley is supported by span wires in the usual manner.

FIG. 22.—CINDER CAR USED FOR CONVEYING ASHES FROM THE POWER HOUSE

The poles for the bracket construction are 35 ft. in length, placed 6 ft. 10 ins. from the center line of the track. Above

the bracket a single cross-arm is bolted. This carries four telephone wires and a single feeder, the pin for the feeder being placed near the pole on the side opposite the bracket. For a distance of 3 miles east from Terre Haute and west from Brazil, the single feeders are 500,000 circ. mils in area. They are then returned to 0000 wire for the remaining 4 miles in either direction to their termination. This leaves a gap of 2 miles between the terminals of the feeders. A 0000 feeder extends east from Brazil toward Harmony, a distance of 2 miles.

Double trolley is used. These are of 00 wire, and are hung on the brackets 19 ft. from the rail. At intervals of about 2 miles, sidings are located. Between Terre Haute and Harmony, the end of the line, there are ten of these, which divide the 19 miles of the line into eleven sections. This makes the distance between sidings comparatively small, and, consequently, very little time is lost by cars lying on sidings while waiting for others going in the opposite direction to pass.

Where the Southern Indiana Railway and the line intersect, the former passes over the electric line on a long wooden trestle. At the Glen Stock Farm, the second siding out of Terre Haute, the line passes over the tracks of the Vandalia Railroad. A steel viaduct (Figs. 23 and 24) several hundred feet in length carries the track at this point. Steel trolley poles of the lattice type support the trolley. Wood fillers insulate the brackets from the poles.

In general features the interurban line north to Clinton is similar in construction to the Brazil line. The rails are of the same weight, but are in 35-ft. lengths. The poles, 35 ft in length, carry between Terre Haute and the sub-station at Atherton, two cross-arms above the bracket. The upper one, together with a pin on top of the pole, support the three high-tension wires, these being arranged in a triangle with 27-in. sides. The lower bracket carries two telephone wires, and for the greater portion an aluminum feeder of 0000 copper equivalent. A single 00 trolley placed 19 ft. above the rail is used. The sidings are numbered, there being five between Terre Haute and Clinton. Spring frogs, as well as spring switches, are used in the track construction. At Clinton the line crosses the Wabash River over the county bridge. One-half mile east of the bridge the road passes over a low portion of the river bottoms, necessitating a heavy fill, which, together with a trestle 700 ft. long, extends for more than a mile.

The fare charged on the interurban line approximates 1½ cents a mile. The through fare between Terre Haute and Brazil, however, is only 20 cents. Twenty-five cents is charged between Terre Haute and Clinton. For through passengers the total amount of fare is collected at one time and a cash fare receipt given. For others, it is collected as each of the several 5-cent sections are passed over. The passenger traffic is largely that of the class usually found on interurban lines terminating in cities. It is, however, considerably augmented by the traffic between the several coal mines along the lines and by carrying the miners to and from their work. The freight traffic, previously referred to, is varied in its character, as may be observed by the assortment of freight ready for shipment, shown in (Fig. 25) the illustration of the freight car being loaded at the station. In addition to the freight hauled in the regular freight cars, every third passenger car carries small packages of express matter.

FIG. 24.—ANOTHER VIEW OF THE VIADUCT OVER THE VANDALIA RAILROAD, AT GLEN STOCK FARM

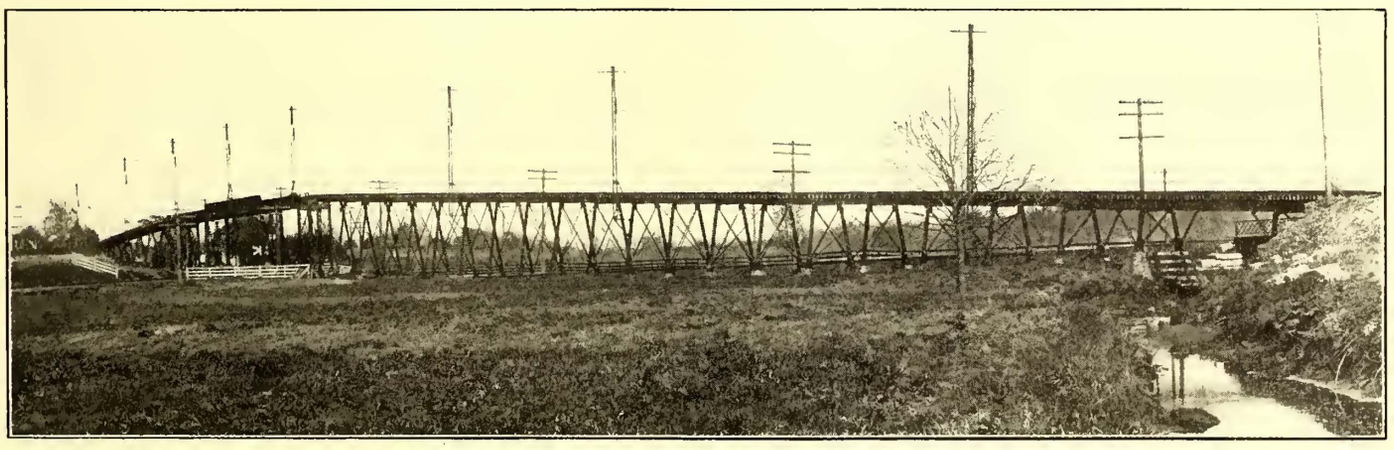


FIG. 23.—VIEW OF VIADUCT OVER VANDALIA LINE AT GLEN STOCK FARM

DESPATCHING

Cars are despatched over the interurban lines by telephone, the despatcher being located at the shops on Wabash Avenue. Three lines terminate at his board, one from the Clinton line, one from the Brazil and one from the switchboard in the offices of the company down town. The sidings of the north or Clinton branch are equipped with stationary telephones, while on the Brazil line each car is supplied with a telephone and cut-in boxes are located at the sidings. Formerly the Brazil line was operated without a despatcher, the car obtaining right to the block by throwing a switch at each siding. This system having been abandoned, the wires formerly used will be utilized as

duplicate wires to the despatcher's office in case of accident to the present one. Each telephone cut-in box will be equipped with a double-throw switch. In case one of the telephone lines becomes deranged, all the cut-in boxes may be connected to the other line by throwing the double-throw switch in the opposite direction. On the Brazil line, the conductor receives the orders

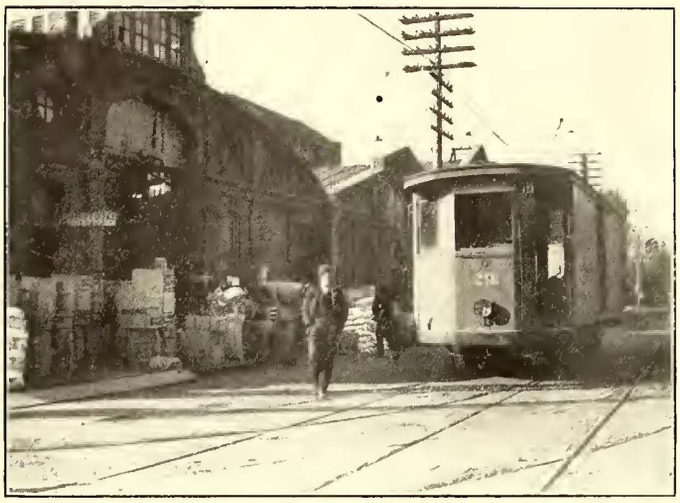


FIG. 25.—FREIGHT AND EXPRESS CAR BEING LOADED AT THE TERRE HAUTE FREIGHT STATION

from the despatcher and repeats them to the motorman. The Egry system of receiving despatches is employed on the Clinton branch. The motorman receives the orders and the conductor writes them down on the triplicator. Three copies are made, one of which is given to the motorman, while the conductor receives another, and the third remains locked in the machine.

The cars on regular schedule have regular meeting places, and despatching is resorted to only in case the cars get behind their scheduled time or extra trains are run. Although it is usually customary on other roads to give the car on scheduled time the right of way over the one behind time, in arranging passing points on this system no definite plan is pursued. In general, orders are given that will cause the least delay to both cars.

REPAIR SHOPS

The repair shops (Fig. 26) for the entire system are located on East Wabash Avenue, in Terre Haute, near the city limits, and are in charge of Morris M. Nash, railway superintendent and master mechanic of the system. The main building is of steel frame construction, with brick walls built in on the rear and the sides. The storage house contains ten tracks, all of which are provided with pits, the floor and track being supported by brick piers. The shops proper occupy the western portion of the building, a brick wall separating them from the storage section. They are well equipped for repair work, and practically all of it is done here, notwithstanding the fact that several large industrial plants of Terre Haute offer every facility for doing the heavier work. All the special work for the tracks is made in the shops. The rails are bent to shape by heating them and then bending them by means of jacks and a trip hammer. Motor repairs are all made from below. A hydraulic jack runs in a trench below the pits and at right angles to the tracks. This trench continues the full width of the building, passing under all the twelve tracks, so that repairs are readily made on any of the tracks of the storage house. When an armature is to be removed, the jack, which runs on a track in the trench, is shoved under the defective motor and raised against the lower shell. The hinge pins have all been removed from the motors, so that removing the necessary bolts permits the lower shell containing the armature to drop down with the jack. The jack carrying the armature and shell is then shoved to the eastern end of the pit, where it is immediately under an overhead traveler leading to the winding room. The armature is lifted by means of chain falls and carried to the winding room. After being repaired, the armature may be carried by means of the traveler to the lathe in the machine shop, where the commutator may be turned. By this arrangement all heavy lifting is avoided and much time saved, as one man alone may handle the heaviest armature.

Wheels are also removed from below. In several of the tracks immediately over the jack trench, sections of the rails may be removed. Wheels are dropped down by means of a jack and removed at one end of the pit. Cast-iron wheels are employed. These are made at the plant of the American Car & Foundry Company in Terre Haute. This company does all the heavy wheel work, the railway company sending the old wheels on the axles to them, and the axles are returned with the new wheels mounted. No attempt is made to grind flat wheels. When the flat spot becomes so large as to be objectionable, the wheel is removed. All armature coils, field coils, etc., are purchased, no attempt being made to wind them. Before being marked O. K., repaired armatures are submitted to an insulation test of 1000 volts. This voltage is obtained from a small step-up transformer located in the winding room and connected to the 110-volt alternating-current system used for lighting shops. Motors are carefully inspected and oiled each night. Once a month they are given a careful overhauling. The lower shell is dropped and the armature is removed. The shells are washed out with kerosene, and usually the inside is painted. The armature is likewise cleaned and painted. The motor axle bearings and the armature bearings of the cars on the Clinton line are equipped with oil lubricators of the Standard Automatic Lubricator Company, of Philadelphia. The lubricators are filled every three or four days, when about half of a pint of oil is required to each bearing.

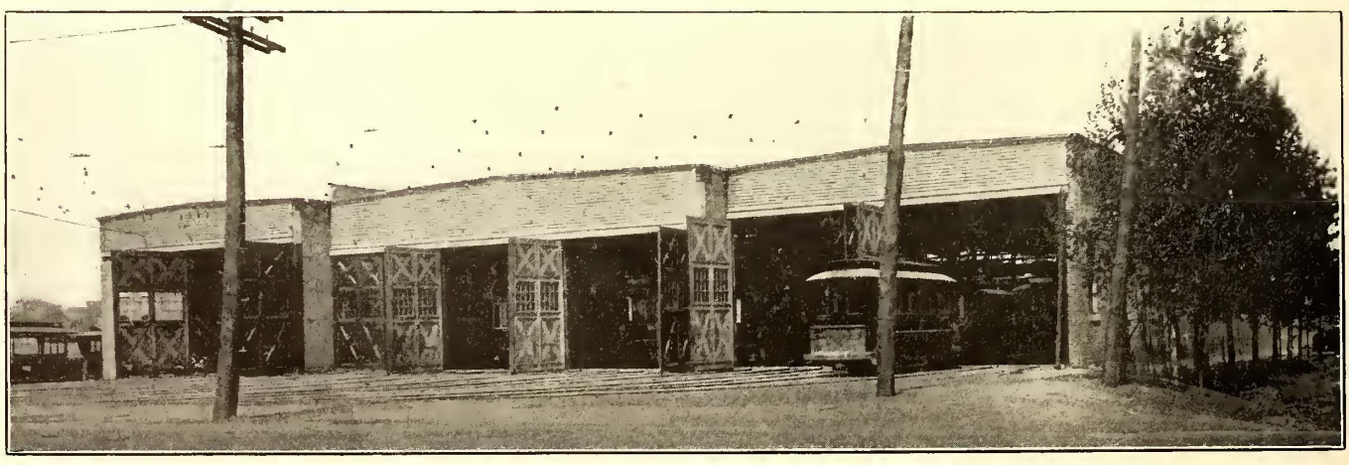


FIG. 26.—CAR HOUSE AND SHOPS ON WABASH AVENUE

PAINTING

A separate room is assigned in the shops for painting the cars. The standard body colors are green and white. The trucks are painted dark green, while the roofs are given a light drab color. Iron trimmings receive a coat of black asphaltum. In general, the striping and lettering is very plain, no corner ornaments being used, as may be observed in the engraving of the standard city box car. On the dark portions of the car, the striping and lettering is of aluminum leaf.

REGULATION OF HEATERS

Electric heaters are employed on the interurban cars as well as on those of the city system. The company recognizes the immense waste occasioned by electric heaters when in the hands of negligent trainmen, and has inaugurated a novel system to avoid much of the loss. The heaters are wired so that three gradations of heat may be obtained. At a specified place at the car houses, and at Sixth Street and Wabash Avenue, where all the cars of both interurban and city lines pass, signs with the numbers 0, 1, 2, 3 are hung up. When the sign with the zero mark is in place, the motorman understands that he is to keep his heaters turned off. The other signs indicate the number of points the heater switch is to be turned. The shop foreman exercises his own judgment as to what point the heater switches are to be turned when the cars start from the shop. The downtown sign is in charge of the starter, who hangs up the different signs according to the temperature. To insure the motorman following the signs, an inspector boards the car occasionally and notes the position of the switch.

MUTUAL BENEFIT ASSOCIATION

The company has sought to promote the welfare of its employees by all possible means, and has provided for their comfort, so far as their quarters are concerned, such facilities and accommodations as comport with the best afforded by companies of like character and size.

It has promoted and assisted in an organization of its men, known as a Mutual Benefit Association, and to this organization nearly all of the employees of the operating departments, both railway and lighting, belong.

Each member pays as dues 15 cents per week, and receives in benefits when sick, $5 a week, and in case of death a proportionately larger sum.

The government of the association is vested entirely in the men, but the company takes an active interest therein, and its officials are always welcome at any of its meetings.

EDUCATION OF EMPLOYEES

Both motormen and conductors are given a very thorough instruction in reference to their duties, both orally and by practical experience in the operation of a car, before they are passed to the status of full-fledged trainmen.

Not only are accepted applicants for work tested and instructed upon the cars by specially selected instructors, but they are also required to spend several days in shops, familiarizing themselves with the electrical equipment of the car and all the different parts of the apparatus connected with same.

While every endeavor is made to give a new man all help and assistance possible, and to expedite his advancement as rapidly as may be necessary, the process of education results in a sifting out of those who do not display natural aptitude for the work, or are not disposed to apply themselves honestly and thoroughly to the acquirement of the requisite knowledge, and by a final test, which is given by way of an oral examination by the superintendent and his helpers, the best men are selected and placed on the extra list for work.

The manager and his assistants are thoroughly alive to the necessity of securing a class of employees which shall be efficient and a credit to the company, but, as well, pleasing and agreeable to its passengers, and any method or system which is likely to insure the accomplishment of this object meets with ready adoption by the company's officials.

CALCIUM CHLORIDE FOR REMOVING SLEET AND PREVENTING ITS FORMATION

Since the introduction of the third-rail method for collecting current, every recurring winter has demonstrated anew the need for using some effective method to prevent the more or less annoying traffic interruptions due to ice-covered rails. Mechanical means involving the employment of scrapers and brushes usually are sufficient where the ice is of appreciable thickness, but they are seldom effective in those cases where a very thin glaze is formed, either through the freezing of rain or the condensation of surrounding vapor, on the colder rail. Despite its great thinness, this layer is an undesirably good insulator of the current-carrying rail, so that its speedy removal is a matter of considerable importance. Various electrical methods have been suggested whereby the sleet would be melted off the rail by raising its temperature, but none of these has been found economical, owing to the large amount of current required, particularly on long interurban lines, where the temperature often falls considerably below the freezing point.

It is fortunate, however, that a number of chemical experiments have also been made along this line by railway companies, and that the chemicals which have proved the best, namely, common salt (Na Cl) and calcium chloride (Ca Cl), are at the same time inexpensive. As is well known, water containing salt in solution has its freezing point lowered according to the density of the solution, and when salt is mixed with ice, the latter will melt at temperatures below the freezing point of water alone. These facts apply also to calcium chloride, but in considering the two, it is essential to bear in mind that calcium chloride is much superior to salt, because, unlike salt, its solutions have practically no corrosive effect on either steel or iron. Both chemicals corrode copper, but this point does not appear to be of any great importance, as very little of the solution squirted on the rails reaches the bonds.

A calcium chloride solution of the proper strength will prevent the formation of ice at a temperature so low as 32.6 degs. F. below zero. The following table, which was prepared by the Carbondale Chemical Company, of Carbondale, Pa., gives the quantity of 75 per cent "Solvay" fused or solid chloride of calcium required to make solutions of given specific gravities and corresponding freezing points:

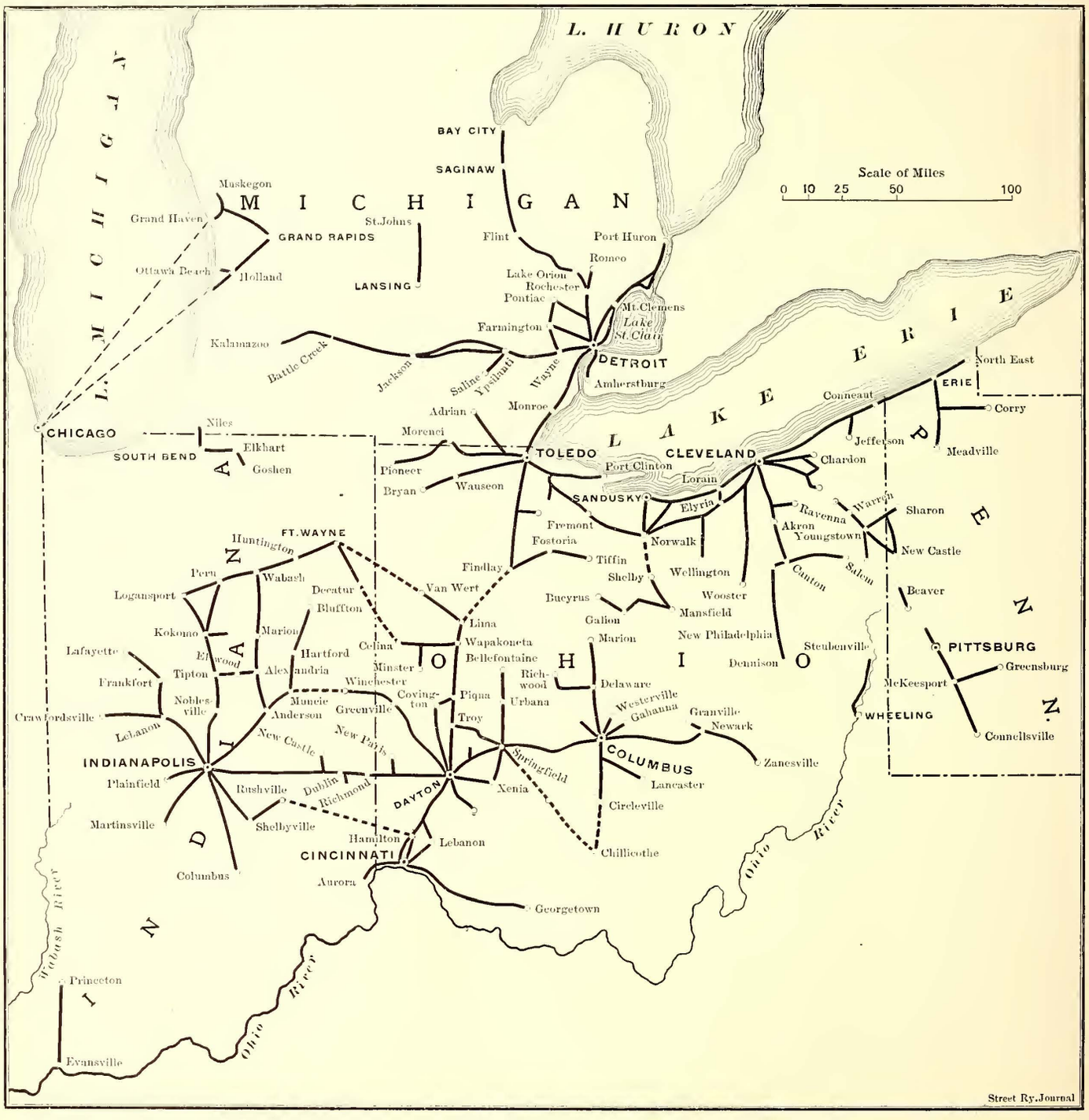
Specific Gravity	Per Cu. Ft. Solution	Per Gal. Solution	Freezing Point
1.250	28.75 lbs.	3 83 lbs	—32 6 degs F
1.225	26.55	3.54	—18.0
1.200	23.00	3.06	—9.0
1.175	19 72	2.63	Zero
1.150	16.83	2.24	7.5
1.125	14.09	1.88	13 0
1.100	11.82	1.57	18.0

The success and economy of calcium chloride on third rail is well exemplified by the article in the Jan. 21 issue regarding its use on the Aurora, Elgin & Chicago Electric Railway. The solution used by this company has a specific gravity, varying from 1200 to 1250, or a temperature range of —9 degs. F. to —32.6 degs. F. As 38 lbs. of calcium chloride is used for every 7½ gals. and only 1 gal. of the solution is required per mile, it is evident that the application of this method involves very little expense. Where the temperatures do not fall so low as on the line mentioned, the cost is even less, as the strength of the solution can be reduced.

A solution of chloride of calcium for fire pails is superior to one of salt or bicarbonate of soda, on account of its lower freezing point, non-corrosive effect on the ordinary iron or steel pail and its tendency to absorb water from the air instead of evaporating it.

LIMITED SERVICE AND INTERLINE BUSINESS

The year just closed has seen more important innovations in various branches of the electric railway industry than any other in the history of the business. It has witnessed the adoption of the single-phase alternating-current motor for interurban work, the use of the turbo-generator in traction power houses, the opening of the New York Subway, the adoption of



MAP OF PRINCIPAL INTERURBAN ELECTRIC LINES IN OHIO, INDIANA AND SOUTHERN MICHIGAN, SHOWING THROUGH ROUTES

electric locomotives on the New York Central terminal and the high-speed tests preliminary to this service, and the purchase of competing electric lines by a number of the great steam systems.

Perhaps of greater importance to the industry at large has been the completion of connecting links between the great network of traction lines in Pennsylvania, Ohio, Michigan and Indiana. Three lines completed within the past year render it possible to travel for hundreds of miles through these States without resorting to the steam roads, and hand in hand with this development has come the adoption by many of the connecting lines of high-speed limited trains, giving service equal in many respects to that of steam roads. Composite sleeping and parlor cars, buffet and chair cars and observation cars are now in actual service on some of the roads in this district, while other roads are planning to install similar service. These innovations have been referred to from time to time, but a detailed review of the conveniences and possibilities for fast long-distance travel now offered to patrons of electric roads are calculated to open the eyes of even those engaged in the business.

The scheme of operating limited trains is not altogether new, but different requirements lead to their adoption on different roads, although, of course, the desire to compete with a parallel steam road was a salient feature in every case. The service given by some of the roads in this district, together with rates

LIMITED TRAIN SERVICE

NAME.	From	To	Distance.	Time.	Time on City Track	Stops	Limited Trains Each Way.	Reg'lar Fare.	Excess.	Steam Fare.	Baggageon Limited.	Charge for Baggage.	Seating Capacity.	Length of Car	Number and Size Motor	Size of Wheels	Kind of Wheel.	Flange Dimensions.	Weight of Car.	Special Features.
				Hrs.Min	Min.			$		$				Feet.				In.	Tons.	
Lake Shore Electric Ry.	Cleveland to Toledo		118	4 45	60	13	3	1.75	No	3.25	Yes	No	42	50	4– 75	34½	Steel Tire	1	34	
Lake Shore Electric Ry.	Cleveland to Sandusky		60	2 30	40	6	5	1.00	No	1.80	Yes	No	42	50	4– 75	34½	Steel Tire	1	34	
Western Ohio & Dayton & Troy	Dayton to Lima		80	2 37	35	5	4	1.45	No	2.20	Yes	Yes	46	51	4– 75	37	Steel Tire	1⅛	35	Parlor-Buffet
Dayton & Western & Ind. & Eastern	Dayton to Indianapolis		108	4 15	55	8	3	1.75	.50	3.30	No	Yes	26	45	4– 50	33	Steel Tire	1⅛	32	
Indianapolis & North Western	Indianapolis to Lafayette		69	2 30	35	5	5	1.05	.20	1.90	Yes	Yes	66	62	4– 75	33	Steel Tire	1⅛	42	
Indianapolis & North Western	Indianapolis to Crawfordsville		52	1 50	30	3	6	.75	.10	1.35	Yes	Yes	66	62	4– 75	33	Steel Tire	1⅛	42	
Indiana Union Tr. Co.	Indianapolis to Logansport		81	3	30	15	9	1.25	.25	2.35	No	Yes	48	56	4– 75	37½	Steel Tire	1⅛	36	Chairs in Smoker
Indiana Union Tr. Co.	Indianapolis to Muncie		57	2	35	10	10	.85	.15	1.50	No	Yes	48	56	4– 75	37¼	Steel Tire	1⅛	36	Chairs in Smoker
Columbus, Newark & Zanesville	Columbus to Zanesville		65	2	30	1	3	1.05	.35	1.75	No	Yes	24	51	4–150	..	..	..	50	Holland Sleeper
Detroit, Ypsilanti, Ann Arbor & Jackson	Detroit to Jackson		76	2	35	4	8	....	.20	....	No	Yes	56	52	4– 75	36	Cast Chill.	1⅛	32	Chairs in Smoker
Jackson & Battle Creek	Jackson to Battle Creek		46	1	25	3	8	.65	No	.90	No	Yes	64	60	4–125	28	Steel Tire.	..	44	Observation End
Grand Rapids, Holland & Chicago	Grand Rapids to Holland		34	1	30	7	13	....	No	....	No	Yes	52	49	4– 50	33	Cast	⅝	30	

of fare as compared with those of competing steam roads, details of equipment, etc., are graphically shown in the accompanying table.

The Lake Shore Electric Railway, the pioneer in long-distance limited train service, has amply demonstrated that with fast service many people can be induced to use electric roads for trips of 100 miles or more. The service adopted a year ago between Cleveland and Toledo has proven so popular that frequently it has been necessary to run double-headers on these runs. Recently the limited service was extended to cover Sandusky, and there are now five fast trains each way between Cleveland and Sandusky; three running to Toledo. Plans are being perfected to extend the service to Detroit, 178 miles. The per cent of through business is increasing each month. The low rate of fare attracts those who aim to travel as cheaply as possible, while the convenience of having trunks carried with them and checked free attracts an unusually large number of traveling men. Reports covering ten months of operation indicate that limited cars earn an average of 38 cents per car-mile, as compared with 25½ cents per car-mile for all interurban passenger cars, including limiteds. The cars used in this service have a baggage compartment and a smoking room similar to that in a Pullman sleeper. Seats in both compartments are upholstered in leather and are comfortable for a long ride. By an arrangement with a caterer at Norwalk, passengers on the noon limiteds are served with attractive lunch en route. Cars leave Toledo and Cleveland at 7:30 a. m., 1:30 p. m. and 7:30 p. m., and stop only at the larger towns.

The interline limited service conducted by the Dayton & Troy Electric Railway and the Western Ohio Railway between Dayton and Lima, is probably the fastest regular service in the country for the distance. Cars leave each terminal at 8:18 a. m., 11:18 a. m., 2:18 p. m. and 5:18 p. m., this arrangement being made so as to allow passengers ample time to make connection at terminals with cars on other roads arriving and departing on the even hour. The schedule provides for an average speed of 33 m.p.h., although the cars traverse about 6 miles of city streets and make five regular stops, collecting and taking off baggage. The time is practically the same as that of the parallel steam road, and a record kept by a disinterested party for a month recently indicated that the electric cars were on time 40 per cent more times than the steam trains. Under the arrangement between the two companies, each road furnishes a car and crew, and they run through without change, each company maintaining its car and paying its own crew. The earnings are divided on a basis of local fares. The Dayton & Troy Company states that the earnings from limited cars is about 5 cents per car-mile greater than those of regular local cars, while the operating expenses are about 25 per cent less. At present no excess fare is charged, but the companies are planning to place carpets and chair seats in these cars and make a slight excess charge. No change has been made in the regular hourly service on these roads by reason of the limiteds, and the business on local cars does not appear to have fallen off.

Under an arrangement with the Richmond Street & Interurban Railway and the Indianapolis & Eastern Railway, the Dayton & Western Railway is operating "Interstate Limiteds" between Dayton and Indianapolis. The Dayton & Western has been running parlor buffet cars between Dayton and Richmond for two months, and the lowering of the grade under a bridge at Richmond now renders the through service possible. There are three trains each way, leaving either terminal at 7:10 a. m., 12:10 p. m. and 6:10 p. m.. This is arranged so that people will take advantage of the buffet service and to make close connections with limited cars on other roads. The cars stop only at stations in the larger towns, and a passenger is required to purchase a seat check before entering the car. Sales of seats are telephoned ahead and seats are reserved, and sales never exceed the seating capacity of the car. The interurban lines have a more direct route between the terminals than the competing steam lines, and the running time is nearly as good. Including the excess of 50 cents for the through run, or 25 cents between points on any one or two roads, the fare is considerably cheaper, and in view of the superior accommodations it is believed that the service is bound to be successful. The buffet service is claimed to be the first in regular service on an interurban road. The menu follows closely that used on regular Pullman buffet cars, and the prices are very reasonable. A copy of the menu is shown herewith. It contains three coupons, one to be retained by the waiter, one is handed to the conductor with the cash, and the third the passenger's receipt. The buffet cars were built by the Barney & Smith Car Company, and illustrations of interior, exterior and floor plan are shown herewith. The cars are finished in St. Jago mahogony, with inlaid decorations of the most recent design. The floor of the smoking room is covered with inlaid linoleum, while that in the main room has heavy Wilton carpet. Chairs

in the smoking room are leather covered, while those in the main room are plush. The buffet between the two compartments contains stove, refrigerator, sink, shelves, etc. There is also a toilet room, lavatory, water cooler, etc. The floor framing is particularly heavy for a car of this length, and the floors

WESTERN OHIO "LIMA LIMITED"

are thoroughly deadened. The car is mounted on Barney & Smith class J trucks. It is fitted with four Westinghouse No. 56 motors, Christensen AA-1 air brakes, K-14 controller, Wagenhals headlight, and 33-in. steel-tired wheels with 1-in. x 1-in. flange. Although the motor equipment is somewhat lighter than that used by many roads for similar service, the cars have shown a speed of 65 m.p.h., and have been run continuously all day without overheating the motors.

For the past five months the Columbus, Buckeye Lake & Newark Traction Company and the Columbus, Newark & Zanesville Traction Company, which are operated by one management, have been operating two Holland composite sleeping and parlor cars between Columbus and Zanesville. The run, of course, was not long enough to make use of the sleeping car feature, but the cars make magnificent parlor cars. They have chair seats with foot stools, individual reading lamps, smoking compartment with leather chairs, electric cigar lighters, toilet rooms and lavatories for both men and women, and the finish is of the highest quality. The scenery along this route is probably as fine as is to be found on any interurban road in the country, and with such luxurious equipment, and without the smoke and dust of the steam road, it makes a trip that ought to attract all the business, particularly as the fare, including the excess, is 35 cents less than that of the steam roads. The cars ride like Pullmans, as they weigh nearly 50 tons each, and have five separate floors, each deadened by a layer of asbestos. They have four 150-hp motors, and are capable of a speed of 70 m.p.h. The arrangement with the Holland Company is very similar to that made by steam roads with the Pullman Company. The Holland Company maintains the interior of the car, the painting, etc., pays the porters and retains the excess fares, and also receives a mileage for the use of the car. The railway company pays its own crew and maintains the equipment. Seats are sold the same as in a Pullman, and the seating capacity of the car is not exceeded.

The earnings of the Holland cars when used as sleepers will necessarily be very much larger than when they are employed as chair cars for day service only, as at present. So far the local conditions on the connecting lines have not been such as to permit of any long trips as that for which sleeping cars are required, but physical connections and improvements are under way on many of these roads by which sleeping cars can be operated over the long routes for which they are designed. The Holland Palace Car Company is now conducting negotiations with several of these connecting lines by which these cars will be taken off of the lines of the Columbus, Buckeye Lake & Newark Traction Company and the Columbus, London & Zanesville Traction Company, so that the present arrangement will shortly terminate.

These companies have therefore arranged to use for this service a parlor car which they have at present. This car, which was heretofore used for private parties, is 55 ft. long and has chair seats. The excess fare will be reduced to 15 cents to Newark and 25 cents to Zanesville. For the balance of the winter there will be two runs instead of three, which will make it possible to take care of the service with the one car. Next spring another car of this type will probably be installed and the old schedule adopted again.

The Indiana Union Traction Company has had long experience in the operation of limited cars, and has settled on the policy of making every other car a limited. Limited cars over two of its lines leave Indianapolis on the odd hours. They make stops only in the centers of towns, while the local cars sandwiched between make all local stops. The excess on limiteds runs from 5 cents to 25 cents, according to distance. The excess is not large enough to be objectionable to the majority of the people in the towns, while the faster service is of great convenience to such people as well as to traveling men. The theory that the country people, who a few years back had no access to the cities other than driving, should be satisfied with a car once in two hours, and not insist upon all cars stopping in front of their doors, is one which is gaining favor, and a number of roads are following the example of the Indiana Union Traction Company. For the limited service, the company has a number of fine 56-ft. cars, built by the Cincinnati Car Company, and described in this paper some time ago. They have chair seats in the smoking compartment and have

DAYTON & TROY "LIMA LIMITED"

a buffet compartment, although this is not used at present.

The Indianapolis & Northwestern Railway operates limiteds over two divisions, at intervals of about three hours, and the local car is dropped out on the hours that the limiteds run. Baggage is carried on every car, and the service is used very largely by commercial traveling men. The cars are among the largest used in interurban service, and were built by the Laconia Car Company; one of them is illustrated. Limited cars on this line earn about 8 per cent more per car-mile than local cars.

The Detroit, Ypsilanti, Ann Arbor & Jackson Railway has recently instituted limited service between Detroit and Jackson. The limiteds, known as "Specials," leave Detroit every two hours. Between these are four cars; two making a local run to Wayne, 12 miles; one making a local run to Ann Arbor, and the third a local run to Jackson, all on the same route. A small excess is charged, and the cars are drawing a class of

traveling men that the road did not get heretofore. If the service proves profitable, special parlor cars will be installed.

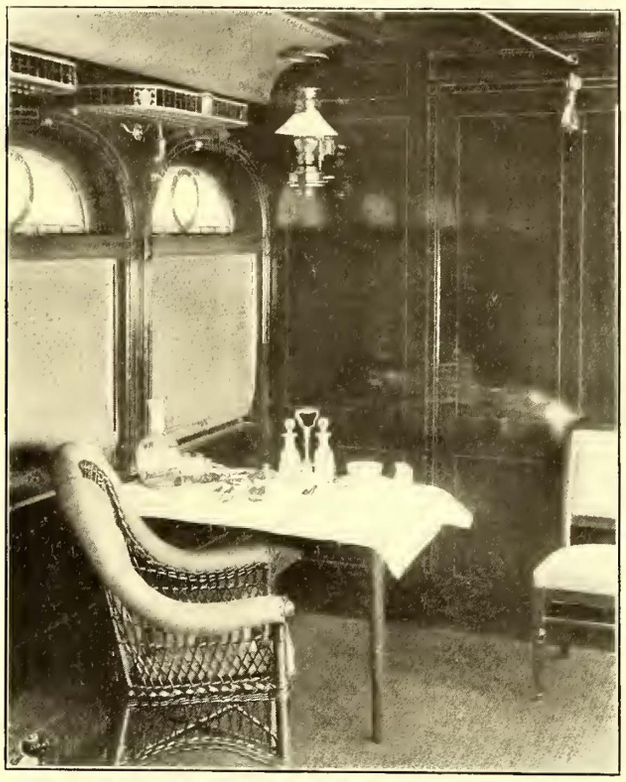
The Jackson & Battle Creek Traction Company operates limited cars between Jackson and Battle Creek at intervals of two hours. They make three regular stops and several flag stops. There are also five through locals and three locals for intermediate points a day. The limiteds seem to have worked up a tremendous amount of through business, as the company states they earn an average of 153 per cent more per car-mile than local cars. These limiteds make direct connection in both directions with the limiteds on the "Ypsilanti" line, rendering possible a trip of 122 miles in four hours and thirty-five minutes. The cars used in this service were described and illustrated in a recent issue of this paper. They have a circular smoking compartment and an observation end, in which there are chair seats. The running time is within five minutes of that of steam trains making the same stops.

The Grand Rapids, Holland & Chicago Railway has hourly headway the year around between Grand Rapids, Holland and Douglass. During the late fall, summer and early spring, it operates half-hour cars, which run limited, stopping only at towns. These cars are scheduled only at starting point and run through as fast as possible, the road being double track. The schedule is arranged so that a car runs limited in one direction and returns as a local. It is found that this counterbalances any evil effects from the continuous strain of high speed and makes all the equipment work alike. The company also runs cars each way night and morning to connect with boats to Chicago. These cars run through without stops except at steam crossings, and make 2 miles in Grand Rapids, 1½ miles in Holland and 26 miles in the country in fifty-six minutes.

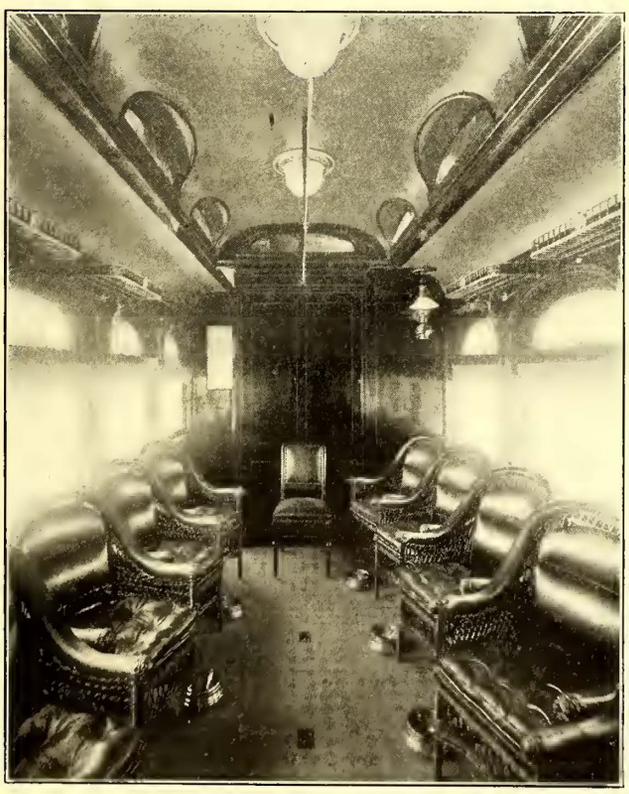
The Grand Rapids, Grand Haven & Muskegon Railway operates limited cars morning and evening to connect with boats for Chicago, and make the 34 miles in one hour and twenty minutes. For this service a dining car has been fitted up and breakfast is served to passengers for Grand Rapids.

The Detroit & Port Huron Shore Line Railway operates limited cars between Detroit and Port Huron, leaving Detroit at 7:45 a. m. and 3:15 p. m. These cars make five stops and cover 71 miles in two hours and thirty-five minutes.

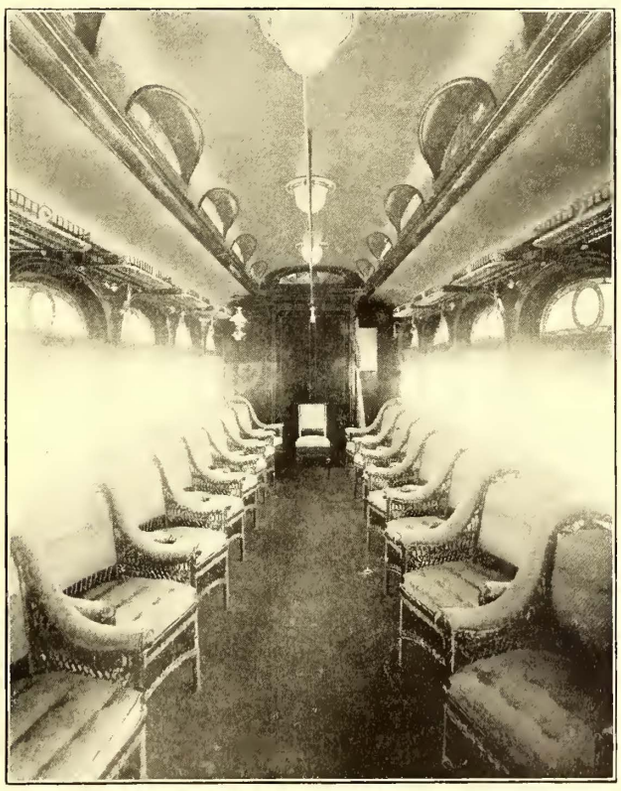
The Cleveland, Painesville & Eastern Railway has operated for several years limited cars from Painesville to Cleveland in the morning and returning at night, for the benefit of Painesville people who do business in Cleveland, making the 31 miles in one hour and twenty minutes. The Cleveland, Painesville & Ashtabula Railway has a car from Ashtabula each morning



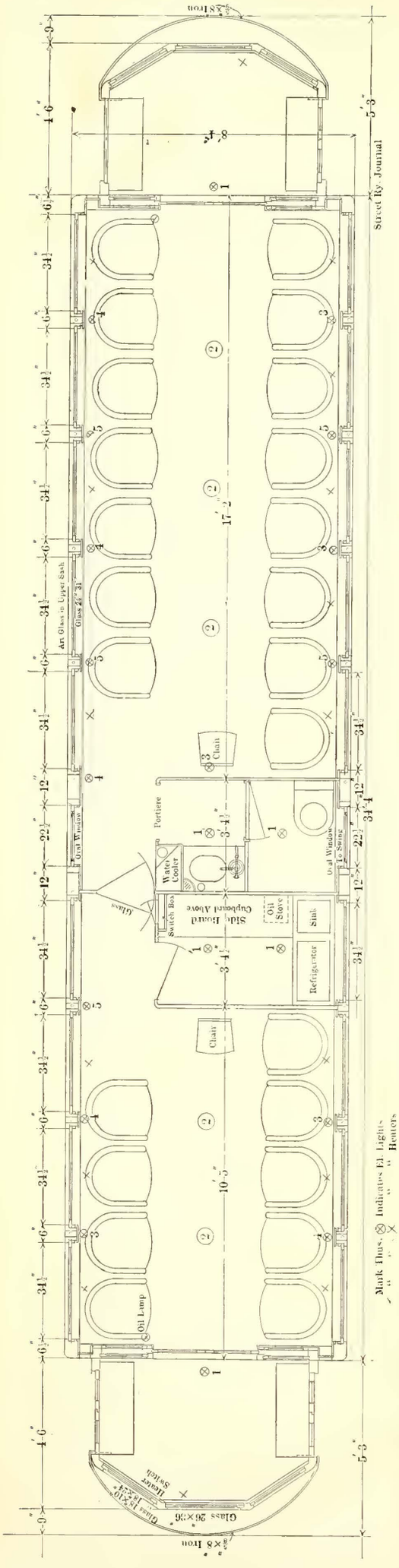
BUFFET LUNCH, DAYTON & WESTERN "LIMITED"



SMOKING COMPARTMENT, DAYTON & WESTERN "INTERSTATE LIMITED"



PARLOR COMPARTMENT, DAYTON & WESTERN "INTERSTATE LIMITED"



SEATING PLAN OF LIMITED CAR USED ON "INTERSTATE LIMITED," DAYTON & WESTERN TRACTION COMPANY

THE WAY TO GO D AND W

Buffet Service

MENU

Passenger will please make cross ⊗ mark in circle before each article desired
If more than one portion is wanted, specify in figures

○ Sliced Oranges, 10c	.10	0	0	0
○ Shredded Wheat Biscuit, with Cream, 20c	.20	0	0	0
○ Grape Nuts Food, with Cream, 20c	.20	0	0	0
○ Consomme or Tomato Soup, 20c	.20	0	0	0
○ Oysters on Half Shell, 25c	.25	0	0	0
○ Oyster Stew, 30c	.30	0	0	0
○ Boned Chicken, 30c ○ Sardines, 30c	.30	0	0	0
○ Cold Boiled Ham, 25c	.25	0	0	0
○ Baked Beans (hot or cold), 20c	.20	0	0	0
○ Boiled Eggs, 15c	.15	0	0	0
○ _____		0	0	0
○ Queen Olives, 15c	.15	0	0	0
○ Imported Chow Chow, 20c	.20	0	0	0
○ Pickles, 10c	.10	0	0	0
○ Bread and Butter, 10c ○ Boston Brown Bread, 10c	.10	0	0	0
○ Ham, Cheese or Tongue Sandwich, 15c	.15	0	0	0
○ Sardine Sandwich, 20c	.20	0	0	0
○ _____		0	0	0
○ Crackers, 10c	.10	0	0	0
○ Imperial or Swiss Cheese, 15c	.15	0	0	0
○ Caviar, 20c	.20	0	0	0
○ Coffe, 10c ○ Tea, 10c ○ Milk, 10c	.10	0	0	0
○ Cigars—Domestic, 10 and 15c		0	0	0
○ Cigars—Imported Havana, 15cst, and two for 25c		0	0	0
Total				

A separate check must be issued to each passenger

Waiter's No. 1 2

B. S. Passenger's Receipt for Meal. Waiter's No. 1 2
To be punched by Waiter and returned to passenger.

Cents	50	55	60	65	70	75	80	85	90	95
	0	5	10	15	20	25	30	35	40	45
Dollars	0	1	2	3	4	5	6	7	8	9

This Receipt should correspond with amount of your order. Please report any overcharge or inattention to duty on this car to General Passenger Office, Dayton, enclosing this receipt with report.

B. S.

Dollars	0	1	2	3	4	5	6	7	8	9
Cents	0	5	10	15	20	25	30	35	40	45
	50	55	60	65	70	75	80	85	90	95

After duplex receipt has been punched, waiter will detach this portion of check and give at once to conductor.

Waiter's No. 1 2

REGULAR MENU CARD, DAYTON & WESTERN "LIMITED"

CAR _____ LINE _____
LEAVING _____ M. _____ 190
ARRIVING _____ M. _____ 190

RAILROADS	Miles	PASSENGERS
		Paying
		Free
		Total
		EARNINGS
		Cash
		Tickets
TOTAL		Total

MARK EVERY CHAIR USED, HOWEVER OCCUPIED.

LADIES' TOILET		LINEN
1 2	B	A 1 2
1 2	D	C 1 2
1 2	F	E 1 2
1 2	H	G 1 2
1 2	J	I 1 2
1 2	L	K 1 2

CHAIR 4 — SMOKING
CHAIR 3 — SEAT 2 1
HEATER — TOILET

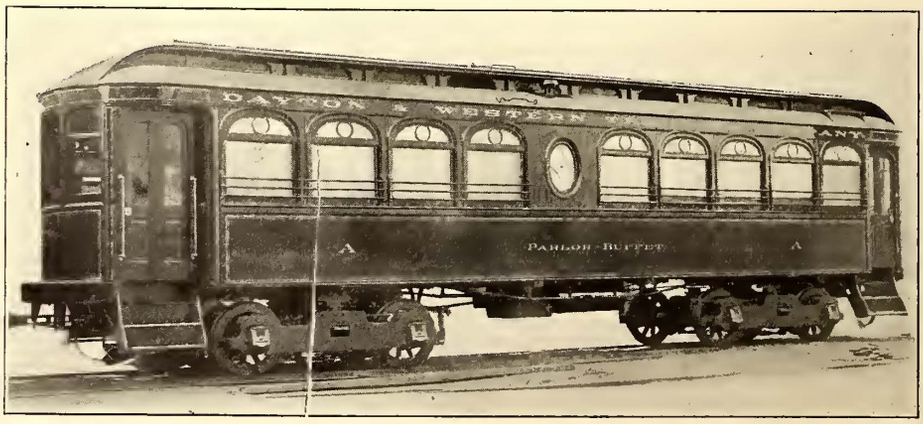
Form 3—2M—8-04 ORDER BY NUMBER.

PORTER'S CHART, HOLLAND SLEEPER, C. N. & Z. R. R.

which connects with the Painesville limited, giving a run of 61 miles in two hours and twenty minutes. No excess is charged.

The four roads between Cleveland and Erie, Pa., have arranged their schedules so that all hourly cars on these roads make close connections, and tickets are being sold through for $1.85, as compared with $2.75 on the steam roads. Negotiations are on for through limited cars between these points.

A number of roads are figuring on instituting limited service next spring. The Canton-Akron Railway Company and the Northern Ohio Traction & Light Company are planning to institute three fast cars a day between Canton and Cleveland, stopping only at Cuyahoga Falls and Akron, making the 59 miles in two hours and twenty minutes. The Canton & Akron Company is also planning to institute limited service between Canton and New Philadelphia.. These cars will connect with the Cleveland cars, giving fast service from New Philadelphia to Cleveland. The Pennsylvania & Mahoning Valley Railway is instituting a new limited service from Warren, Ohio, to New Castle, Pa., in much faster time than has prevailed heretofore. The Toledo, Bowling Green & Southern Traction Company will shortly institute limited service between Toledo and Findlay; three trains each way; time, one hour and fifty minutes, a tremendous improvement over the old schedule of three hours and ten minutes, and practically the same as the time of the steam road. The Detroit, Monroe & Toledo Short Line will



DAYTON & WESTERN PARLOR BUFFET CAR, "INTERSTATE LIMITED"

institute limited service between Detroit and Toledo as soon as the north end of the road has been thoroughly ballasted.

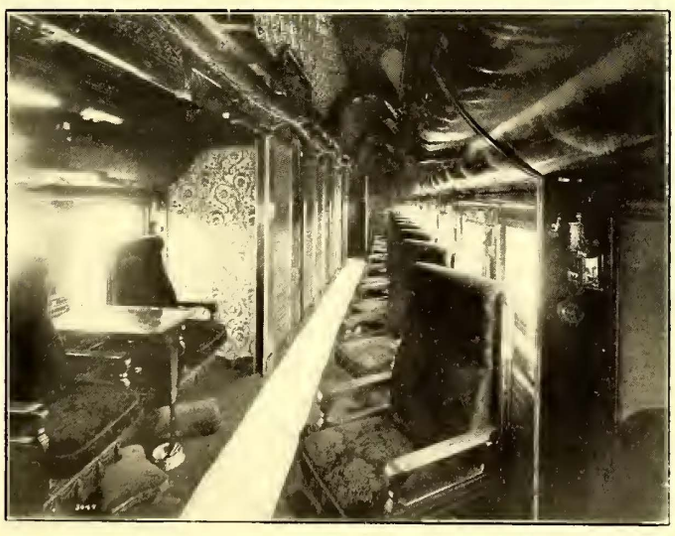
The 60 miles will be made in two hours instead of two and one-half hours, the present schedule. It is very probable that

INTERIOR OF HOLLAND PARLOR & SLEEPER, NEWARK & ZANESVILLE " LIMITED"

cars will be run through from Cleveland to Detroit under an arrangement with the Lake Shore Electric Railway. This run of 178 miles will be made in six hours and thirty minutes.

POSSIBILITIES FOR THROUGH TRAVEL

The existing possibilities for through traffic and those in sight in this district are most interesting. The accompanying map shows the connecting lines of Western Pennsylvania, Ohio, Indiana and Southern Michigan, together with a few roads nearing completion; it is not intended to be a complete map of all the roads in this district. The present longest possible continuous trip is from Corry, Pa., to Kalamazoo, Mich., about 480 miles. From Dennison, Ohio, to Bay City, Mich., gives a trip of about 450 miles. From Logansport, Ind., to Zanesville, Ohio, is a trip of 335 miles. It will be noticed by



INTERIOR COMPOSITE SLEEPER AND PARLOR CAR, PARTLY CONVERTED

reference to the map that there is a zone extending through Northern Indiana, Central Ohio and Western Pennsylvania which has not yet been crossed by any electric line. This year the gap between Lima and Findlay, Ohio, will be closed and probably other lines will be built across this zone, and it will then be possible to make journeys of from 800 miles to 1000 miles. The steam road man will say that it is preposterous for electric roads to hope to secure business over any such distances, but well-informed electric traffic men know that it is coming their way. The low rates of fare are bound to be an attraction, while the frequent service, the possibility of close connections, aided by the instituting of limited trains, places the electric lines in a position to capture a considerable amount of the business between points 200 miles to 300 miles apart. Of course, when such points are on the same steam trunk line, the steam has the advantage, but if they are accessible only by traveling over two or three steam lines, particularly where they are branch lines with one or two trains a day, the electrics can frequently deliver the party at his destination before the steam roads. Here are cases presented in the "deadly parallel":

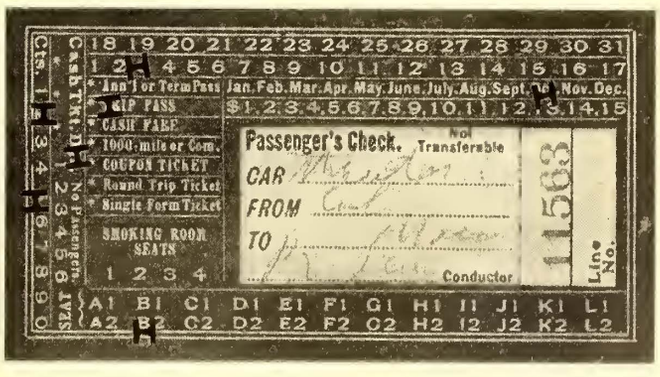
A MAN GOING FROM AKRON, OHIO, TO KALAMAZOO, MICH.

Steam Roads	*Electric Roads*
Leaves Akron, 6:37 a. m.; reaches Cleveland, 8:00 a. m.; leaves Cleveland, 10:35 a. m.; reaches Elkhart, Ind., at 6 p. m., and finds there is no train for Kalamazoo until 5:36 a. m., which gets him to Kalamazoo at 7:10 a. m. Fare, $8.07; miles, 355.	Leaves Akron, 5:30 a. m.; leaves Cleveland, 7:30 a. m.; leaves Toledo, 12 m.; arrives Detroit, 2 p. m.; leaves Detroit, 2:45 p. m.; arrives Jackson, 5:45; leaves Jackson, 5:55; arrives Battle Creek, 7:25; leaves Battle Creek, 7:30; arrives Kalamazoo, 9:45 p. m. Fare, $5.45; miles, 365; 22½ m.p.h.

A MAN GOING FROM INDIANAPOLIS, IND., TO ZANESVILLE, O.

Steam Roads	*Electric Roads*
Leaves Indianapolis at 8:10 a. m.; reaches Columbus, 12:45 p. m., but finds no train for Zanesville until 6:10 p. m.; reaching Zanesville at 8:20 p. m. Fare, $6.95; distance, 256 miles.	Leaves Indianapolis, 7:10 a. m. (Interstate Limited—breakfast on car), reaches Dayton, 11:25 a. m. (35 minutes for dinner); leaves Dayton, 12 m.; reaches Columbus, 3:50 p. m.; leaves Columbus, 4:00 p. m., (Zanesville limited), reaching Zanesville, 6:30 p. m. Fare, $4.70, including parlor car fares. Distance, 250 miles; 22¼ m.p.h.

The Detroit & Port Huron limiteds make close connection at Detroit with limiteds on other roads, and make possible a trip from Battle Creek to Port Huron, 191 miles, in seven hours and forty-five minutes, a rate of 24.9 m.p.h., making no deductions for layovers. Or it is possible to leave Cleveland at 7:30 a. m. and reach Port Huron at 5:50 p. m., 249 miles, in ten hours and twenty minutes, equal to 24 m.p.h., making no deductions for the layover of one hour and fifteen minutes in Detroit. A representative steam road in this district has a schedule of seven hours and fifty minutes for the 191 miles from Toledo to Russiaville, Ind., and a schedule of ten hours and six



PASSENGER SEAT CHECK ISSUED ON HOLLAND SLEEPER

minutes from Toledo to Veedersburg, 249 miles, on a through train having no layovers.

The Dayton & Western "Interstate Limiteds," connecting as they do with the "Lima Limiteds" at Dayton, make possible a trip from Indianapolis to Lima, 188 miles, in six hours and forty-five minutes, which is better connection than can be made by way of Dayton on steam roads. Similar instances almost without number could be found if one figured for connections

between small towns widely separated, and the possibilities would be greater were it not for the fact that few electric roads operate cars before 5 a. m. and after 12 p. m.

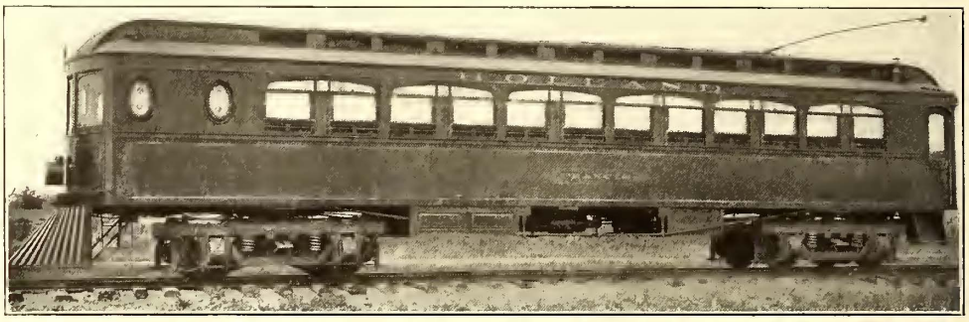
The significant feature of these comparisons is the fact that such journeys could be made quicker if the two systems worked hand in hand and interchanged business. The embargo of steam roads against electrics is bound to be broken sooner or later, and the few roads that have entered into such alliances have clearly disproved the assertion made by the steam traffic associations that the benefits of such alliances would be all on the side of the electrics. The Clover Leaf, a steam road operating from Toledo, Ohio, to St. Louis, connects with a large number of electrics in Ohio, Michigan and Indiana, and interlines with practically all of them, thereby offering low rates to hundreds of points in this district which it otherwise could not touch. Tickets are sold every day from Cleveland to St. Louis by the Lake Shore Electric; during the World's Fair it sold over 2000 of these tickets. In connection with the Indianapolis & Northwestern Traction Company, fast time is made between Indianapolis and Toledo, and in connection with the Detroit, Munroe & Toledo Short Line, good time is made to Detroit.

HOLLAND SLEEPER LEAVING COLUMBUS UNION STATION

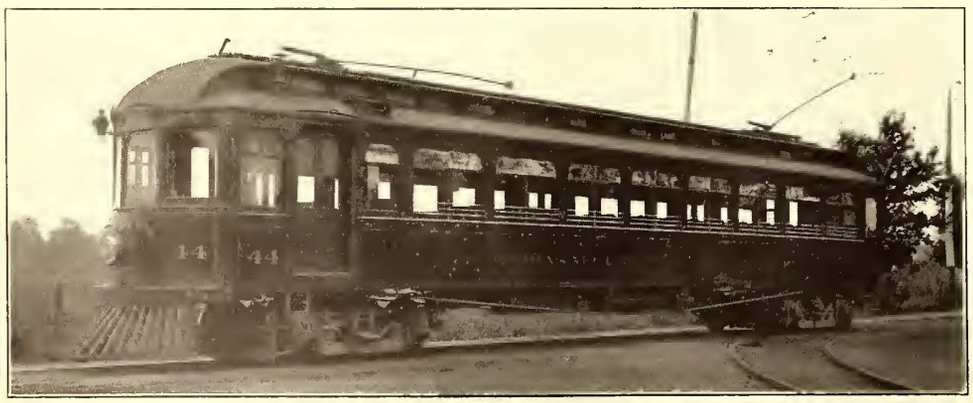
The Dayton & Western Company has made an arrangement with the Clover Leaf whereby it will sell through tickets and make direct connections for St. Louis. A passenger leaving Dayton on the 5:55 p. m. "Interstate Limited" reaches Indianapolis at 1:10 p. m., where connection is made with a limited car on the Indianapolis & Northwestern, reaching Frankfort in good time for the Clover Leaf night train, which reaches St. Louis at 7:36 a. m. The fare is, of course, much lower than an all-steam route, since one-third of the trip is on electric cars. A similar arrangement will soon be announced for through business from Dayton to Chicago.

The Dayton & Troy Electric has announced a most remarkable through service beginning Feb. 1. It has fitted up a handsome chair car, which will be known as the "Clover Leaf Special." Leaving Dayton at 5:18 p. m., it will run through to Delphos, 95 miles, over the Western Ohio and Fort Wayne, Van Wert & Lima electric lines, making close connections with Clover Leaf trains for both Toledo and St. Louis, reaching the former place at 11 p. m. and the latter place at 8:50 a. m. next morning. Going to Dayton, it will be possible to leave St. Louis at 8:15 a. m. or Toledo at 6:58 p. m., connecting with an electric car at 9:25 p. m., reaching Dayton at 12 midnight. On this trip the electric special will make 95 miles in two hours and thirty-five minutes, a rate of 36.8 m.p.h., undoubtedly the fastest long-distance run in the country. Baggage will be checked through on these cars, and Pullman reservations will be made in Dayton and all points on the electric lines. Rates will be $8 to St. Louis and $3.50 to Toledo, as compared with $9 and $4.30, the steam rates to these respective points.

The rebuilding of the Cincinnati, Dayton & Toledo Traction Company's line from Dayton to Cincinnati, and the extension of the Western Ohio from Lima to Findlay, both of which will probably be accomplished the coming summer, will mean fast all-electric service clear through from Cincinnati to Toledo and Detroit, while the purchase of the Appleyard lines between Dayton and Columbus by a strong syndicate, a change which undoubtedly will soon take place, will mean limited trains on these lines, with correspondingly improved service between Cincinnati and Columbus and Indianapolis and Columbus.



SIDE VIEW OF HOLLAND SLEEPER



INDIANAPOLIS & NORTHWESTERN PARLOR "LIMITED" CAR

EARNINGS FROM LONG-DISTANCE SERVICE

The willingness with which many steam roads have released their hold upon short-haul business is evidence that the long haul is the more profitable. The electric roads which have gone into this branch of the business have been more than pleased with the results. Figures given above indicate that already limited long-distance trains are earning from 25 per cent to 150 per cent more per car-mile than local cars. Furthermore, almost without exception, the experience is that such cars cost 10 per cent to 25 per cent less per car-mile to operate, due to the less frequent stops, resulting in smaller power consumption, less wear and tear on equipment and less labor charge per mile.

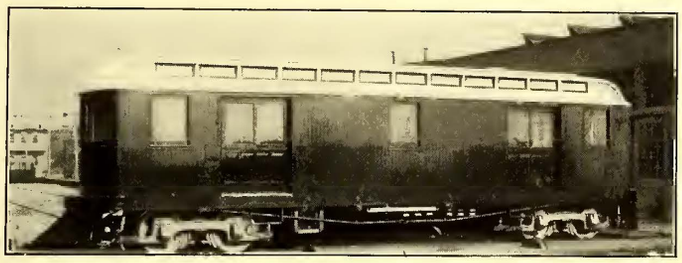
SHALL EXCESS FARE BE CHARGED?

There is a difference of opinion as to the advisability of charging excess fare on limited trains. Some roads that have installed chair cars and other expensive features argue that

these attractions, combined with faster schedules, make the service well worth the small excess fare they are charging. Other managers argue that the faster service, improved facilities, and particularly the low rates, are the points which are attracting people, and that when you charge excess fare you detract from one of the strongest attractions of the electric service. On a long journey, excess fare over a number of roads will bring the total cost of the trip up to practically the steam rate, destroying the object in view.

HANDLING BAGGAGE

The question of handling baggage on interline business is a serious problem. The Ohio Interurban Railway Association, which has been successful in securing the adoption of a form of interchangeable transportation, and of a standard form of interline ticketing, expects soon to evolve a plan for the through checking of baggage, but there are phases of this problem which are difficult to adjust. To charge or not to charge for baggage is a point which is being discussed by many roads. The majority of interurbans in this district make a charge of from 15 cents to 25 cents for each piece of baggage. This is not objectionable on a short trip, but on a long journey over a number of roads it counts up, and will undoubtedly prove a serious drag on interline business. It is a question if a great many roads are not actually losing business at the present time because they charge for checking baggage. The experience of the Lake Shore Electric Railway tends to prove this. This company handles on an average of 2000 trunks per month on its 150 miles of interurban lines, all checked free. A neighboring system of 100 miles, in a territory equally as good, handles



BAGGAGE CAR USED ON THE LINE OF SCIOTO VALLEY TRACTION COMPANY

only 250 trunks per month, charging 25 cents each. The latter road collects sixty odd dollars a month for baggage, but how about the 1750 traveling men whom it does not get? There is food for thought in this proposition.

The plan of carrying baggage on all cars, especially on limited cars, is gaining favor, although a number of roads take the opposite plan and carry baggage on locals and not on limiteds. Roads that have chair cars object to using space for baggage, because chairs have already greatly reduced the seating facilities. There is no denying that the majority of traveling men want to carry their baggage with them. There is no advantage in making quick jumps from one town to another if samples cannot be carried. The Lake Shore, Indianapolis & Northwestern, Western Ohio and other roads that carry baggage on all limiteds have demonstrated to their own satisfaction that they would lose a great deal of business if they could not accommodate traveling men in this way, and they find that by careful arrangements at stations the time lost in taking on and off baggage is not a bar to a fast schedule. While the interurban development has been remarkable, it has not yet reached a point where roads can afford to ignore the requirements of the great mass of traveling men for the sake of catering to the few who want "twentieth century limited" accommodations.

SLEEPING CARS

Sleeping cars for night service are not yet in actual operation, but this is due more to physical conditions, which prevent the operation of cars having the width, height and weight of those cars which have been designed for this service, than to other objections to this proposition. The Holland Palace Car Company, which hopes to occupy the relationship to electrics that the Pullman Company does to steam roads, has made praiseworthy progress in the right direction, and the conditions which have barred the use of its cars on certain roads are being overcome. The improvements of the coming season will render it physically possible for these cars to be operated from Cincinnati to Detroit, from Detroit to Cleveland, from Columbus to Indianapolis, and other routes made possible by combining these routes, and this paper repeatedly expressed the opinion that such service might be made to pay over comparatively short routes where the passenger does not care for speed so long as he lands at his destination at an early hour in the morning.

The Holland Palace Car Company has made a tentative arrangement with the Western Ohio, Dayton & Troy, Dayton & Western, Richmond Street & Interurban and the Indianapolis & Eastern for the operation of two of its sleeping cars on the route between Lima, Ohio, and Indianapolis. The distance is 190 miles, and the run will be made in seven hours or less. It is probable that the cars will be used for both night and day service. Tests are being made to determine the power consumption, speed and clearances of the cars, and if these points are satisfactory, the service will be tried.

HEAVY TRAFFIC ON INTERBOROUGH LINES DURING RECENT NEW YORK BLIZZARD.

"The transit lines of New York were put to the most severe test of the winter during the recent storm," says Vice-President Bryan, of the Interborough Rapid Transit Company, of New York. "On the day after the storm (Jan. 26) the elevated lines of the Interborough system carried 835,000 passengers and the subway lines 411,000 passengers, making a total of 1,246,000 passengers carried in twenty-four hours, with little or no interruption of traffic. The popularity of the subway was clearly demonstrated, and the ease with which the 411,000 passengers were carried shows that the system, with the present incomplete terminals and facilities, is amply able to handle 150,000,000 passengers a year. This carrying capacity could be very easily increased by putting in effect on the local tracks of the subway the train schedule as now maintained on the Manhattan Elevated."

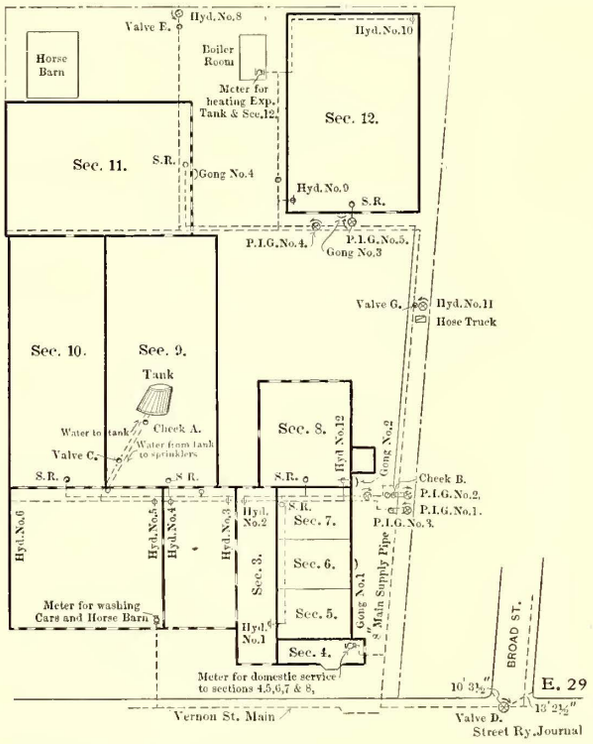
TESTS ON NEW YORK CENTRAL ELECTRIC LOCOMOTIVE

For fourteen consecutive hours electric locomotive No. 6000, built by the General Electric and American Locomotive companies for the new York Central's terminal in New York City, was run up and down the stretch of third-rail track near Hoffmans, N. Y., on Jan. 25, in order to see how the bearings would act in regard to heating up. The test was a part of the daily tests that have been going on since the locomotive was completed, and was highly satisfactory to the officials of the General Electric Company. There was no heating of the bearings to speak of, and during the time of the test the engine ran 900 miles in a blinding snow storm.

The Brooklyn Polytechnic Institute has recently increased its evening instruction in electric engineering by the addition of a laboratory course in dynamo and motor testing. These tests will include a number of railway experiments with trolley equipment in the laboratory. The course began on Jan. 16, and will include twenty experiments, usually held on Monday evenings from 7:30 to 9:30. This work will be under the direction of Prof. Sydney W. Ashe, who is an instructor in physics and electrical engineering in the day classes of this institution.

FIRE INSPECTIONS AND FIRE PRECAUTIONS IN HARTFORD, CONN.

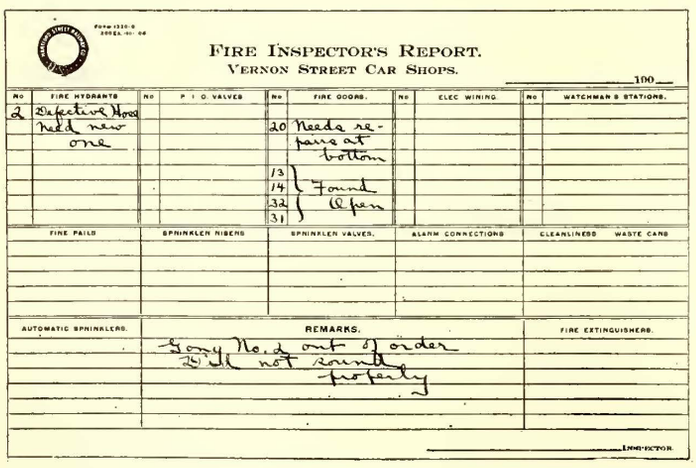
The Hartford Street Railway Company has in force at all its various buildings, including three car houses, power house,



REPRESENTATIVE DIAGRAM USED IN CONNECTION WITH THE FIRE-INSPECTION SYSTEM

office building, etc., a system of fire inspection that is unusually rigid and complete. It is of interest to note that this system of inspection, in conjunction with the methods of construction followed in the design of all these buildings, has resulted in the granting of a very low rate of insurance by the fire insurance companies.

The conspicuous feature of this system of inspection is the care taken to make sure that all apparatus intended for fire-fighting purposes, from fire pails to automatic sprinklers, are



FIRE INSPECTOR'S REPORT.
VERNON STREET CAR SHOPS.
100

No	FIRE HYDRANTS	No	P. I. G. VALVES	No	FIRE DOORS	No	ELEC. WIRING	No	WATCHMAN'S STATIONS
2	Defective Hose Need new one			20	Needs repairs at bottom				
				13	Found Open				
				14					
				32					
				31					

FIRE PAILS	SPRINKLER RISERS	SPRINKLER VALVES.	ALARM CONNECTIONS	CLEANLINESS	WASTE CANS

AUTOMATIC SPRINKLERS	REMARKS.	FIRE EXTINGUISHERS.
	Gong No. 1 out of order Will not sound properly	

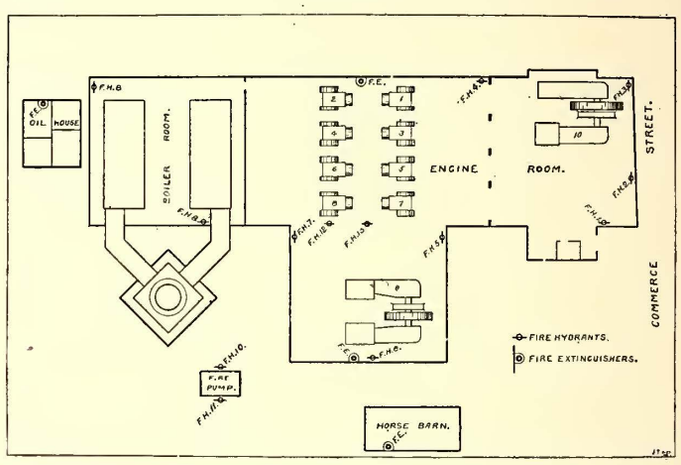
INSPECTOR.

FACE OF INSPECTION CARD OF VERNON STREET CAR SHOPS

always in place and are always ready for use at an instant's notice. The company's motto, indelibly impressed upon the mind of every employee, is: "In case of fire, fight the fire," and it is the duty of a responsible official to see that there are always men and means available to fight the fire, no matter in what part of any building, or at what time of the day or night it may be dicovered.

All of the buildings belonging to the company, as car houses and power station, are divided into sections for fire-fighting purposes. These divisions are not necessarily fire walls, but the area of each building is arbitrarily apportioned off into fire sections, the number and extent of which depend on the individual conditions. A special study is then made of each separate section, and each is provided with such fire hydrants, hose, fire pails, extinguishers, fire doors, etc., as the conditions in each area may seem to require for effectually confining and extinguishing any fire that might occur therein.

The idea is well illustrated by means of the representative diagram reproduced herewith, which shows the fire sections, hydrants, hose, sprinklers, etc., at the Vernon Street shops of the company. Diagrams similar to this are made for all the buildings, and are posted in blue print form at conspicuous

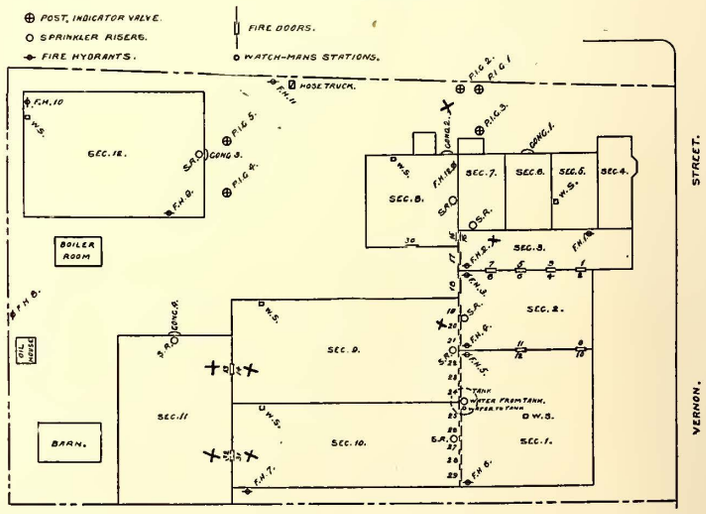


REVERSE OF INSPECTION CARD FOR POWER HOUSE

places where they can be easily consulted. Accompanying these diagrams are carefully prepared instructions, explaining the diagram and telling just what to do in case of fire. The set of instructions for the Vernon Street shops is as follows:

DIRECTIONS FOR OPENING AND CLOSING VALVES IN CASE OF FIRE

To open P. I. G. valves (referring to post indicator gate valves



REVERSE SIDE OF INSPECTION CARD USED AT THE VERNON STREET SHOPS

in the city water mains) Nos. 1, 2, 3, 4 and 5, and hydrants Nos. 7, 8 and 11, turn handles and wheels in the direction of arrows.

If sprinkler service is required in any section from the tank service, see that P. I. G. valve No. 3 is open and P. I. G. valve No. 2 is closed. This will allow check valve "A" to open and check valve "B" to close. The latter will prevent the water in the tank at the top of building from flowing back into the 8-in. main supply pipe, and supply water to automatic sprinklers in any section.

P. I. G. valve No. 1 supplies hydrants Nos. 1, 2, 3, 4, 5, 6, 9, 10 and 12, all of which are domestic hose service in sections 1, 2, 3 and 8, and sprinklers in sections 1, 2, 7, 8, 9 and 10; also sprinkler riser in section 7, and sprinklers in sections 4, 5 and 6.

To shut off sprinklers from section 12, close P. I. G. No. 5.

To shut off sprinklers from section 11, close P. I. G. No. 4.

Tank is refilled automatically with ball cock in tank. To shut off water supply to tank, close valve "C."

City pressure is at all times on sprinkler system and domestic hose service, through P. I. G. valves No. 1 and No. 2.

Tank pressure is on sprinkler service when P. I. G. valve No. 2 is closed.

Close valves E. F, G for repairs to hydrants 7, 8 and 11.

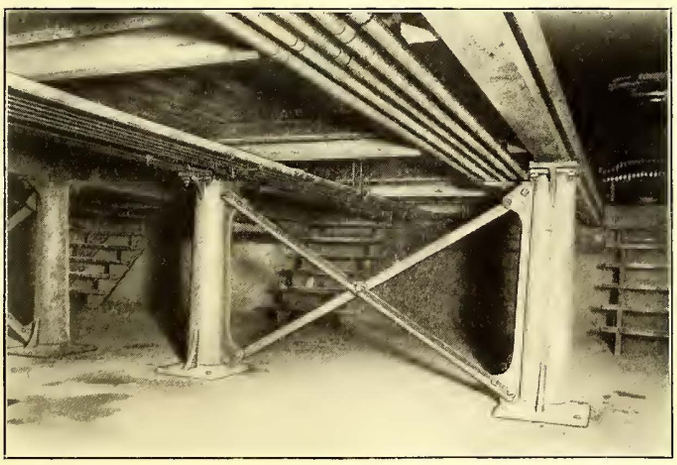
Valve D shuts off water from the whole system.

GONGS

No. 1 gong gives alarm for sections 3, 4, 5, 6 and 7; No. 2 for section 8; No. 3 for section 12; No. 4 for section 11.

The primary idea of the inspection system is, as stated, to make sure that every part of the fire-fighting equipment is at all times ready for action. To this end various means are taken for impressing upon the minds of employees the necessity for keeping pails, hydrants, hose, etc., in working order. For instance, it was found that the space around fire hydrants would frequently become cluttered up with scrap and rubbish of all kinds, this accumulation greatly interfering with the usefulness of the hose. To do away with this the wall back of each hydrant in the car houses and power station was painted yellow to a height of 4½ ft. above the floor and for 2 ft. each side of the apparatus. Around the yellow was painted a deep black border. In conspicuous black letters against the yellow background are the words "Keep this space clear," and on a white mat against the yellow is painted the hydrant number, as, for instance, "Fire Hydrant No. 3." The hydrants, sprinkler risers, valves, pails, etc., are painted red. This color scheme serves to accentuate the importance of keeping everything connected with the fire-fighting system free from rubbish and in working order. The fact that each piece of apparatus is numbered serves as a means for locating the various parts of the water-supply system and (in connection with the diagrams with which every employee is required to be familiar) greatly simplifies the giving of orders when the emergency arises.

All doors in fire walls in all the buildings are sheathed in tin and are balanced with counterweights, in accordance with



VIEW IN PITS, SHOWING HEATING AND SPRINKLER PIPES UNDER FLOOR

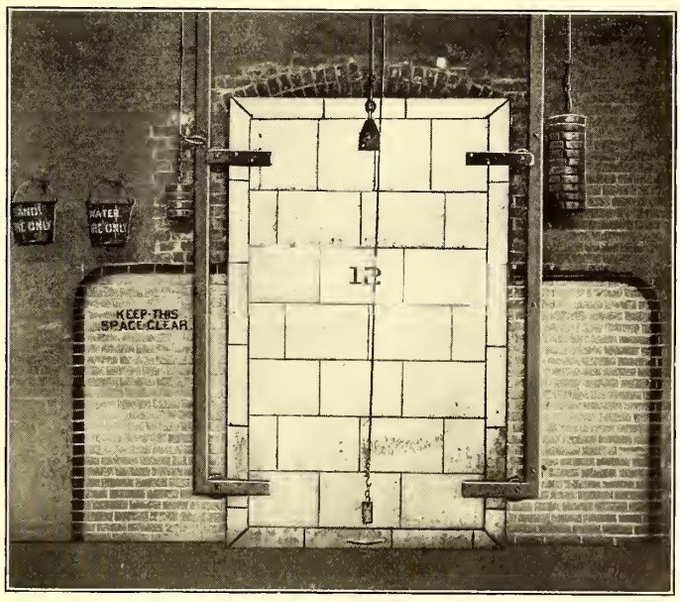
the underwriters' requirements. The wall around each door is painted yellow, for the purpose of emphasizing the fact that nothing must be set against the wall in this space which would interfere with the operation of the door. All fire doors are also numbered and their locations are indicated on the diagram.

The employees at each building are organized into fire companies and frequent drills are given. The day foreman is captain of one company and the night foreman is captain of the other. Each captain has an assistant, who is to take charge in the absence of the foreman.

The responsibility for inspecting fire apparatus rests upon

VIEW OF HYDRANT, ILLUSTRATING SCHEME OF PAINTING SPACE AT BACK OF HYDRANT

the company's engineer, who makes a trip every two weeks around all the company's property. He tests hydrants, valves,



THE SYSTEM OF PAINTING AS APPLIED TO FIRE DOORS

sprinklers and all water supply pipes, and inspects hose, pails, etc.

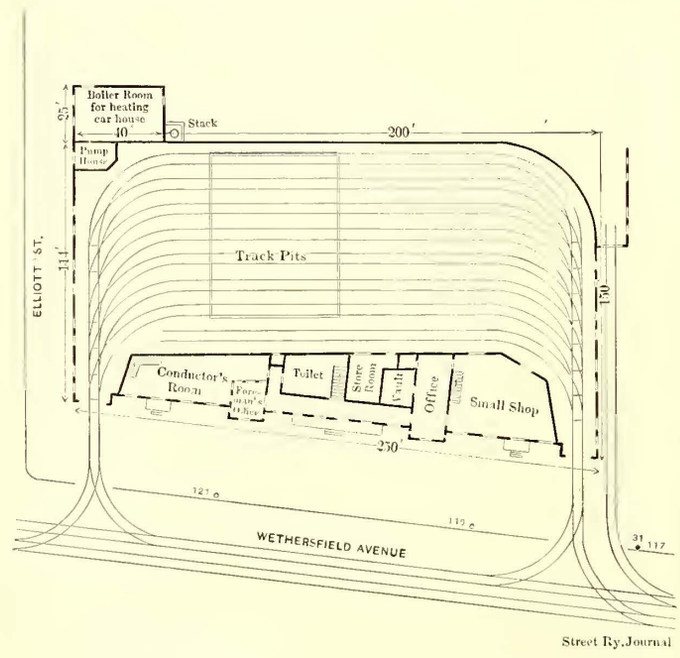
For reporting anything found out of order a set of cards has been designed, as reproduced herewith. These cards are 6 ins. x 9 ins., and one is printed for each separate building, the card for each building being of different color. On the front of the cards are columns, as shown, for reporting the nature of the trouble, and on the back of each card is a dia-

gram of the building to which it refers. These diagrams are small reproductions of the large blue print diagrams, previously mentioned, and show the location of each feature of the water-supply system. The small diagram on the back of the card is used for indicating, by marking a small cross, the location of the trouble reported on the front of the card. For instance, the card as made out for the Vernon Street shops reports that hydrant No. 2, which is in section No. 3, has a defective hose; fire door No. 20, in section 9, needs repair at bottom; fire doors 13, 14, 32 and 31, between sections 11 and 9 and sections 11 and 10, were found open, contrary to the rules; gong No. 2, in section 8, is out of order.

EXTERIOR VIEW OF WETHERSFIELD CAR HOUSE

After each tour of inspection the cards are sent to the general manager's office and any defects reported are immediately repaired. If the report would seem to indicate improvements along any line, steps are at once taken to place these in effect, or if the reports call for reprimands for violations of the fire regulations, the occasion is taken to impress upon negligent employees the necessity for strict adherence to the rules.

The cards and system of inspection have received the hearty approval and indorsement of the New England Insurance Exchange, and it is not without interest to add that the inauguration of the scheme is saving the Hartford Street Railway Company $2 a day in fire insurance premiums. The general idea has been worked out by J. T. Tregoning, engineer for the Hartford Company, in conjunction with Norman McD. Crawford, general manager, to whom acknowledgement is made for the information and diagrams reproduced in this article.

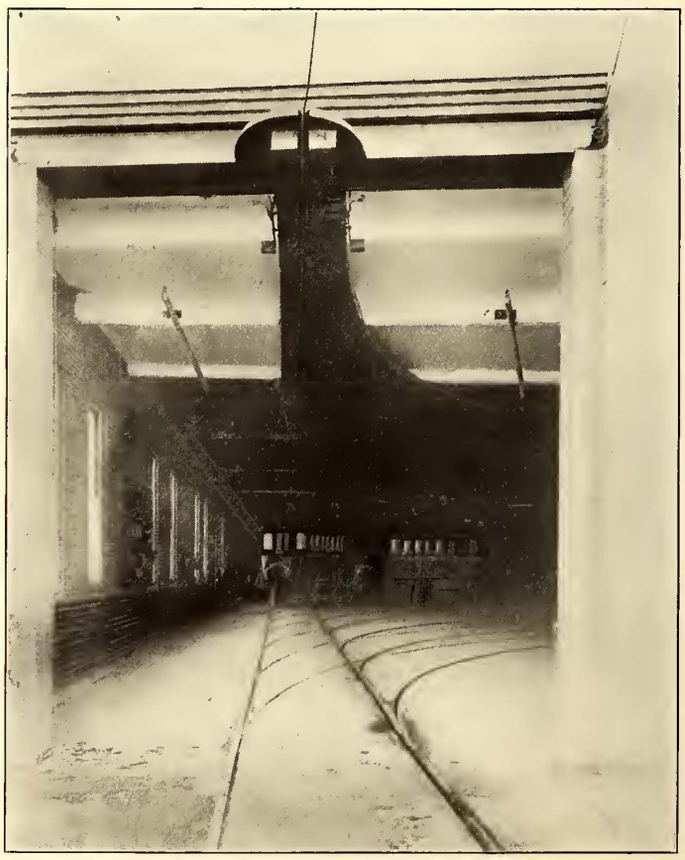


PLAN OF WETHERSFIELD AVENUE CAR HOUSE

In connection with the system of fire inspection at Hartford, it is in order to describe some of the engineering details of the various buildings covered in the insurance scheme. At least two of these buildings, namely, the Wethersfield Avenue car house and the central power station, are characterized by the extensive use that was made of concrete work in the foundations and wherever fire-resisting material seemed to be called for. The Wethersfield car house is the newest of the Hartford Company's car houses, and while it is a large structure and is provided with ceiling instead of inter-track sprinklers, it embodies many other late ideas recommended by the fire underwriters for buildings of this nature.

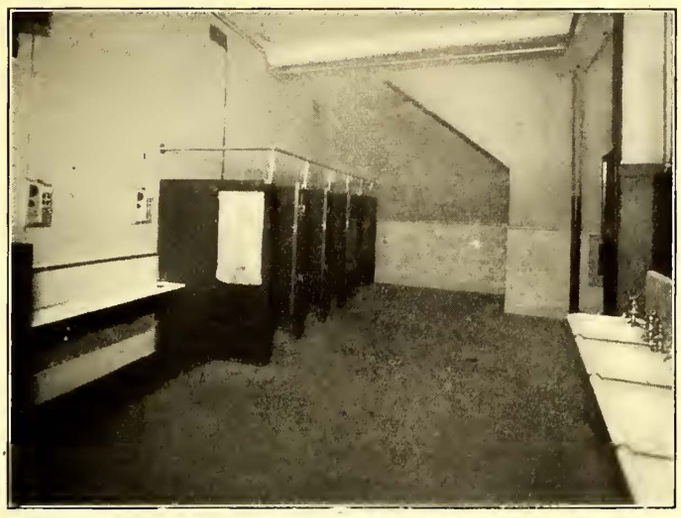
The house is designed for combined storage, minor repair and operating purposes. It has a frontage of about 250 ft. and a depth of 114 ft. The roof is supported by steel girders resting upon steel columns. The heavy brick walls rest upon concrete foundations, the general structural details of the building conforming closely to the adopted standards of modern fireproof construction.

Owing to the location of this house in the outskirts of the city, it was thought desirable to supplement the city water supply with ample water storage facilities for fighting any fire that might occur in or near the property. In view of the expense of building an elevated tank for water storage purposes, it was finally decided to provide a large underground storage reservoir having a capacity for holding 100,000 gals. of water, and to connect the sprinkler system and the fire-hydrant system of the car house property to this reservoir.



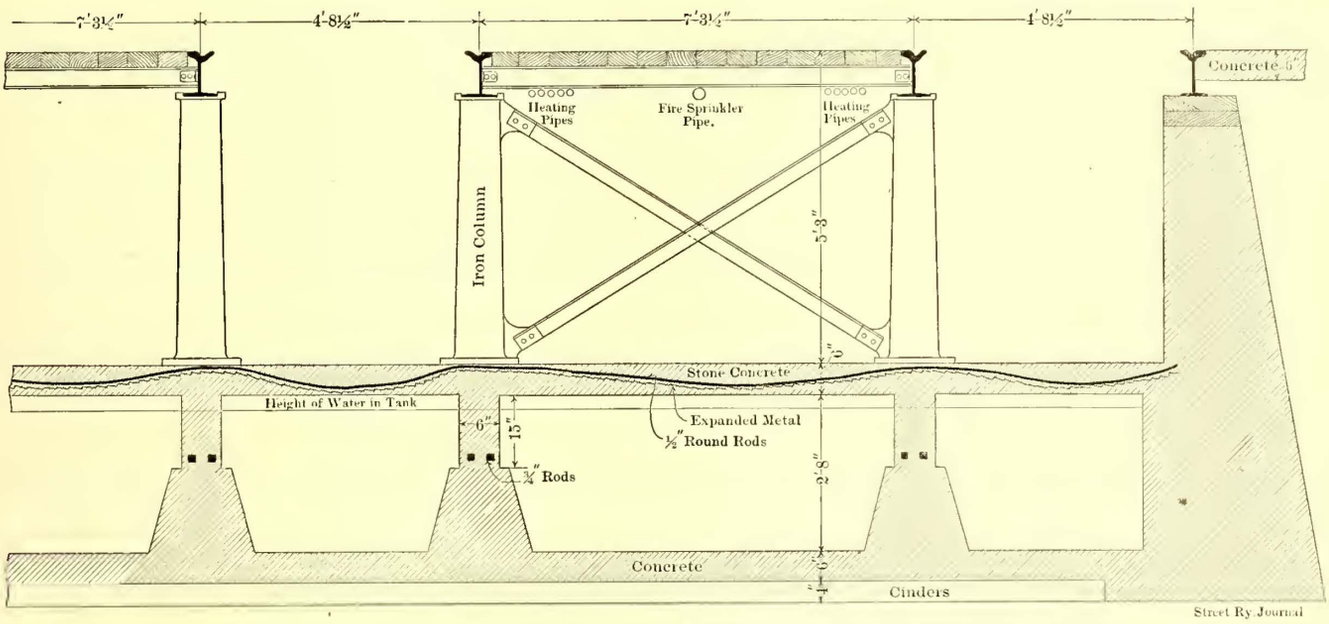
ENTRANCE DOOR, WETHERSFIELD CAR HOUSE, SHOWING LADDER TRACKS INSIDE THE HOUSE

The underground cistern or tank is 60 ft. long and extends underneath eight tracks. In building it, the space was excavated to a depth of 9 ft. 3 ins. below the floor level. In the bottom of the space 4 ins. of cinders well tamped were first laid; on this, 6 ins. of concrete were placed, and the walls of

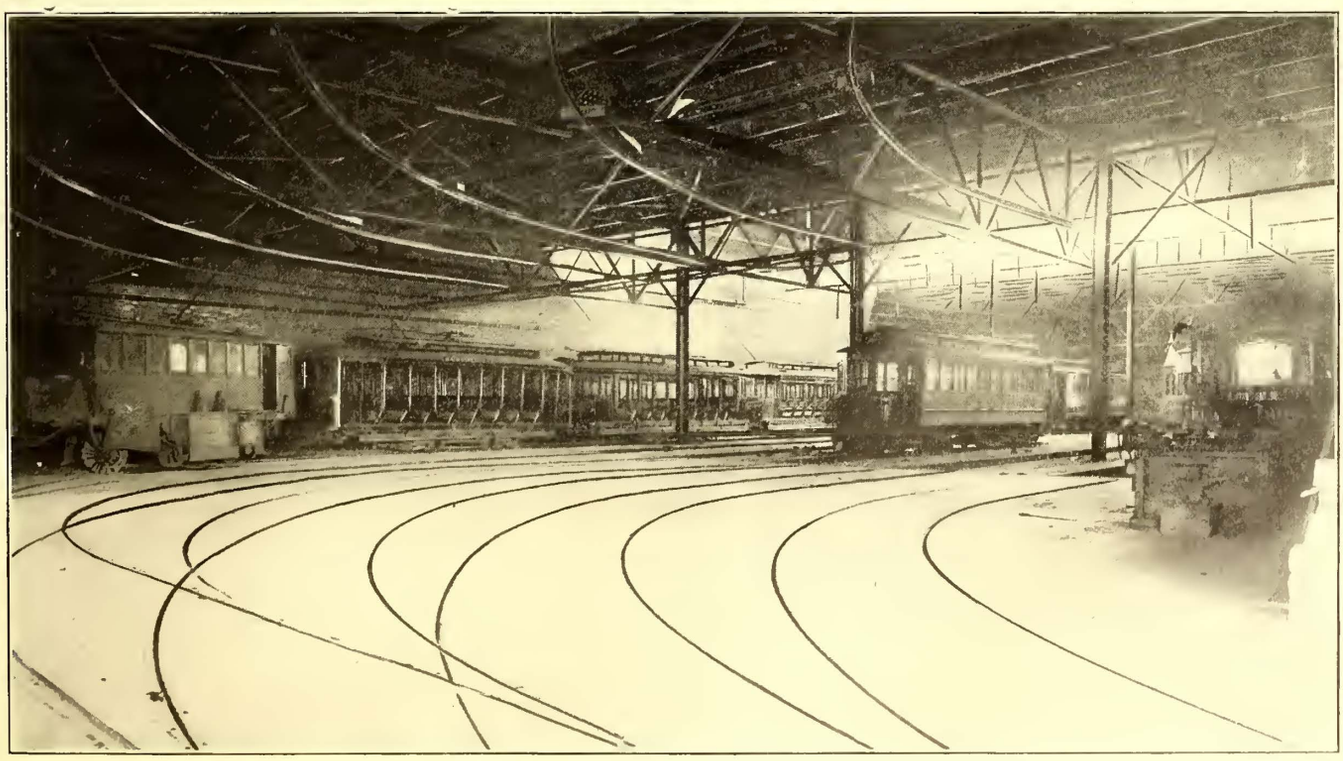


EMPLOYEES' TOILET ROOM

BATHS, SHOWERS AND WASH BOWLS IN THE EMPLOYEES' TOILET ROOMS

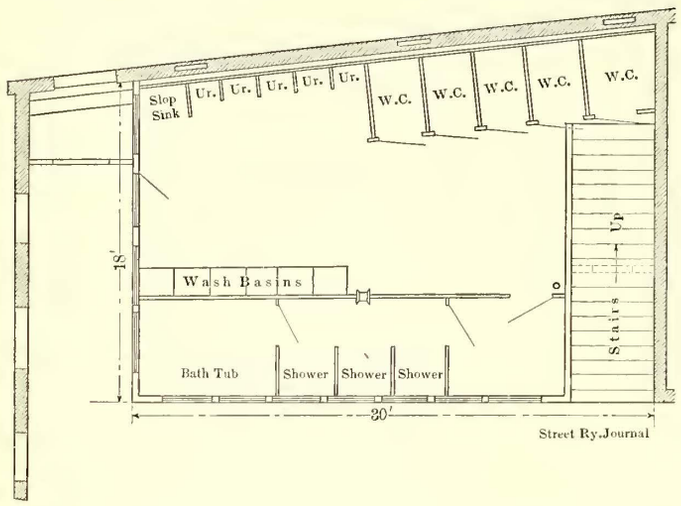


SECTION THROUGH TRACK PIT IN THE WETHERSFIELD AVENUE CAR HOUSE



INTERIOR OF WETHERSFIELD AVENUE CAR HOUSES, HARTFORD

the reservoir were built up with concrete cement work. The water reservoir itself measures 2 ft. 8 ins. from the concrete bottom to the roof. This roof consists of 6 ins. of concrete cement, reinforced with ½-in. round rods and sheets of expanded metal placed in the manner shown on the cross-section



PLAN OF TOILET AND WASH ROOMS

drawing. The top of the roof of the reservoir serves as the floor of the car house pits, the pits measuring 5 ft. 3 ins. from bottom to the floor level. The track rails in the car house rest upon hollow iron pipes or columns 10 ins. in diameter, the bases of these columns in turn resting upon the concrete roof of the reservoir. Under the line of each column concrete piers were built up from the floor of the reservoir in the manner indicated. The iron columns for supporting the track rails are cross-braced with angle-iron bracing. At the car house floor level the space between tracks was planked over with heavy plank-ink. The pipes for heating the pits were carried just beneath this flooring, and a pipe line from the sprinkler system was also carried underneath the floor between each set of tracks, with sprinkler heads spaced every 10 ft., and designed to throw water upward against the floor in the event of fire.

The entire car house is protected with the Esty automatic sprinkler system, made by the H. G. Vogel Company, of New York City. The system can be fed either from the city water mains or from the underground storage reservoir by means of fire pumps of the underwriters' type. Fire hydrants with hose attached are placed in various parts of the building, as described in the foregoing article. The underground storage tank receives the drainage from the roof of the car house, and is also connected with the city water mains. In view of the fact that this underground tank will render available 100,000 gals. of water at all times and that it can be drawn on in the event of a large conflagration in the neighborhood, the insurance interests considered themselves justified in rating this car house as a particularly good fire risk.

The heating system was installed by Evans, Almirall & Company, of New York City. Heating of the building is accomplished by the circulating hot-water method, the heating system including a separate boiler plant and live steam heater to heat the water. A pump is inserted in the water circuit to keep the water in rapid, continuous circulation. The water pipes are carried around the walls of the building near the floor and between each set of tracks in the pits.

The general layout of the tracks in this house will be seen from the accompanying plan. It will be noticed that the entrance to the house is through two small doors, all the special work in connection with the entrance tracks being under cover. This arrangement does away with all troubles from ice and snow clogging up the switches, and facilitates the moving of cars in and out. The layout, of course, uses up considerable space inside the house, but this lost space is about made up by the ample space at the front of the building for employees' rooms and store rooms. It will be seen from the photograph showing the exterior of the house that the front of the building is three stories high, which, with the two towers, give a number of large, light rooms for offices and other purposes. On the ground floor is a large room where conductors and motormen can spend their time when off duty. This is fitted up with card tables and various games. There are also on the ground floor a store room, a large office with vault, and a small shop. On the second floor is the employees' association room, fitted up with billiard table and easy chairs. This room has a large anteroom, which is used for checking coats and serving lunch when the association desires to give a sociable. On this same floor is another room in which entertainments, card parties, dances, etc., are given. The third and fourth floors are used as draughting rooms and offices.

The employees' toilet and wash rooms at this house are very complete, as will be evident from the engravings. These are finished in tile and fancy brick, with porcelain wash bowls and urinals. The toilet closets and bath room are enclosed with slate slabs. There are two showers and a large porcelain bath tub.

EMPLOYEES' ENTERTAINMENT ROOM, SHOWING PAINTED SPACE AROUND HYDRANT TO THE RIGHT OF THE CENTER POST

It will be noticed from the illustrations that the fire-hydrant system is extended through the men's rooms and the offices, and the same color scheme and inspection system are carried out as in the car storage and operating sections of the car house.

The power house of the company is on Commerce Street,

near the river, and has been described in previous issues of the STREET RAILWAY JOURNAL. All of the building foundations and the foundations for engines, generators and boilers at this power house are built of concrete cement. The steam and suction pipes from the condensers are carried in a concrete subway. All the walls and roof are either brick or steel, and there is no woodwork used in the building, so that it is as near fireproof as modern engineering can make it.

The other two houses of the company, namely, the Vernon Street shop and the State Street shop, are brick and steel structures, and are thoroughly protected with sprinkler and hydrant service, as outlined in the foregoing article.

ELECTRIC TRAMWAYS IN HONG KONG, CHINA

Although little more than sixty years have elapsed since the island of Hong Kong became a British possession, its rise in importance, both as a commercial and naval center in the Far East, has been both rapid and unique. Situated near the mouth of the Canton River and distant about 90 miles from the ancient Chinese city of Canton, it possesses one of the finest and most beautiful natural harbors in the world. This must have been recognized by the Chinese themselves hundreds of years ago, as the Chinese characters representing the name of the island are said to signify "Good Harbor." The island itself is some 11 miles long and from 2 miles to 5 miles broad, and consists of lofty uncultivated hills. In the younger days of the colony it was considered a most unhealthy place, owing to the virulence of malaria, but to-day the efforts of the Sanitary Board on the one hand and the Afforestation Department on the other have completely altered these characteristics. During the summer months the humidity of the atmosphere renders the heat very trying to Europeans, but from September to March the weather is all that could be desired. The population of Hong Kong is estimated at 284,000, and of these, 274,500 are Chinese. Its trade is estimated at $250,000,000 per annum. It has excellent dock accommodation, is strongly fortified and is the permanent naval base of England in the Far East.

In 1902 an ordinance was passed by the Legislative Council of Hong Kong authorizing the tramways to be laid down by the Hong Kong Tramways Electric Company, an English company, with its headquarters in London, and work was commenced in May, 1903, and completed last July. The detailed plans and specifications were prepared by the company's consulting engineers, Alfred Dickinson & Company, of Birmingham, who appointed Harold Hackwood to act as their representative in Hong Kong, as resident engineer in charge of the construction. The contractors were Dick, Kerr & Company, of London, who carried out the whole of the work.

The total length of single track is 14½ miles, laid in 9¼ miles of route, to a gage of 3 ft. 6 ins., with rails of the girder type, weighing 86 lbs. per lineal yard. Each rail-joint is double bonded with oooooo S. W. G. copper bonds. The lines within the city are laid for the most part as center-pole construction, but the eastern portion of the route being outside the city boundary, is laid as single line, with passing places equipped on the side-pole system.

With the exception of a short branch line which runs to the race course, the route runs parallel with the water front, and aside from a short length at Quarry Bay is practically level. At Quarry Bay some road grading has been done, the original grade of 1 in 10 having been reduced to 1 in 15. Beyond Quarry Bay is the eastern terminus of the line, where is situated the small Chinese village of Shankiwan.

Owing to the varying nature of the ground, three forms of permanent way construction have been adopted. Where the ground was solid the rails were bedded on a concrete beam 18 ins. wide and 6 ins. deep; where the ground was not so good a bed of concrete 6 ins. deep and 7 ft. 3 ins. in width, extending under the whole track and 1 ft. 6 ins. on either side, was adopted; over doubtful ground which had been recently reclaimed from the sea, this concrete bed was increased to 8 ins. in depth. The concrete used was mixed in the proportion of 6 to 1, Portland cement of local manufacture and exceptionally good quality being used. After the rails and the bottom concrete were laid, the road surface was made up to rail level with

A SCENE ON ONE OF THE MAIN STREETS OF HONG KONG, SHOWING THE CONTRAST IN TRANSPORTATION BY THE YOKE, 'RICKSHA AND TROLLEY CAR

concrete and finished off with a smooth surface to the proper camber of the road.

The overhead construction has been carried out in a very neat manner, the length of arms on the center poles not exceeding 2 ft., while the arms on the side poles vary in length,

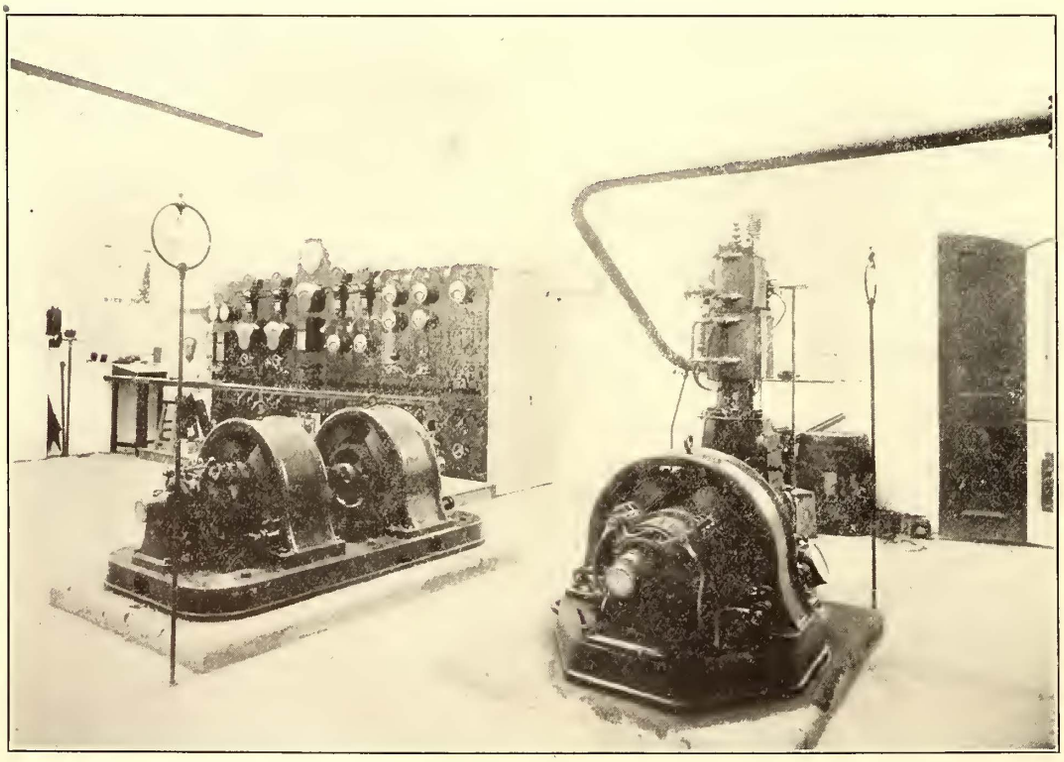
CHINESE COOLIES AS TRACK MEN

the majority of them being 6 ft. long. The poles are of mild steel, 28 ft. 3 ins. long, 7 ins. in diameter at the base, tapering to 4 ins. in diameter at the top. They are set 6 ft. in the ground in a solid block of concrete. Within the city, ornamental base castings greatly add to the appearance of the poles, which are still further enhanced by the addition of wrought-iron scrolls on the bracket arms.

The trolley wire is divided into ½-mile sections by means of section insulators, and at each of these points the main feeder cables are tapped and current is taken to supply each section of trolley wire. This is accomplished by running the feeders through a feeder pillar containing the necessary switches and fuses, the connections from the feeders to the trolley wires being made with rubber-covered cables, carried up inside the poles and along the sides of the bracket arms. The pressure on the trolley wire is 500 volts. A lightning arrester is provided in each feeder pillar, and also a telephone giving direct communication with the power house. The feeder cables were supplied by the Callenders Cable & Construction Company and laid on the solid system. In addition to the main feeders running east and west from the power station, a return booster feeder has been laid in each direction to within a mile of the two distant termini, where it is connected to the rails; it also makes connection with the rails at each feeder pillar. A three-core pilot cable has also been laid from the power station to each terminus, one core being connected up for testing purposes and the remaining two cores being used for telephone service.

The generating station is as nearly as possible in the center of the system, a convenient site having been obtained alongside the Bowrington Canal, from which water for condensing purposes is obtained, and which enables coal and materials to be delivered by barges direct on the site. The only objection which could be found with the site lay in the fact that a very few years ago it was reclaimed from the sea, and consequently no good foundation could be obtained for either buildings or machinery; however, as it was the best site obtainable in all other respects, this difficulty had to be overcome, and efficient foundations were obtained by the driving of over 5000 piles. These were spaced so as to support the whole weight of the buildings themselves, the ground, which greatly varied in solidity, being left as an additional factor of safety. China fir poles, 15 ft. long and 5 ins. in diameter, were used for the buildings and machinery, special 7-in. poles, 18 ft. in length, being used for the chimney foundations.

The depot comprises engine room and basement, boiler house and coal store, car shed and machine shop, blacksmith shop, paint shop and carpenter shop, and also offices.



INTERIOR VIEW OF SWITCHBOARD ROOM, SHOWING ALSO THE LIGHTING SET

The engine room, which is lofty and well lighted, contains two Dick-Kerr direct-current, direct-connected railway generators, of the multipolar type, compound wound, giving a potential of 550 volts and running at 100 r. p. m. They are designed to run either separately or in parallel. The generators are keyed direct on to the main shaft of the engines, which are of the horizontal cross-compound type, each engine being equal to a maximum load of 557 bhp. The engines, built by Yates & Thom, are each provided with a Wheeler surface condenser of the Admiralty pattern, and may be worked either condensing or non-condensing. The condensers are fixed in the basement below the engine room, as also are all the steam and other pipes, thus leaving the engine room free and open. Circulating water is obtained for the condensers from the Bowrington Canal, which is alongside the site, the water first passing through sumps fitted with gratings and strainers to exclude obstructions. In addition to the two traction sets, there are two smaller plants for arc and incandescent lighting of the depot, one set being driven by a small high-speed engine

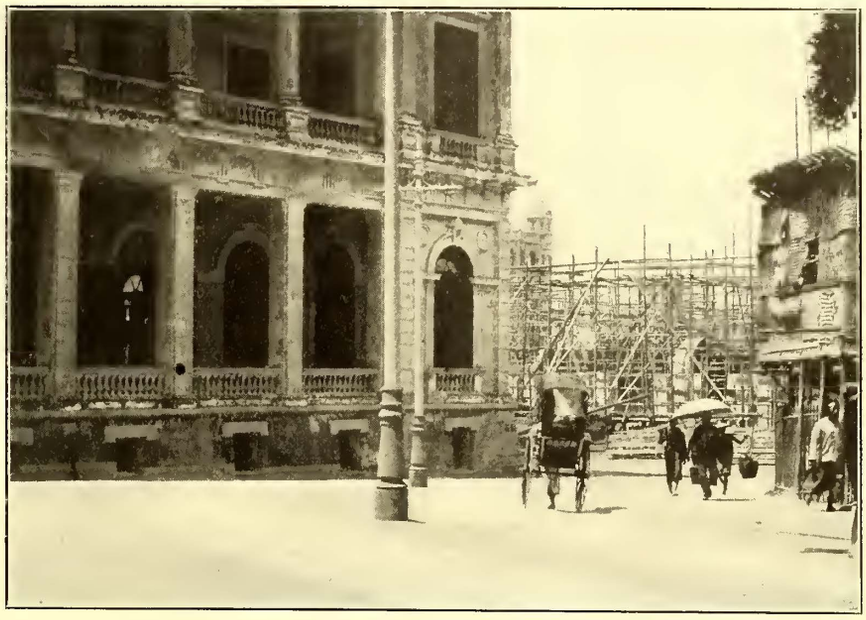
and the other by a motor running from the 500-volt circuit. The lighting circuit is supplied at 100 volts pressure.

The switchboard, which is of Dick-Kerr's standard type, consists of nine panels. It includes a main station panel, two generator panels, two feeder panels, one Board of Trade panel and three lighting panels. The main station panel contains recording instruments of the latest pattern, including a recording wattmeter, showing the total output of the station. The Board of Trade panel is arranged for receiving test wires from different parts of the line, and is provided with instruments for making all the tests required by the Board of Trade.

An overhead traveling crane is provided, capable of lifting and traversing in any direction a load of 10 tons over the whole area of the engine room.

The boiler house, which is a lower level than the engine room, contains two double-drum water-tube boilers of the Babcock & Wilcox type, arranged to burn ordinary Japanese engine slack. Each boiler has 3654 sq. ft. of heating surface, evaporates 12,000 lbs. of water per hour and works at pressure of 160 lbs. per square inch. In addition to the steam and water gages, each boiler is fitted with a spring safety valve and a dead weight safety valve. Water is supplied to the boilers by two Blake & Knowles feed-pumps, which take water from either the storage tank or the hot well, and feed the boilers either direct or through a Green economizer. In case of mishap the economizer may be cut out, the flue gases being conveyed to the chimney by means of a by-pass or auxiliary flue and the feed-water being pumped direct into the boilers without passing through the economizer tubes. Two feed-water filters are supplied, and all water passes through one or other of these before entering the boilers.

The chimney, which is circular, is built of brick and is 153 ft. high. As Chinese bricklayers are unaccustomed to this class of work it presented greater difficulties in construction than any other part of the work, and as Hong Kong is subject to typhoons of noted severity, exceptional care had to be taken with both the foundations and the building of the shaft. With the exception of the foundations and the chimney cap, the whole of the brick work is built in lime mortar of special composition, as is also the brick work of the buildings.



A CURVE AT THE CITY HALL CORNER IN HONG KONG

There are twenty-six single-deck motor cars, ten being of the combination type, with an enclosed portion in the center and an open platform provided with seats at either end. The remaining sixteen cars are of the open cross-bench type. The over-all length of the cars is 29 ft., the total width is 6 ft. 6 ins., and the wheel base, 6 ft. 6 ins. The combination car has a seating capacity for thirty-two passengers, and the cross-bench cars for forty-eight passengers. Each car is mounted on a truck of the Brill type, equipped with Dick-Kerr 25-A motors, the standard metallic shield blow-out controllers and the usual hand brakes. The trolleys, which are of the lateral type and provided with a swivel head, are 16 ft. 6 ins. in length, and enable the trolley wire to be fixed 10 ft. away from the center

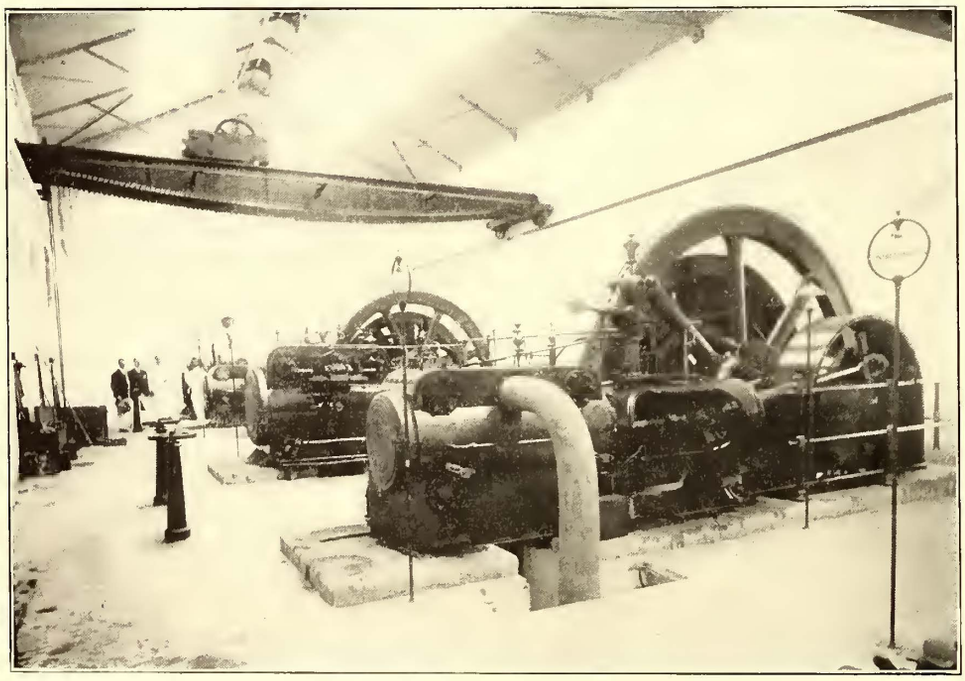
SIX-TRACK CAR SHED OF THE HONG KONG TRAMWAYS, 220 FT. LONG, AND ACCOMMODATING THIRTY-FIVE 29-FT. CARS

of the track, where necessary. The car bodies were built at Preston by the Electric Railway & Tramway Carriage Company, and were shipped to Hong Kong in sections, where they were fitted together and connected up in a very short space of time.

The car shed, which is a rectangular building 220 ft. long, contains six lines of track and gives accommodation for thirty-five cars. The roof is of iron, in two spans, partly glazed and provided with louveres, giving plenty of light and ventilation. Inspection pits run the whole length of the shed.

At one end of the car shed is a well equipped work shop, containing screw cutting gap lathe, wheel lathe, wheel press and drilling machines, the whole being driven by a 500-volt motor. A suitable smith shop, carpenter shop and paint shop are also provided.

Before the introduction of electric traction into Hong Kong, the popular 'ricksha drawn by a Chinese coolie was the principal means of locomotion, and of these nearly 2000 were licensed for hire, in addition to a large number owned privately. Although rather slow, the ricksha is hard to beat for general convenience; the fight for supremacy between the out-of-date ricksha and the new electric car will be of interest, but must of necessity end in the victory of the latter.



MAIN ENGINE ROOM, CONTAINING 10-TON OVERHEAD CRANE

As this is the pioneer system of electric traction in China, it is to be hoped the venture will meet with a well-deserved success, and that electrically-equipped lines will shortly be laid in other parts of the Celestial Empire.

President Schoepf, of the Cincinnati Traction Company, says that during the past year the company expended $3,000,000 in betterments, whereas under the terms of its lease it was necessary to spend only $2,000,000. He says the company has put on 50 per cent more cars since it took over the property two years ago, while the traffic has increased but 18 per cent. Fifty new large cars have been ordered and are being installed. Plans are being made to enlarge some of the power stations to increase the power facilities. Mr. Schoepf explains that Cincinnati is one of the hardest cities in the country in which to give good service, owing to its narrow and crooked streets, and to the fact that the public seems to demand that the cars shall all go to one point at Fountain Square, which congests the downtown district. Plans are under consideration for deviating certain lines to relieve this congestion.

CAR STORAGE HOUSES VS. OPERATING BARNS

BY D. F. CARVER

With those street railway companies which find it to their advantage and profit to operate with double equipment of summer and winter cars, whether or not the duplication of the equipment is of the bodies only or of the bodies and trucks with motor equipments, it becomes a question worthy of very serious study and consideration of how best to store the out-of-season equipment. Taking note of the fact that these equipments receive their yearly general overhauling at their out-of-season times, they should be stored during the off-season as near to the repair shops as governing conditions will admit for the greater convenience of the master mechanic and his department, and in order to reduce to a minimum the costly item of dead mileage of each car on four trips at least per year—two trips with its own equipments and two trips in tow—(and the towing of stripped cars is becoming a not unusual procedure since the development and improvement of motors and trucks has added to the amount invested therein, an amount too great to be left unproductive of revenue for six months in each); and for the further reason that the accumulation of the out-of-season equipment directly under the observation and control of the man who is most interested in maintaining it at the minimum cost and maximum of efficiency, places the responsibility for it without question on the one man—the master mechanic.

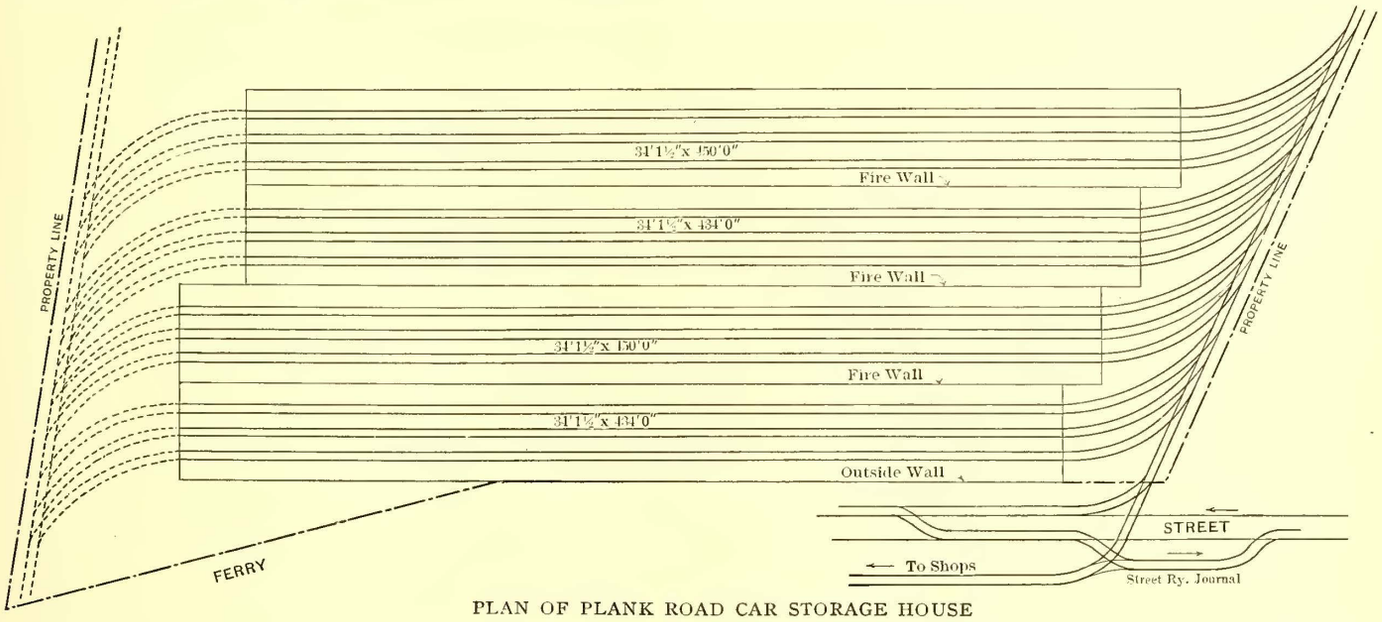
The theoretical and probably the most wise use of an operating car house on large city systems is for operation only, or as nearly as may be. But this is only a theory—it is open to interesting discussion, and is yet to be conclusively demonstrated, and even when demonstrated the principle can be applied on many existing city systems only within narrow limits because of the general layout of the lines. The apparently cheapest way to house a few more cars when not in use is to build an addition to an existing house, or fit up as economically as possible an abandoned car house which has been thrown out of use as an operating house. The items of cost in relation thereto are, however, worthy of very serious consideration, and here are some facts taken from actual construction. The figures are based on New York prices:

A most modern and complete operating barn of small size of the most approved truss roof construction with brick walls (but no fire walls), with shops, waiting rooms, men's rooms, depot master's office, plumbing, etc. (but exclusive of track work and real estate), of a cubical volume of 760,000 cu. ft., will cost $0.0616 per cubic foot. The same class of barn as to details, finish, completeness and convenience, but extremely large, covering an area of 60,000 sq. ft., with a cubical contents of 1,720,000 cu. ft., will cost $0.059 per cubic foot, whereas a barn designed and built for the special purpose of storing out-of-season cars, with a floor area of over 60,000 sq. ft., divided by fire walls into four compartments of about 15,000 sq. ft., the whole building having a cubical contents of 1,250,000 cu. ft., will cost (exclusive of real estate and track work) $0.042 per cubic foot. These figures are for one-story car houses only. Those for houses which are of necessity to be built in two or more floors with fireproof construction, as the term is ordinarily applied, are different. These figures show a decided economy

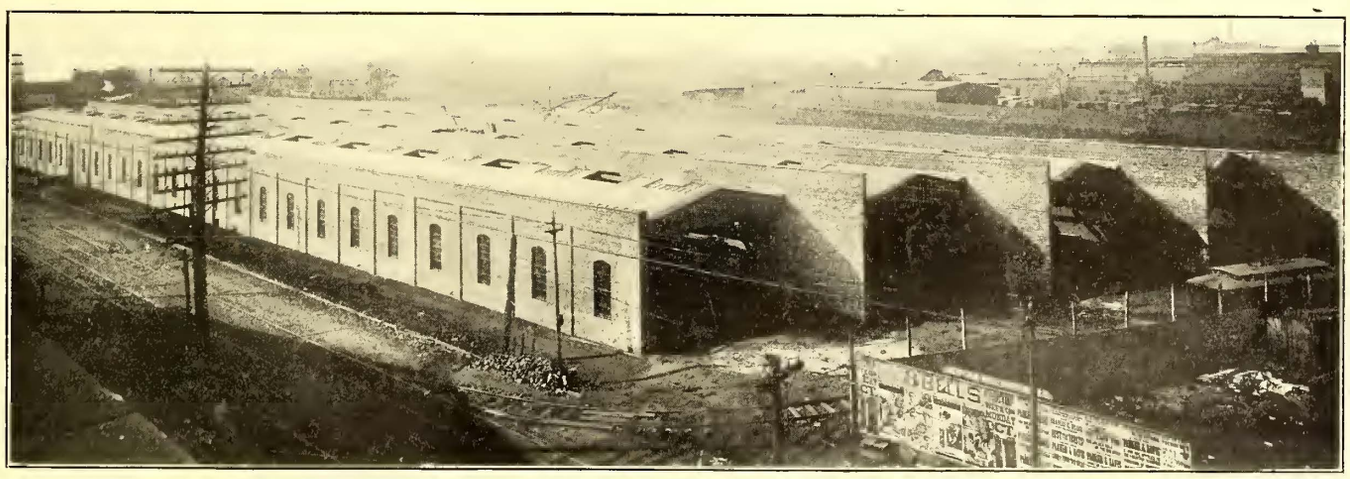
in first cost of a purely storage barn compared with an operating barn as it is necessary to build the latter type.

Car bodies stored and out of service are obviously not under as close watch as those which are in daily operation, and it is not necessary that they should be, for many of the sources of car house fires are removed from them. Consequently, when for some unforeseen cause a fire does start among closely stored car bodies, it may gain much headway before it is discovered; then it can only be fought at a disadvantage among other cars which cannot be run out into the open. The argument is to separate entirely the out-of-season cars from the operating cars, and the endeavor is to show that it is an all around economical proposition as a general one. To produce the best results for economy's sake, the number of cars accumulated must be very large on large systems—their value may aggregate half a million dollars. This requires of the designer of these buildings that he shall confine as much as possible, consistent with the use of the building, the amount of area through which any fire can spread, and further, that for those parts of the building which, for lack of something better, the material of construction must be something which is subject to destruction by fire and water, he must select his materials and assemble them to produce that combination which will resist to the greatest the spread of flames. That is to say, the fire beyond control must be by the building, to the greatest possible extent, kept within the four walls and the roof in which it starts. The Electrical Bureau requests that this area shall not exceed 20,000 sq. ft., with 15,000 sq. ft. as much better.

The existing conditions surrounding the Plank Road shops of the Public Service Corporation in Newark were, in 1903, ideal for the development of this type of building, and a large car house exclusively for storage purposes has been erected during the past summer directly across the street from the Plank Road repair shops. When eventually completed, there will be storage room for 240 cars of the company's largest type, i. e., cars measuring 40 ft. over all. Room for only 120 was needed in 1903 and 1904, so only one-half of the building has been completed, this being built in four bays—two of them 434 ft. long each and two of them 450 ft, long each. All fire walls are 34 ft. 1½ ins. apart, face to face of pilasters, with three tracks between each fire wall, and a storage capacity in each bay of thirty cars of largest type. The bays are staggered across the lot, as shown on plan, to resist the possibility of flame licking around the end of one bay into an adjoining one.



PLAN OF PLANK ROAD CAR STORAGE HOUSE



EXTERIOR VIEW OF STORAGE HOUSE, TAKEN DURING CONSTRUCTION TO SHOW FIRE WALLS

The plan and cross section show the method of construction very clearly.

The following are the special details as worked out to resist travel of flame: The side walls and fire walls are brick. There are no metal girders in the building. All timbers are in very much larger sizes than is necessary to carry their working loads. The larger timbers will burn half-way through before they will fall, and will char all around for an inch and a half in depth or so, and after that, if still burning, there will be little dangerous flame from them. The trusses are 16 ft. apart center to center, and between every alternate one there is a skylight of 100 sq. ft. and a 48-in. ventilator. The lights are of

¼-in. thick hammered wired glass carried in metal frames. The skylights are framed in between the trusses, and not over them, the reason being that the ventilators would probably go first in a fire and would tend to draw the flames toward the openings, and it is desired to keep the trusses out of the path of flame as much as possible. The edges of skylights are bound all around with 8-in. x 8-in. timbers. This is done to resist as much as possible the burning of the roof sheathing on its edges. The sheathing is 3-in. x 9-in. yellow pine lumber, laid parallel to the line of the trusses and splined along the edges to resist burning through between planks on their edges. The fire walls rise 5 ft. above the line of the gutter, and are really higher than the comb of the roof. The 1¼-in. diameter tie rod of each truss is driven through a snugly bored hole down the center of an 8-in. x 8-in. stick. This will protect the rods from burning off except at the lower end, and further, the 8-in. x 8-in. timber will act as a strut if the joints at the foot of the truss should burn away. Twice in the length of each bay a truss is completely sheathed and splined on both sides. This is done to resist the spreading of tongues of flame along the under side of the roof. These covered trusses will turn the flame downward, and they are spaced in relation to the stored cars, so that there are no cars directly under these trusses. In fact, there are no cars within 8 ft. on either side of these trusses. This gives the following car distribution along each track:

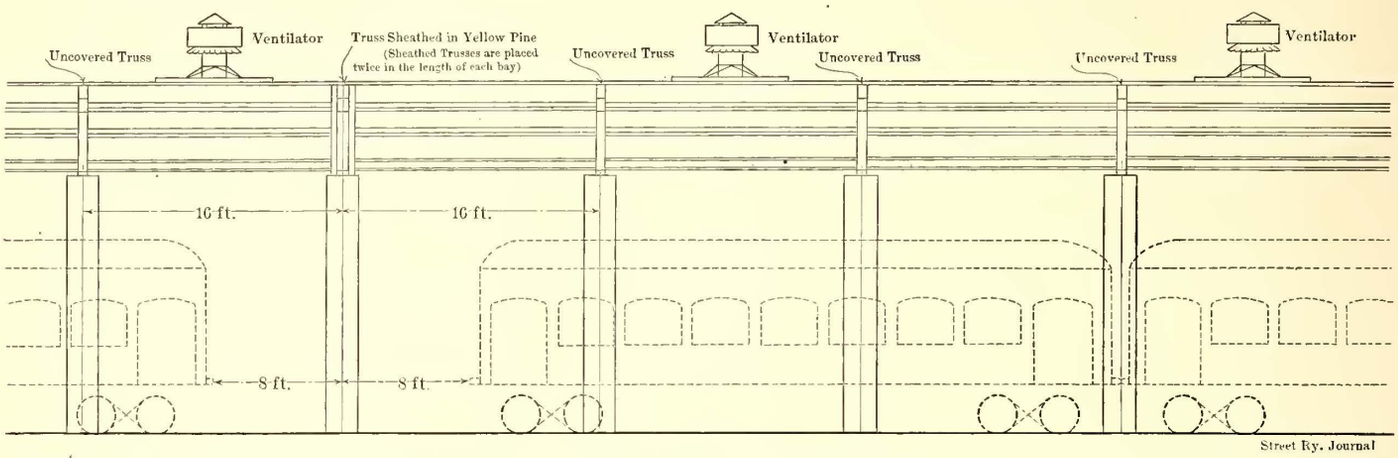
First three cars close together, then an open space of 16 ft. under the covered truss, then four cars close together and another 16-ft. open space under another covered truss, then three more cars together. This is illustrated in an accompanying sketch.

The tracks within the barn are second-hand T-rail of light section, laid in stone ballast, and is standard main line right of way construction. The ends of each bay are protected by steel rolling doors, supplied by the James G. Wilson Manufacturing Company, of New York City.

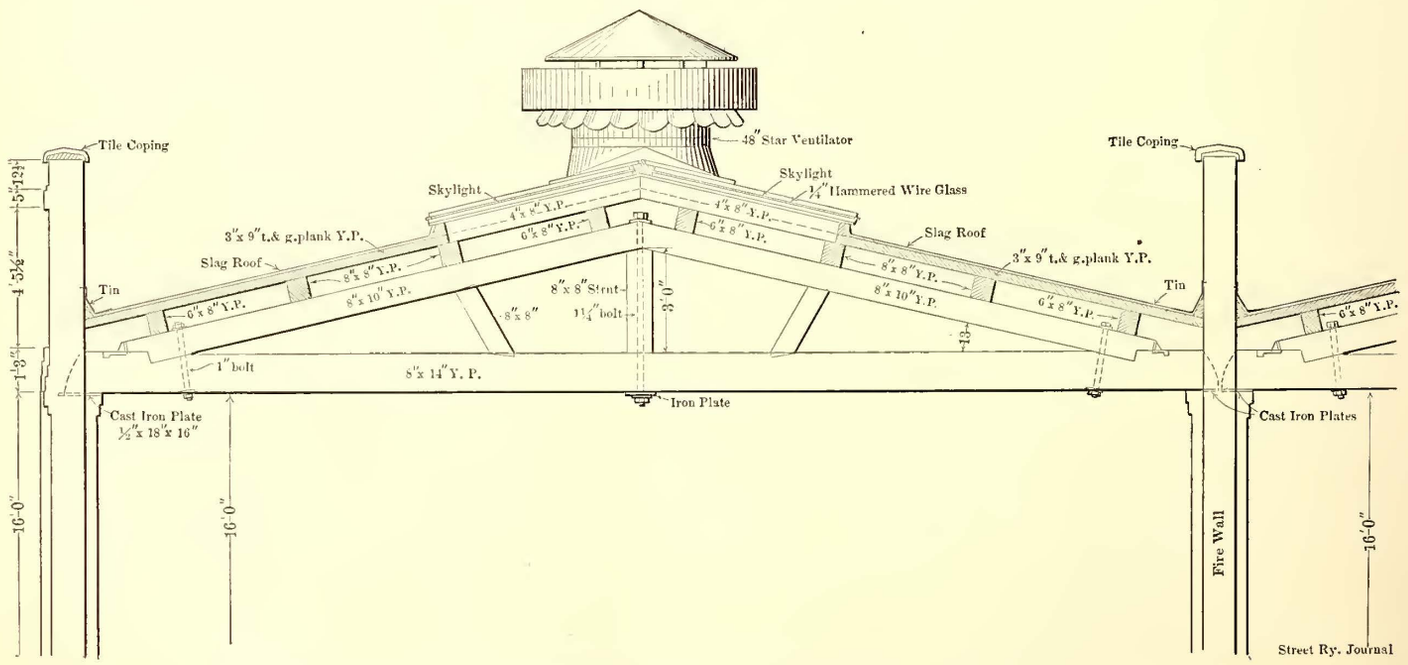
There are no pits and no heat is provided for.

This barn was built with trusses 16 ft. apart center to center, but the subsequent development of the sprinkler system for car house protection will probably make it advisable to change this distance to 20 ft. in future construction. The ends of the trusses do not touch by 8 ins. where they abut at the fire walls. This space was filled with brick and cement as the wall was carried up. The fire walls are solid from end to end, and from the neat line at foundation to the tile coping. The half-tone engraving on page 215, illustrating the exterior of the storage house, was taken during construction, and shows the arrangement of fire walls and method of staggering the bays across the lot. The openings shown in the roof will be covered eventually by the ventilators, the frames of which now appear at the sides of the openings.

Ground was broken for the foundations on Aug. 11, and the first cars for storage were run into one of the bays in seven



LONGITUDINAL SECTION DOWN CENTER LINE OF EACH BAY, SHOWING SPACING OF CARS ON EACH SIDE OF SHEATHED TRUSS



CROSS SECTION, SHOWING DETAILS OF ROOF TRUSS, PLANK ROAD CAR STORAGE HOUSE

weeks. Bruce E. Loomis, inspector for the New York Electrical Bureau, took personal interest in the construction work, and many of the ideas put into the work were his.

An interesting detail of this car house is the arrangement for securing good drainage.

The property lies on the eastern outskirts of the built up portion of Newark on the old Newark Plank Road to New York. This road was once a private enterprise, and while such, the railroad company acquired its land and laid its own sewer system with a 15-in. diameter trunk line sewer leading down the road into the Passaic River, but as new buildings were erected their sewage systems and surface drainages were turned into this, until its limit has been more than reached during heavy storms. The Plank Road with its sewer has passed into public control, and there being no public demand for a larger drain for storm water in this section, it became necessary for the company's engineers to devise some method of disposing of the storm water collected by 125,000 sq. ft. of roofs. It was out of the question for the railroad company to construct a long line of new sewer in a public highway, so the expedient is being tried of increasing the rate of flow through the 15-in. crock sewer at any time when the natural flow of water due to the fall of the drain is not sufficient to carry away the storm water as fast as it is falling. This is done by building a cistern at the head of the 15-in. line, from which it leads, and connecting to the cistern all the storm water drains from the new building. There is a horizontal centrifugal pump 10 ins. discharge connected with the end of the main sewer, and this pump is driven by a motor automatically controlled by a float on the surface of the water in the cistern. During mild storms the sewer carries away the surface water as fast as it falls, but during heavy showers or floods, the water in the cistern will rise, taking the float along with it, and the pump will increase the rate of flow equal to a head of 10 ft. There are several catch-basin openings along the sewer, and as its depth is not over 5 ft. anywhere, these openings will relieve the sewer of bursting pressure from the pump if the pipe should become stopped up along its line. The pump was built by the Buffalo Forge Company, of Buffalo, N. Y., and the motor by the Northern Electric Company, of Madison, Wis. The controlling box and float were supplied by the Cutler-Hammer Company, of Milwaukee, Wis.

It should be borne distinctly in mind that the foregoing reference to costs is an explanation of a solution made necessary by governing conditions which applied to this particular case. These restricting or governing conditions are never the same in any two instances, and the proper solution for each situation requires much special consideration.

MASSACHUSETTS RAILWAY MANAGER ADDRESSES WORCESTER BUSINESS MEN

Frederick A. Huntress, general manager of the Worcester Consolidated Street Railway Company, of Worcester, Mass., gave an address on the "Development and Progress of Street Railways" on the evening of Jan. 19 before the Worcester Board of Trade. The address was illustrated by stereopticon views. After sketching the growth of street railways during the past thirty years, Mr. Huntress summed up his address by stating that "the street railway has expanded and beautified the city; the crowded city has been expanded into the country; towns and cities have been brought into communication where none existed before; the value of property has been vastly increased and streets made cleaner and healthier; in fact, the city of to-day is as much unlike its former self as is the street railway unlike its predecessor in construction, equipment and operation."

CORRESPONDENCE

THE REMOVAL OF SNOW

UNITED TRACTION COMPANY

Albany, N. Y., Jan. 20, 1905.

Editors Street Railway Journal:

The system of the United Traction Company consists of approximately 80 miles of track. For fighting snow we have eight single-truck plows and eight single-truck sweepers, or one plow and one sweeper for about 10 miles of track. As soon as a snow storm gives evidence of becoming serious, or when about 1 in. of snow has fallen, we start out the sweepers. Each sweeper has its proportion of track to cover, and it is required to cover its section every two hours. The sweeper crews report to the division superintendent at the terminal of each line. This routine is kept up till the snow stops. If the storm continues and the snow begins to get heavy the plows are ordered out. If the storm still continues, both sweepers and plows are kept in service so that the entire system can be covered every hour.

We believe the secret of fighting snow successfully lies in getting at it and keeping at it. The sweepers and plows must keep to schedule time, and we impress upon the sweeper and plow crews that they are running on regular schedule and must keep up the schedule.

After snow has ceased falling the sweepers are sent out daily between the hours of 1 o'clock and 4 o'clock a. m. over the entire mileage to clear up any loose snow and keep it back from the tracks. This is done every day while snow remains on the grounds, as wagons and teams are apt to drag snow into the tracks, and if this is not cleared away it will make slush and increase the number of burned out armatures.

We have had storms when the only way to get into or out of the city of Albany was over the tracks of the United Traction Company.

Edgar S. Fassett, Superintendent.

ROCHESTER RAILWAY COMPANY

Rochester, N. Y., Jan. 18, 1905.

Editors Street Railway Journal:

Apropos of the letters appearing in your columns recently relative to fighting snow, our method of handling the snow problem at Rochester may be of interest.

The Rochester Railway Company operates 89 miles of track in its city division, 80 miles of which are within the city and 9 miles outside. Our snow-fighting equipment consists of ten single-truck shear and nose plows, three sweepers, one double-truck plow and two rotary plows. The suburban division is not included in these remarks.

The ten small plows are equipped with two motors each. All of them have adjustable wings at the side for pushing snow away from the tracks. The sweepers are mounted on single trucks, each sweeper having two motors to move the machine and one additional motor for operating the brooms. The double-truck shear plow has four 40-hp motors. The single-truck rotaries each have two motors on the truck and two additional motors for rotating the fan shaft.

For snow-fighting purposes, the pick of the regular car crews are assigned to plow duty, and each plow is assigned to a certain route. At the first signs of snow, the snow crews report at their respective car houses, and the sweepers and plows are sent out as required. The sweepers start first, and if the storm shows a tendency to continue, they are followed by the shear and nose plows.

The latter type of plows are equipped with powerful flangers to dig out the groove of girder rails, and these have been found valuable additions, as the snow in this section of the country is usually wet and heavy. If the snow is particularly heavy and deep, the small plows require pushers, and we couple up a passenger car behind each plow to push it along.

The passage of plows is reported to the superintendent's office by telephone once every hour, so the superintendent is kept informed of the condition of the various lines at all times. The supervision of snow-plow work is directly under the division superintendents, each division superintendent having as assistants the inspectors of the lines, who assume charge of the plows in their district, and when necessary the inspectors ride on the plows in order to keep things moving.

Our passenger cars are equipped with track scrapers, and these help materially in the work of keeping the tracks open.

The removal of snow and ice from the street and the care of curves, crossings and switches during snow storms comes under the supervision of the track department. For this purpose the city is divided into sections, each under a section foreman in charge of gangs, the size of the gangs varying with the amount of work to be done. It is the policy of this company to keep a certain number of track men during the winter for this purpose, and at times of heavy snow extra men are taken on for fighting snow, the extra men being largely men who work on track during the summer.

For removing snow from the streets, we co-operate with and act in conjunction with the city authorities. We use our own teams and hire as many extra teams after each storm as are necessary to get the streets into shape. The teams are in charge of the roadmaster. The city also starts its own wagons and teams at work removing snow, and between us we get the streets into shape in the shortest possible time. The total cost of removing the snow is then divided between the railway company and the city, in the proportion that the area covered by our tracks, including a 2-ft. strip each side of the tracks, bears to the total area of the street, measured from fence line to fence line, and to the area from curb to fence line.

During the winter of 1903-04, the amount charged to "cost of removing snow and ice" on the Rochester Railway was $20,305. The total car mileage for the system during the year was 6,138,030, giving $.0033 as the cost per car-mile for fighting snow. The Rochester & Sodus Bay Railway, which is leased to the Rochester Railway Company, has 40 miles of interurban track, all of which is kept open with three rotaries.

R. E. Danforth, General Manager.

GETTING THE ADDRESSES OF WITNESSES

New Haven, Conn., Jan. 15, 1905.

Editors Street Railway Journal:

An important part of a conductor's duty is to secure the names of witnesses to an accident, but there are often difficulties in obtaining many names during the excitement which follows a casualty of this kind. To overcome this trouble, I have adopted the practice of finding out, as well as I can, the names and, if possible, the addresses of certain regular riders. I enter these names in a small book and keep it in my locker at the car house. By this means I am able, when an accident occurs, to furnish more names than I would otherwise be able to, an important consideration, as the claim department is always glad to have more than the usual number of names furnished by conductors, say three or four.

As to the method of getting names beforehand, several ways will suggest itself to anyone interested, as no set rules can be laid down on the subject. With a little practice, the faces of many regular riders soon become familiar. Sometimes, if there is any passenger on the car whom I know, I ask him the name of some other regular rider; sometimes I glance at the address on an envelope.

A good way for a company, which sells tickets in bulk, to obtain the names of witnesses to an accident, would be to require everyone purchasing tickets to leave his name and address. Thus, if there were an accident, the trip envelope of the conductor could be gone over, and if ticket 234,567 was in that envelope, the records could be looked up to see who was the purchaser of ticket book No. 234,567, and that passenger could be approached as a witness. T. C. Morris.

TWO REGISTERS ON CARS

Newark, N. J., Jan. 29, 1905.

Editors Street Railway Journal:

The Public Service Corporation of New Jersey is installing two registers on all of its lines where a single fare is collected and where the Ohmer register is not used. The old registers are to be pensioned off and made do duty for transfers, while a modern register for the main fare is used. The much mooted question, "Should transfers be registered?" will, therefore, be settled.

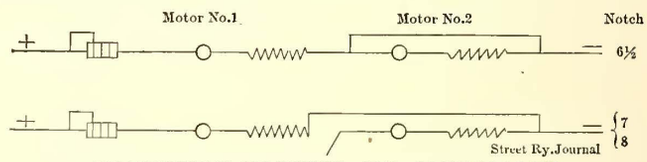
The writer has always claimed that a long trolley car, to be inspected properly, should have a main fare register on the rear end and one on the front, to work simultaneously. If this were done an inspector sitting at the back of the car, under one register, could look at the other. To those who do not wish to follow this practice the following suggestion may appeal: Place a mirror in the center of the car, so hinged that it will catch the reflection of the register and make it visible from any part of the car. That it will pay a company to have a separate register for transfers is obvious. Joseph Andrews.

THE CONTROLLER PROBLEM

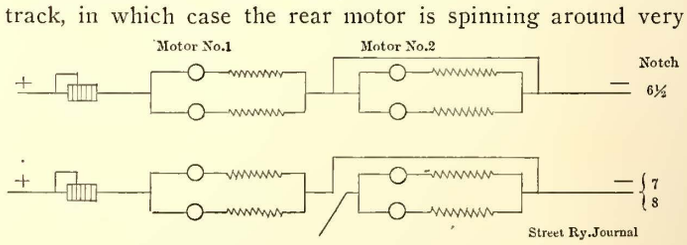
Boston, Jan. 19, 1905.

Editors Street Railway Journal:

I have read with much interest the article on surface car controllers in the Street Railway Journal of Jan. 7, 1905, by Edward Taylor. The subject is certainly important, and anything which can be brought forward to illuminate the problem of short-circuits in car wiring is certainly worth careful consideration by electric railway engineers. There was one point in connection with these controller short-circuits which did not receive mention in Mr. Taylor's article—the occurrence of such troubles in passing from series to multiple when the motors are carrying widely different loads. Such a condition often occurs when the forward motor, through its connected car wheels, is slowed down by the bind of the curve in the track, in which case the rear motor is spinning around very rapidly on the tangent track behind; sometimes a marked difference in grades between the front truck and the rear truck causes this difference in loading, and again, the front motor, or pair of motors, in a snow-plow equipment very frequently catches this uneven load.



TRANSITION NOTCHES, K-10 CONTROLLER



TRANSITION NOTCHES, K-12 CONTROLLER

Now, at this point, as will be seen by the accompanying skeleton pen diagrams of the transition notches on a K-10 and a K-12 controller, motor No. 2 (or the second pair of motors in a four-motor equipment) is first short-circuited and then open-circuited in passing from series to multiple. Under the

conditions above mentioned, when the motors are loaded unevenly and No. 2 is spinning around rapidly, the open-circuiting of No. 2 (single or pair) generally is accompanied by a heavy flash in the controller, caused apparently by the breaking of the heavy current flowing through No. 2 and its short-circuiting connection. Acting as a generator at this time also, No. 2's high speed and resulting abnormal potential seem to make matters worse, as the opening of the circuit under normal conditions of loading ordinarily gives little trouble.

In view of the foregoing facts, it is considered desirable by more than one operating man that the surface controller of the future shall be designed so that the circuit of No. 2 will not be opened in passing from series to multiple. The difficulties of the problem are doubtless not to be minimized, and the question is one for the controller expert rather than the average electric railway engineer. With a four-motor equipment the flashing is far more destructive than with a two-motor outfit.

HOWARD S. KNOWLTON.

DETECTING BEATS

Brooklyn, N. Y., Jan. 12, 1905.

EDITORS STREET RAILWAY JOURNAL:

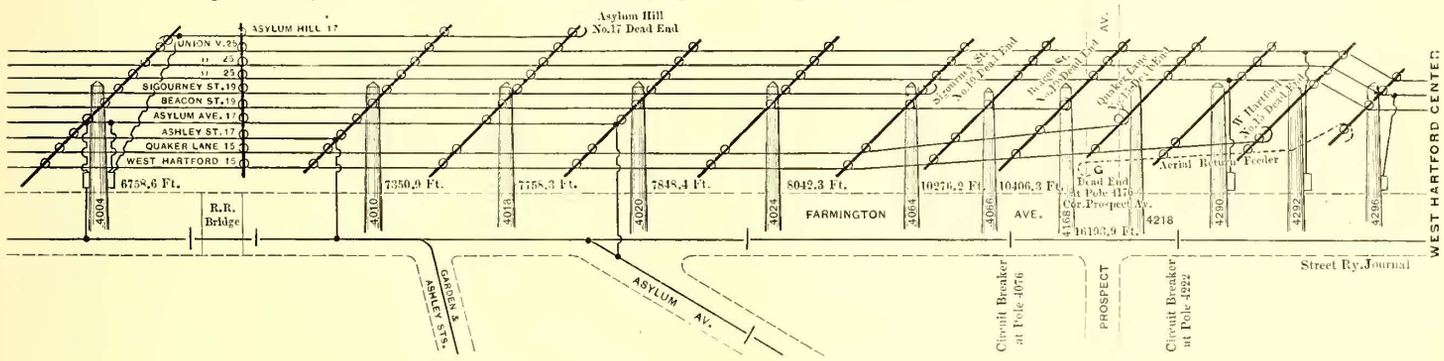
Your recent editorial on collecting fares calls attention to the fact that in practically all cities there is a class of people that "beat" the conductor and are proud of it. They usually do this on a crowded car by claiming that they have already paid their fare, when they are asked by the conductor for their nickle. To protect its own interests, a company should take measures to break up this practice, as these people by their boasting lead others to follow their example, especially if they are among a large number of workmen in a shop. One plan would be to detail a detective to listen to one of these men and then secure a warrant for his arrest, both as a disorderly person and for defrauding the company. A few examples like this would have a wonderful effect and stop a great deal of this kind of swindling, which is practiced especially on new conductors.

R. P. WILLIAMS.

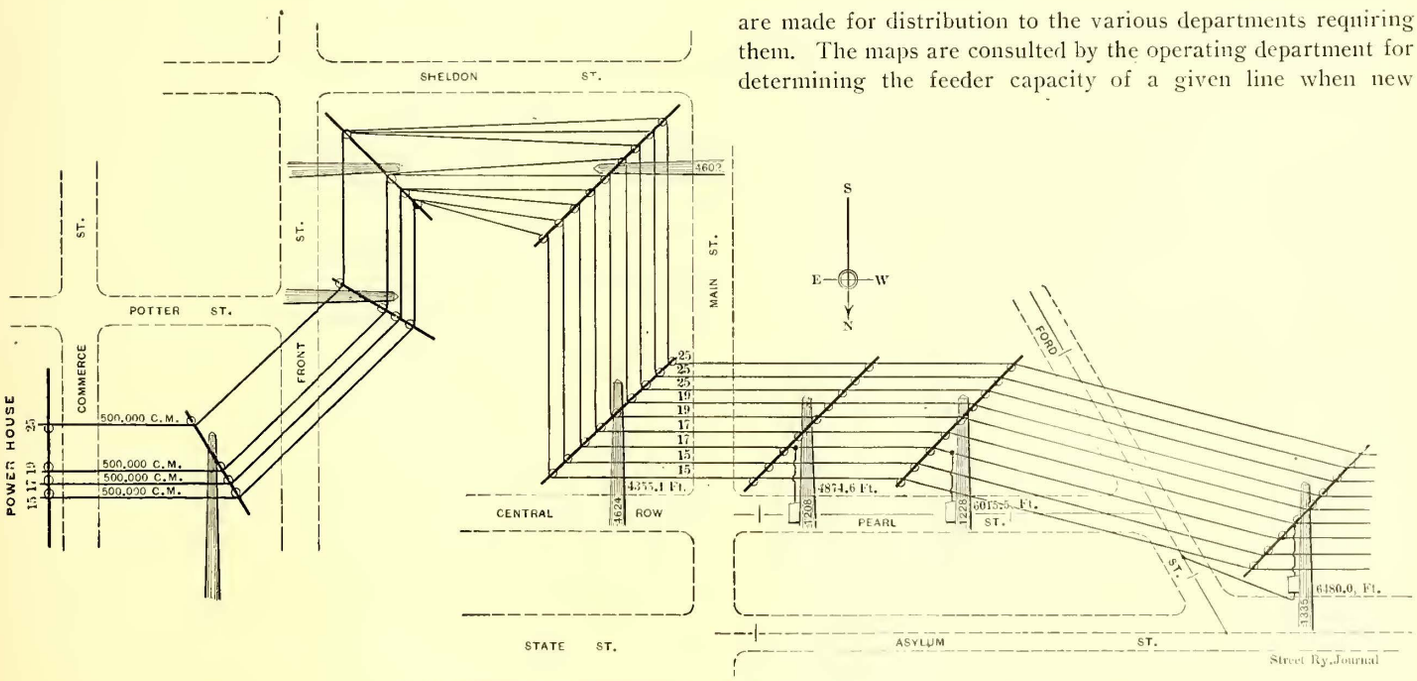
PLOTTING FEEDER MAPS

Through the courtesy of J. Tregoning, engineer of the Hartford Street Railway Company, of Hartford, Conn., the feeder map is reproduced herewith, showing the method adopted by the engineering department of the Hartford Company for plotting, in form convenient for quick reference, the feeder layout on each line of the system. The maps are not drawn to scale, but they show the size and length of each separate feeder, and also the location of each pole at which a feeder ends or where there is a tap to trolley wire. The curb lines of the streets are also superimposed upon the maps so as to show the exact location of the feeders and poles with reference to the street lines. Distances, as shown, are indicated in feet, and are measured from the bus-bars at the power house.

Separate maps are traced for every line, and blue print copies are made for distribution to the various departments requiring them. The maps are consulted by the operating department for determining the feeder capacity of a given line when new schedules are under discussion; by the track department when changes are to be made in the tracks or streets, and they afford a very convenient means of indicating any particular point on the system at which changes or repairs are to be made in overhead construction.



MAP SHOWING METHOD OF PLOTTING FEEDERS ON STRAIGHT LINES



MAP SHOWING METHOD OF PLOTTING FEEDERS AT CORNERS

RECENT METHODS OF CONSTRUCTION AND PAVEMENT OF TRACKS IN BOSTON

BY ARTHUR L. PLIMPTON
Civil Engineer of the Boston Elevated Railway Company

8-IN. T-RAIL CONSTRUCTION

Although the high T-rail has been in use in paved tracks in other parts of the country for some time, particularly in the West, the Boston Elevated Railway never seriously considered using it on its system until this last summer. The attention of some of the officers of the company was called to it in Minneapolis while visiting that city. They were so much pleased with its appearance and its perfect construction that the final result has been that several lengths of it have been laid on the Boston system, amounting in all to a little less than 13,000 ft. of single track. The Minneapolis form of construction, as described in the Aug. 29, 1903, number of this journal, was practically followed in most of the work, and does not differ materially from what has been done in several cities. Nevertheless, as in one case, bitulithic pavement was used, and as possibly there are some other differences in the details, the following drawings, showing what was actually done in each case, may be of general interest.

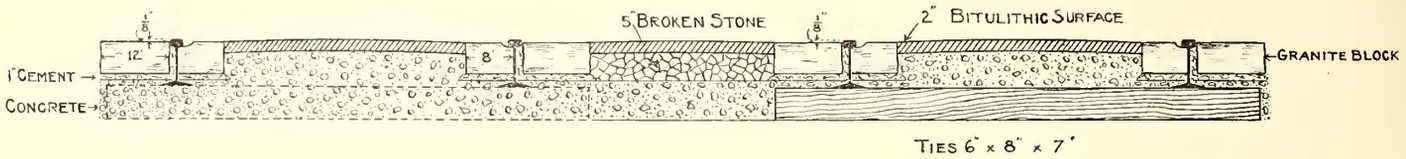


FIG. 1.—CROSS-SECTION OF TRACKS IN HIGH STREET, MEDFORD

As illustrative of this general type of construction in Boston, Figs. 1 and 2 are presented, showing respectively a cross section of the tracks in High Street, Medford, and the form of construction used in Boylston Street, Boston. In each of these cases, twelve ties were used in each 30 ft. of track; tie rods were placed 5 ft. apart and continuous rail-joints were used. It will be noted that in the case of High Street, the concrete base is carried to within 2 ins. of the surface and that this forms the base for the bitulithic surface, although usually this surface is laid upon a solid bed of broken stone. The reason for this change was that it was found that it would be impossible to properly roll the broken stone without injuring the tie rods, which came a little above what would have been the top surface of the broken stone.

The use of a rail with a T-rail head and the omission of a tram altogether, constitute, of course, a radical departure from girder-rail construction. It should not be supposed for a moment that, on any narrow streets where there is heavy team traffic, this form of construction would prove to be durable, as in such places, ruts of irregular depth would before long be formed alongside of the rails. The places selected for trial, therefore, were either where there is very little team travel on the street generally, or where the cars run so frequently, and where there are such good roadways that the teams keep off the tracks, as is the case on Boylston Street.

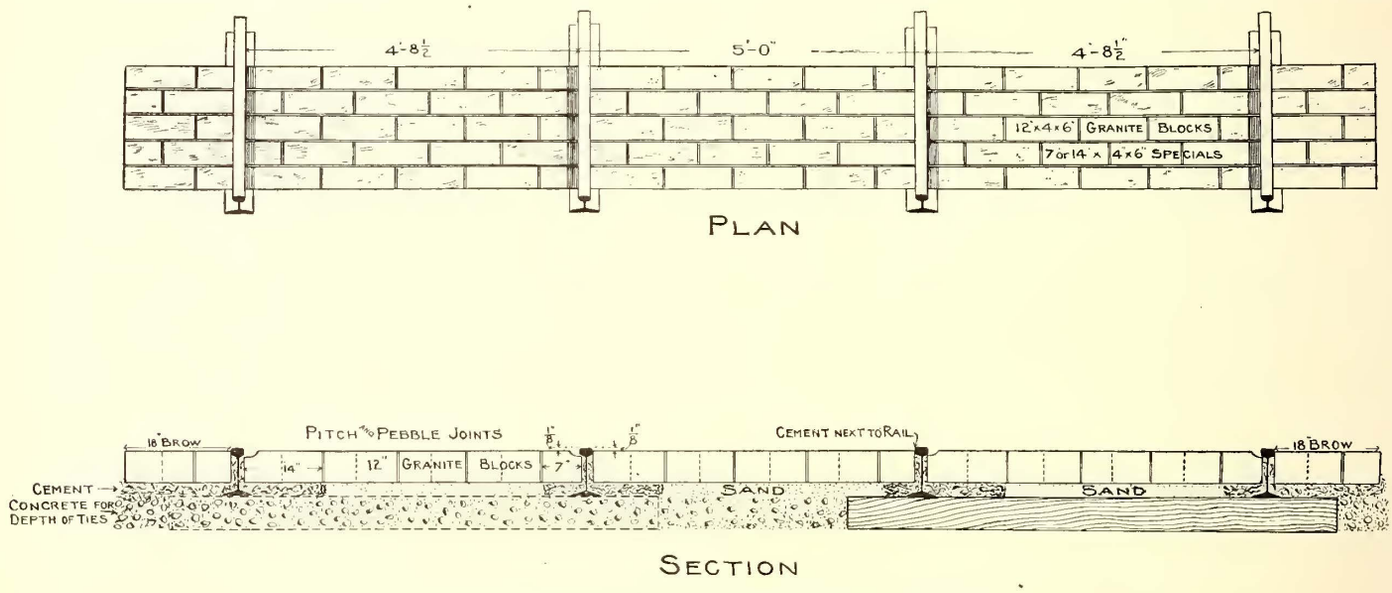


FIG. 2.—FORM OF CONSTRUCTION IN BOYLSTON STREET, BOSTON

BITULITHIC PAVEMENT

Besides its use in connection with the T-rail track, bitulithic pavement has been used in several places in girder-rail track, the form of construction being shown in Fig. 3, which represents a cross section of the tracks of the Boston Elevated Railway Company in Springfield Street, Cambridge. Here again tie rods prevented properly rolling a foundation of broken stone, so that concrete was used instead, except in the center between tracks.

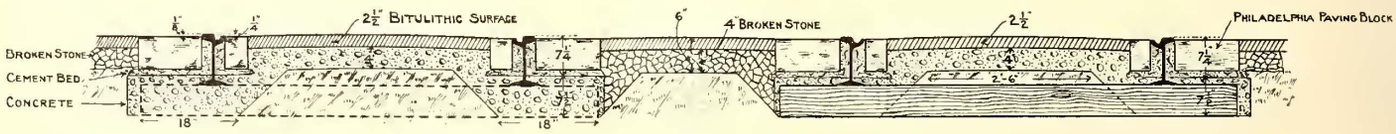
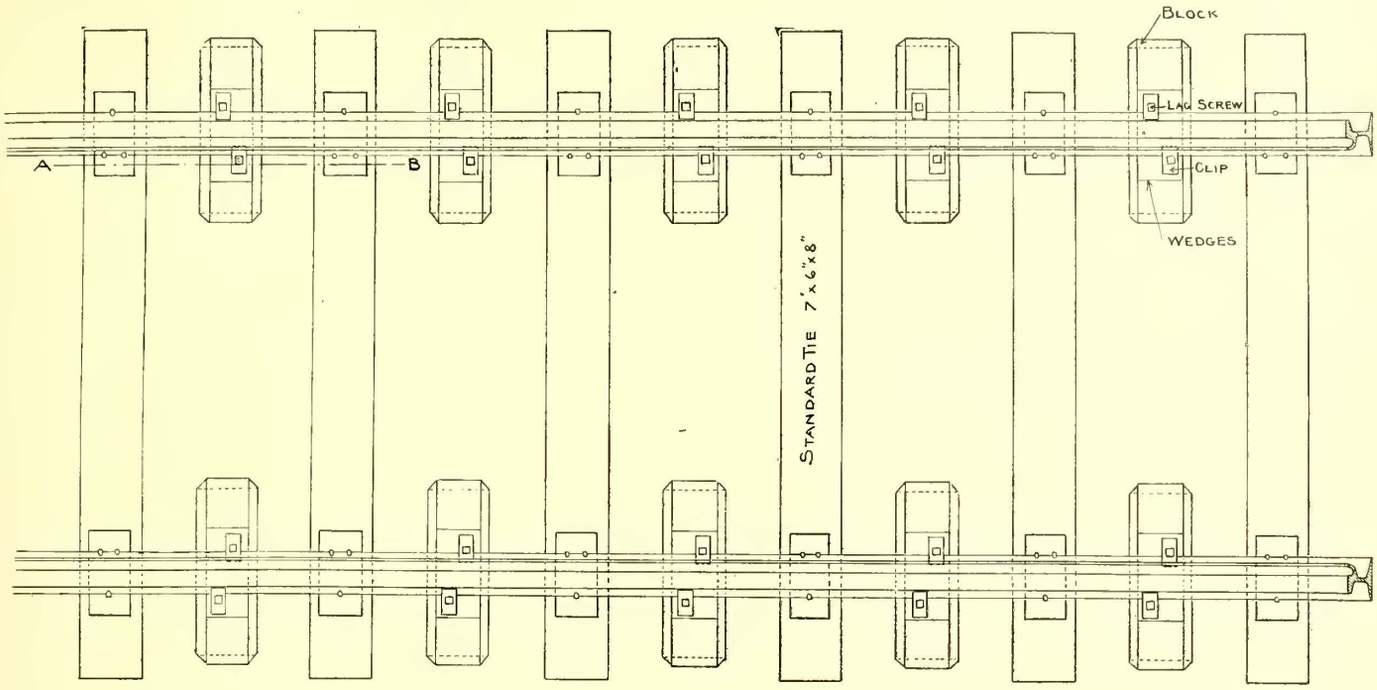


FIG. 3.—CROSS-SECTION OF TRACKS IN SPRINGFIELD STREET, CAMBRIDGE

How durable this form of pavement will be cannot be stated from actual experience on the Boston Elevated system, as this last season was the first time that it was ever tried. It is a very

satisfactory pavement in one respect, as it presents a gritty surface, and horses can get a better foothold on it, when the tracks in the central parts of our cities where the streets are laid with a modern pavement on a concrete foundation, is to



PLAN

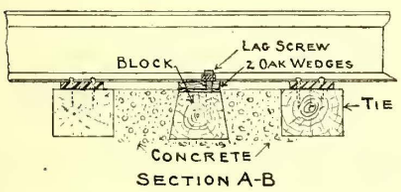
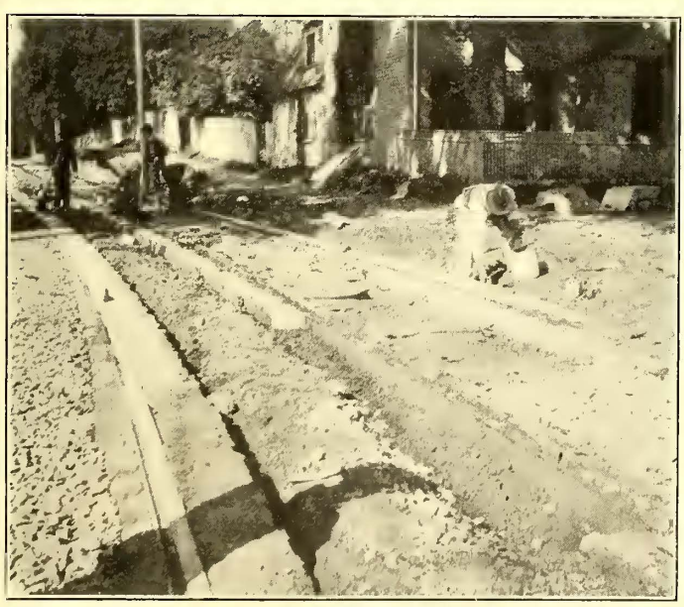


FIG. 4.—METHOD OF RELAYING TRACKS WITH CONCRETE BASE WITHOUT INTERRUPTING CAR SERVICE

do the work properly without interrupting the car service.

To allow the concrete in the track to properly set and to become strong enough to stand the pounding of the heavy electric cars without injury, the cars should be taken off for a week or ten days. On a line of great traffic it is impossible to carry



BOSTON ELEVATED RAILWAY CONSTRUCTION OF TRACKS IN HIGH STREET, MEDFORD, SHOWING STONE BLOCK HEADERS LAID ON PORTLAND CEMENT CONCRETE FOUNDATION AND GROUTED WITH PORTLAND CEMENT

BOSTON ELEVATED RAILWAY, HIGH STREET, MEDFORD, SHOWING THE THICKNESS AND UNDER SIDE OF A SECTION OF THE BITULITHIC PAVEMENT, CUT FROM BETWEEN THE TRACKS TO INSTALL A CATCH-BASIN INLET

street surfaces generally are in a slippery condition, than they can on most smooth pavements.

RELAYING TRACKS WITHOUT INTERRUPTING CAR SERVICE

One of the greatest difficulties that presents itself at the present time in connection with the relaying of street railway the traffic on a single track, and in narrow streets it would be impracticable to lay a temporary track outside of the permanent location, so the result is, all work on the tracks has to be done during the time at night when most of the traffic is suspended, which is for about five hours. The problem before the track

engineer is therefore to put in durable construction and yet not to injure the fresh concrete by allowing the cars to operate over the track the next morning.

The writer has given this matter considerable study, and has devised a method which has been tried in an experimental way, and which promises a solution of the difficulty.

The method is as follows: A short length of track, as much as it is practicable to complete in the ordinary way on ties 2½ ft. on centers, is relaid each night. The 6-in. layer of concrete is then put in between and around the ties and the cars are allowed to run over the track the next morning. The effect of this, of course, is to break the bond between the ties and the concrete, allowing a slight up and down movement of the track.

Although not previously stated, we install under each rail and in each space between the regular ties a block of wood about 2 ft. long, 8 ins. wide and 6 ins. deep, with the sides beveled one way and the ends the other, so as to insure a bond. This block is bedded in the concrete and is left so as to give a space of 1 in. between the top surface of the block and the under side of the rail.

The movement of the track in no way disturbs these blocks, which at the end of ten days are held solidly in the concrete. Then at each block two wedges are inserted between it and the rail, one on each side of the rail, and are driven in so as to transfer the entire weight of that part of the track to the block. The method employed in the experiment was to then fasten the rail by means of clips and lag screws; see Fig. 4. By these means practically all movement of the rail under a passing car is eliminated.

It is advisable now to completely fill the spaces between the ties and the concrete, and the spaces under the ties created by the movement of the tracks, with quick-setting Portland cement grout. The pavement can then be put in without fear of movement of the rail disturbing the

BOSTON ELEVATED RAILWAY, HIGH STREET, MEDFORD. SHOWING THE UPPER SURFACE OF A SECTION OF THE BITULITHIC PAVEMENT CUT FROM BETWEEN THE TRACKS TO INSTALL A CATCH-BASIN OUTLET

block next to it. The wooden block can be dispensed with and vertical bolts can be bedded in the concrete instead for holding the rail, or any other method that is desired and which will accomplish the same result can be used. The essential point is to create new points of support on the solid concrete to take the place of those permanently injured by the operation of the cars on the tracks before the concrete has hardened enough to stand the strain.

FUEL, ASH AND GAS TESTING: I, LABORATORIES

BY J. STANLEY RICHMOND

As most of the large power houses are equipped with testing laboratories at present, it will be the main object of this article to place before the smaller undertakings as briefly as possible

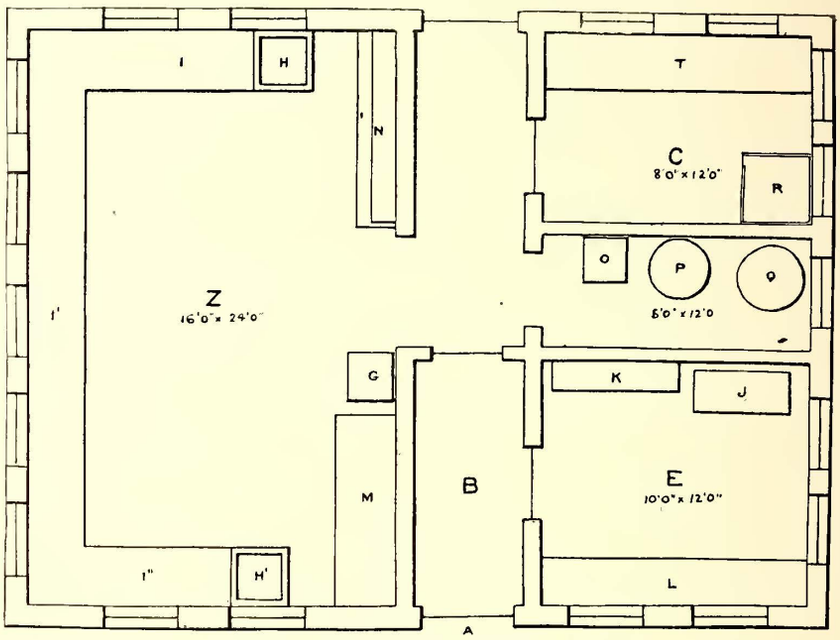


FIG. 1.—LARGE-SIZED LABORATORY

a description of how this class of work should be carried out to suit their smaller financial ability. For, with the inexpensive laboratory and apparatus required, the necessary tests are of such a simple character that they can easily and rapidly be made by any young engineer who is a college graduate or has an elementary knowledge of chemistry. And, in nearly every power house, there is some minor official possessing such qualification who would be quite willing to give a couple of hours a day (often otherwise wasted) to undertake this work in return for a small increase in his salary. To assist in the description, this article will be divided under three headings—laboratory, apparatus and work; while the last will be treated of under three sub-headings—outside sampling, inside sampling and tests.

LABORATORY

The laboratory, if possible, should be a one-story building, detached from any other structure and located near the smokestack. In choosing the location, due attention should also be given to the question of the gas, heat and water supply. In case gas is not obtainable from the mains, it can be provided for by the occupant of the laboratory with some inexpensive apparatus, which will be described further on. Figs. 1, 2 and 3 are rough ground plan sketches of suitable buildings. Which one should be chosen will depend on the amount of the appropriation placed at the disposal of the engineering staff. The scale of each is ⅛ in. = 1 ft.

Fig. 1 illustrates, approximately, the ground plan of a laboratory with which, besides fuel, ash and gas testing, water, oil, paint, iron, steel and general metallurgical testing may be carried out, a description of which will considerably assist anyone undertaking to equip or operate a medium or small sized one. *A* is the main entrance; *B* is a passageway; *E* is the balance room, which is also used as a library and office; *C* is the sample

room, and Z is the laboratory proper. M is the stink cupboard, which is built of wood, and about 2½ ft. deep by about 5 ft. high, with hinged glass doors, and is supported on wooden legs, and the inside connected to the power-house stack by means of a wooden tube. If connection to the stack is difficult, a wooden tube, having an inside sectional area of about 1 sq. ft., can be attached to the nearest tall building and connection be made to it instead. Such tube should, of course, be run to about 12 ft. above the top of the wall. G is a four-legged stool about 2 ft. high and having a top about 2 ft. square. This serves for a stand for a 10-gal. or 20-gal. glass or stone jar to hold distilled water, which water should be used in all operations without any thought of economy. N is a reagent cupboard extending from the floor to the ceiling, the lower portion of which is provided with two or three shelves and wooden doors, while the upper portion is divided by shelves to suit the different sized reagent bottles, and has a front composed of three sliding glass doors. H and H' are sinks made out of enameled ware or of wood lined with lead. These should be about 2 ft. square by about 12 ins. deep, and the top edging around them should slant inward. I, I' and I'' are benches with about 2-in. tops and about 2½ ft. deep, so arranged that a single tier of drawers is located below them (tops), while the space between the tier of drawers and the floor, by the use of plain hinged doors, becomes available for storing purposes. On the wall, about 12 ins. above the benches, is fastened a gas pipe with cocks and hose outlets about every 18 ins., each one of which should be provided with about 3 ft. of heavy rubber tubing for connections to Bunsen and solid flame burners. At each of the corners, where the benches meet, should be placed a water bath.

The floor of the laboratory proper should be of cement or, preferably, of glazed tiles, and should always be mopped and not swept, for sweeping raises the dust, which settles on and in the glassware. J is a roll-top desk; K is a bookcase, and L is a bench for two balances and a few desiccators. The floor of this room should be covered with linoleum. O is a small four-legged stool about 3¼ ft. high, with a top about 2 ft. square, which is used as a support for the muffle furnace, which muffle is heated by gas or by air blast in connection with a small oil-gas tank similar to those used in dental work. P is

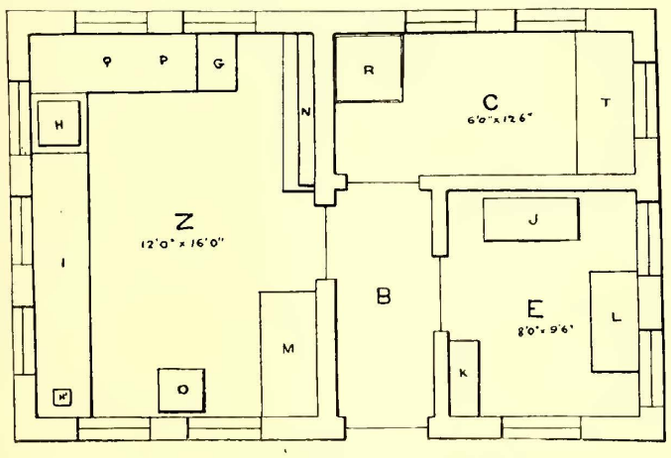


FIG. 2.—MEDIUM-SIZED LABORATORY

a circular tank about 6 ft. deep and 3 ft. in diameter, supported on a stool about 2½ ft. high. Inside the tank is a coiled tin condensing tube, which is soldered to and passes through the side of the tank about 1 ft. from the top, the outer portion being expanded so that the nozzle from the copper still Q can be inserted into it, the coupling being made steam tight with asbestos. The bottom end of the tin coil is soldered to and passes through the front of the tank about 2 ins. from the bottom, protruding about 6 ins. The incoming condensing water is allowed to trickle into the mouth of a long-necked tin funnel (about 6½ ft. over all), which funnel, of course, is inserted in the tank so that the cold water runs to the bottom of it. The hot water is carried away to the drains by means of a piece of rubber tubing attached to a nipple soldered to the tank about 6 ins. from the top. The still is set in an iron-plate furnace provided with a small grate for burning coal, which furnace can be made out of a piece of boiler plate by any average blacksmith. The floor of this room should be of cement and the

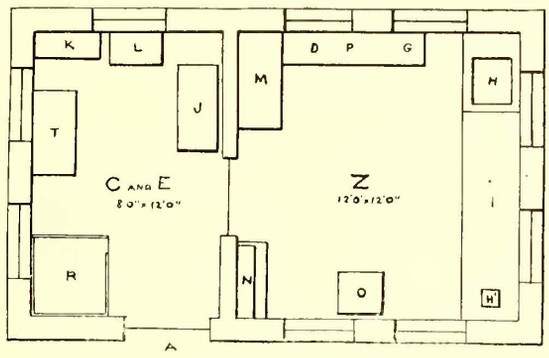


FIG. 3.—SMALL-SIZED LABORATORY

room be provided with a door, which should be taken down in winter—that is, only used in summer, otherwise the heat from the muffle and furnace is insufferable during the hot months. C is a sample room, the floor of which should be covered with sheet lead. R is a solid brick support about 2½ ft. high, with a cast-iron top about 3 ft. square, which top has a raised edge about 1 in. high all around it except for about 6 ins. at the corner S. T is a bench table provided with a well-balanced scoop scale to weigh up to about 5 lbs., and of such a grade that the index needle will move with the addition of 10 grains to one side of it.

Fig. 2 is a rough ground plan of a smaller laboratory, in which Z is the laboratory proper, M is the stink cupboard, N is the reagent cupboard, I is the bench, H is the sink, H' is the water bath, and QPG is a table with a small copper still heated by gas, a small condensing tank and a distilled water bottle on it. C is the sample room, R is the sampling table, and T is the bench. B is the passageway, E is the balance room and office, J is the desk, K is the bookcase, and L the table for the balance and desiccators.

Fig. 3 is a rough plan of a still smaller arrangement, in which E is the sampling room, office and balance room. R is the sampling table, T is the bench, K is the bookcase, J is the desk, and L is a small case with a glass front that can be lifted upward, and in which the balance is kept. Z is the laboratory, M is the stink cupboard, N is the reagent cupboard, I is the

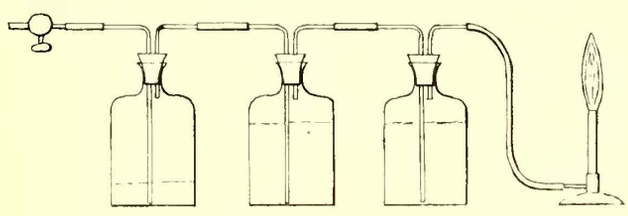


FIG. 4.—GAS-GENERATING APPARATUS

bench, H is the sink, H' is the water bath, and QPG is a table with a copper retort and condensing tube for distilling water.

Having described the laboratory buildings, it may not be out of place to now give the details of the apparatus necessary for the production of gas, provided that such is not obtainable from regular gas mains. The first thing to do is to obtain a small blower and motor and erect them in the sampling room or other convenient place, and connect the blower to the gas piping in the building. Between each Bunsen and its gas-cock is connected in series three bottles, each one having a capacity of

about 1 quart, and each fitted with a cork and bent-glass tubes, as shown in Fig. 4, so that the air will be carried down in succession to the bottom and pass out at the top of each bottle. The bottle nearest to the gas-cock is about one-quarter full of commercial sulphuric acid, which extracts the moisture from the air. The other two bottles are about two-thirds full of gasoline or some other light petroleum oil, which oil is volatalized by the air and passes over with it to the Bunsen burner, where it is ignited and burns like ordinary gas.

OVERHEAD EQUIPMENT*

BY H. M. SAYERS, M. I. M. E.

The stresses on all the supporting structure of an overhead construction are functions of the size and weight of the trolley wire used, and to keep down the size, weight, number and expense of supports the wire should be chosen as small as will serve the designed purpose. It is easy to show that there is no electrical necessity for using any wire larger than No. 0 S. W. G. (.324 in. diameter), where the trolley wire is fed as usual at ½-mile intervals, unless the traffic is extremely heavy. But on suburban or interurban lines carrying an infrequent service it may be necessary to avoid the expense of underground feeders and to employ heavier trolley wires or, preferably, overhead feeders. Heavy traffic, especially over curves of short radius, may also afford a reason for the use of larger wire in order to increase the life and remove the risk of breakage on account of heavy mechanical wear. The most economical size of trolley wire to employ in any particular case is thus mainly a question of its life as a mechanical wearing part, the cost of renewal and the loss by scrapping having to be put against the capital expenditure. But it must not be forgotten that a heavier wire involves heavier poles and other supports, the cost of which must be properly brought into the account. The conditions are too complex, and at present too little determined by experience, to admit of the formulation of any general rule, but it is probable that where the conditions are very severe it is better to employ one of the harder bronze alloys than a copper wire of larger size.

One reason for this is that the wearing qualities of hard-drawn copper wire are not directly proportional to its weight, the hardness diminishing from circumference to center. This is well shown by the fact that the post-office specification for such sizes as Nos. 12 and 14 calls for a breaking strain of 28 tons per square inch, while the usual trolley wire specification is equal to 22 tons, over 20 per cent less. The effective thickness of the hard skin varies with the details of the manufacturing process, and very little seems to be known about the subject by users; but, from the behavior of trolley wire under long wear, it seems probable that the hardness diminishes gradually and, up to such sizes as No. 0, a considerable thickness is appreciably hardened. It is also possible that the rolling of the trolley wheel has a further hardening effect, but where the wheel rubs or grinds, hard abrasion removes the hard exterior and the softer metal inside is soon reached. On these facts it is clear that a material that is hard right through should be preferred. Very little experience with these bronze wires has been made public, and as some are brittle and some pit badly under arcing, they should not be extensively adopted without trial. They are all of higher electrical resistance than copper, and therefore require feeding at shorter intervals if the traffic is heavy. The mechanical and electrical qualities required in trolley wire are well known, easily verified by test and readily complied with by a considerable number of makers. Very high tensile strength should be regarded with suspicion as probably indicative of brittleness, and bending and falling weight tests should be made in such cases.

The maximum distance apart of supports is settled by the Board of Trade regulations at 40 yds.; on straight lengths there is no reason for diminishing this, and it is therefore taken as the standard. But at curves, junctions and termini, the positions of poles have to be carefully considered and so arranged as to take the longitudinal pulls of the straight lengths or tangents as directly as possible, to hold the trolley wire closely and firmly to the required curves, and to hold "special work" to its correct place. There is often but a limited choice for pole positions, especially at junctions where streets cross, and in all such cases an accurate large scale survey should be made, the trolley wire and special work laid down on it, and the best arrangement of span and pull-off wires that will suit the possible pole positions worked out. The labor of drawing several alternatives will be well repaid by the workmanlike and satisfying appearance of the completed work, and by the absence of working troubles.

One essential point at these places is to anchor the straight lengths as directly as possible to a heavy pole. If such a pole can be placed at the intersection of the tangents it can take both anchor wires. The ends of the curves should also be anchored in the usual way. This anchoring is very important, because it makes the straight lengths and the curve work mutually independent; the span wires are not distressfully pulled out of line, and the pull-off wires intended to shape the curve have not to take indefinite components of the pull of the straight lengths. Most important of all, if any accident happens to the overhead work on either the curve or one of the straight lengths its effects will be stopped by the anchoring. Anchoring is also necessary at section insulators, and it is advisable to anchor every quarter of a mile, even on a perfectly straight line, in order to localize the effect of a trolley wire breaking. Termini, curves and junctions are the keystones of the whole structure, and, when the pole positions at these places have been worked out, the tangents between have only to be divided up into equal lengths of as near 40 yds. as circumstances permit, but never exceeding that distance. Side poles with brackets can rarely be used to carry wires central to the track, as the bracket arms would be unduly long; the choice lies between span wires and central poles. Where there is room, central poles have certain advantages, especially that of neat or even ornamental appearance, and their cost is somewhat less than that of span-wire construction. But as the clearway between the tracks has to be from 2 ft. to 2 ft. 6 ins. wider to give the regulation clearance between cars and standards, the total cost to the tramway undertaking is rather increased than diminished. They also have to be lighted sometimes at the tramway expense. To other traffic in a busy thoroughfare central poles are a nuisance and a danger, but, where streets of magnificent width relatively to the traffic on them exist, the disadvantages may be inappreciable. On even slight curves center poles are insufficient, as there is no means of "pulling off" the outside wire, and, if side poles are added for that purpose, they look very odd.

Feeding points have also to be reckoned with in laying out pole positions. The best way of cutting up the work into ½-mile sections will depend upon many local conditions, but one constant consideration is to arrange that a fault on any section shall have a minimum effect upon the whole service, and consequently sections frequently terminate at junctions. Section insulators should be kept out of the junction special work, and, where this is complex or important, it is best to insulate it on all sides and feed it separately. Section insulators should not be put on curves or on steep gradients. With span-wire construction on curves more and stronger poles are needed on the outside or convex side of the road than on the concave side, the pull of the trolley wire being centripetal. Bracket-arm poles should always be on the outside or convex side of the road.

* Abstract of paper read at the meeting of the British Tramways and Light Railways Association, Jan. 13.

Having arrived at the pole positions, the next point to determine is the strength of pole to be used in each. Generally speaking, three grades of strength will suffice. The Engineering Standards Committee has recently issued a standard specification for tubular tramway poles in which the three strengths are classed as light, medium and heavy, and the strength defined by the loads needed to produce a temporary deflection of 6 ins. and a permanent set not exceeding ½ in. under conditions fairly representing the working loads. The temporary deflection load may be regarded as the maximum safe working load, and the permanent set load as marking the commencement of danger by deformation. The loads are as follows:

Class of Pole.	Load for Temporary Deflection of 6 Inches.	Load for Permanent Set Not Exceeding ½ Inch.
Light	750 lbs.	1,000 lbs.
Medium	1,250 "	1,750 "
Heavy	2,000 "	2,500 "

Occasionally heavier poles than the standard "heavy" class may be needed, but these occasions are rare, and may often be avoided by dividing the load between two "heavy" poles. The choice as between sectional and taper poles is mainly one of taste and price. That the appearance of a pole of uniform taper is better than that of a pole built of three parallel sections is a general opinion. At present, for equivalent mechanical tests, taper poles to standard dimensions are dearer than sectional poles and somewhat heavier. The absence of the swaged joints is put forward as a mechanical advantage, but it is very rarely found in practice that a sectional pole fails at the joints. If taper poles are used it is desirable to have them solid rolled, as a lap-weld the whole length of the pole may prove a line of weakness. Solid rolled tube is an improvement in sectional poles, but there is not a great risk of poor welds in these comparatively short lengths, and if the joints are set at 120 degs. in plan, as they should be, the pole as a whole will show no line of weakness. Wooden poles should be chosen to give the same temporary deflection as would be called for in steel poles. As this depends upon stiffness, it will generally be found that very thick timber is necessary, and the poles will have a stumpy and heavy appearance. The first cost will generally be lower than for steel poles, but the ultimate economy is somewhat doubtful and should be considered with full knowledge of the special conditions, especially the probable life of the wooden pole in the local soil and climate. In any case the poles should be creosoted to the post-office specification, and they should not be set in concrete.

Lattice poles can be purchased, and are sometimes used on the Continent. They are said to be cheaper than tubular poles of equal strength, but are very ugly, and it is probable that the painting necessary to preserve them from rapid corrosion in this climate will neutralize the initial saving.

The type, positions and sizes of poles being settled, the intermediate supports between poles and wires claim attention. The choice lies between span wire and bracket arms, but it is frequently necessary to use both constructions in different parts of a tramway network. Span-wire work will generally predominate, but there are many exceptions, especially on systems which are mainly composed of single lines with turn-outs. Where bracket arms are employed it will be wise to use the flexible suspension.

Span and pull-off wires are generally of galvanized steel, but in many towns this material has but a short life on account of atmospheric pollution, and in such cases phosphor or silicon-bronze wire should be used. This applies equally to guard wires and their supports; whichever is used the metal parts of the suspension fittings should be of similar metal. There is no means of preventing galvanic corrosion where dissimilar metals are in contact, and such contact should be avoided. The use of iron insulated bolts screwed into brass ears is almost universal, and frequent trouble results at this point. Gun-metal bolts would be better, but there is some difficulty in getting them made.

The size of span wire should not be less than 7/14 S. W. G. There seems no reason for using larger wire, but such use is quite common even up to the monstrosity of 19/12. This wire should have a breaking point equal to from 35 tons to 40 tons per square inch after stranding; the galvanizing should be carefully examined and tested in the manner prescribed by the post-office. Galvanizing that is originally defective, or that cracks and peels off in erecting, is useless; the wire will rust through at the unprotected points in a brief period.

To secure the wire at the poles it should be laid around a horse-collar thimble of size proportioned to the size of strand and properly bound with galvanized charcoal wire—not twisted up. Better than the thimble is a shackle or reel of porcelain with a central hole to take the strap bolt. Porcelain is a far better, more durable and cheaper insulator than any of the compounds used in turn-buckles, globe strains, etc. There is no need to provide any tension adjustment at the ends of span wires—insulated turn-buckles, strains, etc., are quite unnecessary and represent wasted money. With a dynamometer on the draw-vice, or by the measurement of the sag from the ground, span wires can be put up with the greatest uniformity and the certainty that the trolley wires will be carried at their correct level. This level can be checked, if desired, by loading the span wires at the correct points with weights representing the working load, but this only needs to be done once for each width of street.

Bracket arms are generally made of 2-in. steel steam tube either screwed or expanded into a socket on the pole clamp. These arms are often much too long for safety. A 2-in. tube 12 ft. 6 ins. long, fixed as a cantilever, and loaded with the weight of a span of trolley wire and the suspension fittings, is very near its breaking point. Longer arms are therefore entirely dependent upon tie rods. The longer the arm the less efficient the tie rod, owing to the more acute angle between the two members. As generally made, tie rods are pulled up by a nut so that their effective strength is the resistance of the threads to shear. Bracket arms 18 ft. and 20 ft. in length are therefore extremely unsafe, having practically no margin of safety. It is better to use eye-ended tie rods and dispense with nuts, and no real difficulty arises in erection if the clamps are fixed at measured distances, so that the brackets and tie rods make the correct calculated angle; but if adjustment is necessary it is best provided by a long, solid, right-and-left threaded sleeve fitting the two parts of the rod like a rigging screw. Struts are usually inapplicable, but if the scroll work can be made to give some support so much the better. Bracket-arm pole clamps should be of substantial length, and a good fit on the pole by internal fitting rings at top and bottom. The bolts should fit through long bored sockets in the planes of the fitting rings and be kept close in to the poles. The socket receiving the arm should be of ample length and well thickened out to the body of the clamp. In fact, in designing bracket arms and their fittings, the stresses and strains should be calculated out as for a loaded cantilever, ignoring the tie rod, but adding 50 per cent to the dead weight to allow for the rolling load and its hammering effects. Then the tie rod and its fastenings should be designed to carry the same load safely. Malleable cast iron is the best material for pole and bracket-arm clamps and bow-string brackets. These last are often too short to give proper clearance, and are spaced too close on the bracket to give the elasticity so desirable. They should be pinned or otherwise secured so that they will not slide along the arm. Porcelain shackles should be used as the secondary insulation of bow-strings.

On straight work the "straight line" hanger is the best in-

sulated fitting, but on curves and wherever there is a probability of lateral pressure on the wire, the pull-off pattern must be used. The caps of these should be provided with some form of locking device, and a soft leather washer should be placed between the head of the insulated bolt and the cap. The insulating material on the bolts is far from perfect. While new the insulating qualities are very good, but in a short time the atmosphere deposits dirt on the exposed surface, and sooner or later, in damp weather, a trifling leakage of current chars the surface and break-down follows. This should not happen if the secondary insulation remains good, and, if porcelain is used, such break-downs are very rare, because a porcelain surface does not char with a small creeping leak; it dries up and the leakage ceases. This matter is a really serious one, and the insulated bolt is probably the most unsatisfactory item of the whole overhead equipment. The cure may be found in redesigning the arrangement in such a way as to remove the insulator itself from so trying a position, but there are obvious difficulties. The usual practice of keeping the two trolley wires for up and down directions separately insulated and separately fed is highly advantageous. But at junctions this becomes very difficult. Insulated crossings are a variety best avoided, and, as above stated, the best course is to feed junction work separately; the next best thing is to feed it through one wire only of one of the junctioning lines, and to insulate the junction from all the other wires. In bow-string suspensions care should be taken to provide ample clearance above the cap of the hanger. Sometimes only a small fraction of an inch is left between the cap and the bracket-arm tube, with the result that at every passage of a trolley wheel the hanger strikes the arm, damage soon resulting.

The soldered ear is the best form of attachment for the trolley wire. Many patterns of mechanical ear have been devised and tried, but it is hard to see how any mechanical clip can give equal security without adding to the effective diameter of the wire on the arc in contact with the wheel. The use of wire of figure 8, or grooved section, makes the mechanical ear satisfactory, but such wire is at once more expensive and more troublesome to erect, so that the balance of advantage remains with the soldered ear. The metal used for ears should be a tough bronze or gun-metal, and careful inspection after machining is necessary to eliminate defective pieces, as the castings are somewhat apt to show blow-holes and other weak places. The groove to receive the trolley wire should be milled to a hundredth of an inch larger diameter than the wire, and should come to a sharp edge. It is doubtful whether the small lugs, which it is usual to provide at the ends of the ears for hammering over the wire, serve any useful purpose. They sometimes hold up a wire that has not been properly soldered until traffic commences. Fifteen inches is the minimum length of ear for straight work, the tendency is to increase the length up to as much as 24 ins., but the advantage seems doubtful. On curves longer ears are necessary, and by bending them to a proper radius the change of direction of the trolley wheel is much smoothed. Unfortunately, curved ears tend to pull into angular shape with use. There seems no good reason why they should not be cast curved with lateral webs to impart stiffness. It would not be necessary to use many different radii, as the varying radii of the track curves should be met by the use of a larger or smaller number of pull-offs, with a standard deviation at each. Splicing ears should not be needed in building a new line, but are necessary for repair work. They are rarely well designed, the wire ends having to be bent too sharply, and some patterns are provided with foolish little steel-set screws, that invariably set fast and break off. Anchor ears should be provided with stout eyes of rounded section, to which the anchor wire can be secured without bending to a dangerously small radius.

Section insulators present a combination of difficulties, and in selecting a pattern both mechanical and electrical considerations must be studied. The pull of the wires has necessarily to be transmitted through insulating material, and it ought to be so transmitted as a straight pull without any binding or twisting component. This is inconsistent with the necessity for allowing a straight level path for the trolley wheel. Hence the best designs are but compromises, and the worst may be guaranteed to break down within a few months. The terminating arrangements for the wire ends need the same easy curvature as in splicing ears. It is better to dispense with set screws for securing either the feeder cable or the trolley wires and to have tinned sockets or grooves into which they can be soldered. The air-gap pattern is probably better than that with a gap stick, but there should be two distinct air gaps, and an insulated running piece between them, to prevent an arc being drawn in the event of an earth on one wire. Gap sticks of lignum vitæ have been found to wear smoothly and give a regular life. Section insulators are very heavy, and saving of weight is a merit to be fully credited. Easy and rapid replacement is another virtue which will be appreciated when the line is at work. The sweating of the connections is not inimical to this, because, knowing that it has to be done, the fire pot and bit will be ready, but a rusted-in set screw cannot be calculated for.

Junction special work fittings also require careful selection. For central wires and rigid trolley heads the frog makes a satisfactory facing point, provided that it is properly set, with reference to the track points and the lengths of the cars and trolley booms. Crossings are apt to give more trouble than frogs or switches. The greatest care should be taken to get them of the correct angle to suit the track crossing, but as the angle is also affected by the lengths of car and trolley boom, the junction should be drawn to scale, a template of the car and trolley boom fitted to it in successive positions to ascertain the best angle and position for the crossing. All these fittings should be so designed that the trolley wires need not be cut when fixing them, and so that they can be securely held by pull-off and span wires to their positions.

THE FOWLER SOLID ROLLED STEEL CAR-WHEEL

The Duquesne Steel Foundry Company, of Pittsburg, has purchased from the American Car & Foundry Company all of the rights to manufacture the solid rolled-steel car wheel formerly made by that company under the H. W. Fowler patents, and will soon put this wheel on the market for electric railway service. This wheel is claimed to be cheaper than the steel-tired wheel, and when properly made quite as serviceable. It has been used pretty extensively, but in rather an experimental way, by electric companies and railroads. Practically the only criticism that has been made by the users of the wheel so far has been a lack of uniformity in wearing qualities. This has been due to the fact that the American Car & Foundry Company, having no steel foundry of its own suitable for this purpose, has been compelled to purchase the blanks used and which it has afterward rolled. The company has found it impossible to secure a uniform quality of steel in these blanks; that is to say, some of the blanks would be soft, giving a minimum amount of wear in service, while others would be of proper hardness. When the proper grade of steel was used very gratifying results as to mileage were obtained.

The Duquesne Steel Foundry Company proposes to change this condition of affairs by making the wheels of uniform quality and of a grade that experience has shown gives the best results. To secure this uniformity, it is proposed to make the wheels in special heats. The company's steel foundry is a large modern plant, well equipped with appliances for expeditious and economical handling of the important work to be undertaken.

THE OPEN FEED-WATER HEATER

BY E. T. WALSH

In the design and operation of modern power stations, the economy possible through an intelligent use of the feed-water heater, and particularly of the open feed-water heater, is often overlooked. There is, however, a partial explanation for this fact. The advantages of the open feed-water heater have often been neglected in the past, owing to the difficulty heretofore experienced in separating the oil used for lubricating the cylinders from the exhaust steam, and the serious consequences if this oil should pass into the boilers. This difficulty is now disappearing, and the open heater, particularly in bad water districts, is now being widely installed almost as a matter of course.

The reason for the difference in efficiency between the open and the closed heaters is not difficult to understand. In the closed heater no attempt is made to use the water of condensation, all of which is allowed to waste either at the drips or through the vapor pipe. As the steam and water are separated by the metal in the tubes, the percentage of heat that will pass from the steam to the water depends on the conductivity of the metal of which the tubes are made, and also upon how clean they are. The heater, therefore, decreases in efficiency directly as the tubes foul, which they must do from the oil in the steam and scale or deposits from the carbonates in the feed-water. Another source of loss in the closed heater is from tubes bursting or leaking from any cause. When such accidents happen, the usual course adopted is to plug the defective tube, continuing to plug the tubes as they give out, until there are enough out of service to make it necessary to shut down the heater and replace them all at one time. As the closed heaters are generally rated by their area of heating surface, allowing one-third of a square foot per boiler-horse-power, it will be seen that the rating is seriously reduced by having one or more tubes out of commission. It has, in fact, been said by good authority that closed feed-water heaters are seldom provided with sufficient surface to raise the feed temperature to more than 200 degs. F., and as it is under boiler pressure, it is subject to all the troubles that come with high pressure.

On the other hand, the open feed-water heater, from its construction, must have a practically constant efficiency as the exhaust steam comes in direct contact with the feed-water.. The deposits on the trays do not interfere in the least with the action of the heater, and its capacity is limited only by the quantity of water and steam that can be brought together—that is, within certain reasonable limits. Before the exhaust steam enters the open heater proper it passes through an oil separator, which consists usually of a chamber in which is placed a baffle plate on which the steam impinges. The baffle plate catches the oil, while the steam, thus relieved, passes through ports at the sides of the baffle plate into the heater, the oil dripping into a trap below. For an additional depositing surface and for filtering purposes, a bed of coke or crushed quartz is spread on perforated plates placed a short distance above the bottom of heater; through this the water must pass before it enters the pump to be pumped to the boilers.

Open heaters have been condemned sometimes in the past on account of the poor success of the oil separator. That this was caused by unfavorable conditions or locations is shown by the fact that a separator placed under the normal conditions for which it was designed will give the desired results, and as it is a mechanical appliance, it will repeat these results whenever the conditions are repeated. Assuming that the separator is properly designed, efficient separation depends on three factors:

1. The velocity of the exhaust steam passing through the separator must not be excessive; there is a limit to the capacity of a separator just as much as to the capacity of a boiler or an engine.

2. The oil to be taken out must be one that will remain in a liquid condition at the temperature of the steam—which is, of course, the only kind of an oil suitable for cylinder lubrication.

3. The separator must be properly drained.

With this understanding of what constitutes normal conditions, it will be recognized that the conditions upon which efficient separation is dependent are most reasonable and logical, and that they can be established in any well designed and well regulated plant.

Another objection to open heaters which has sometimes been raised has been the difficulty experienced in pumping hot water, and that it is necessary to do this will be readily understood, as the boiler feed-pump must be placed between the heater and the boilers. However, to pump hot water it is only necessary to keep solid water against the piston or plunger of the pump; this is accomplished by providing a sufficient head of water on the pump to lift the pump suction valves and overcome the friction in the suction pipe. The pump should be of ample capacity for the work, and should be equipped with metal valves.

It might be said here that with an open heater, two pumps will be required to get the water into the boiler, unless, of course, it passes into the heater under a head. This second pump is not altogether a disadvantage, however, and the actual work done by it is only a part of that which would have to be performed by a boiler feed-pump in pumping the water from the same level, and the heat in its exhaust steam not utilized in performing its work is returned to the boiler in the feed-water. In a condensing plant this may be very desirable, as the supply of exhaust steam at atmospheric pressure that is available for the purpose is rarely sufficient to heat the feed supply to the highest possible temperature. However, this second pump is rarely found necessary, as in nearly every steam plant where feed-water must be pumped from a river or well, an elevated tank is provided for storing sufficient water for boiler use, fire protection, sanitary purposes, etc.

In the present trend of power plant design, in which the steam turbine takes such an important part, the open heater is peculiarly adaptable, as the perfect freedom from entrained oil in the exhaust makes it safe to use the whole of the water of condensation again in the boilers, without the use of an oil separator. The heater may be so placed that the water of condensation will flow from the condenser hot-well by gravity into the heater, from which it will be pumped into the boiler. By using the exhaust steam from the auxiliaries to heat the water of condensation from the hot well of the condenser, it is quite possible to introduce the feed-water into the boiler at a temperature of 210 degs. F., showing a saving of 10 per cent in fuel.

In addition to the above saving of the heat in the auxiliary exhaust, it is evident that all of the condensation will be saved and returned to the boiler except the very small percentage lost in the oil separator. This condensation is distilled water, and is therefore perfectly pure, having been relieved of all of its scale-forming properties in the process of distillation, and, with the addition of the small percentage of raw make-up water, which effectually neutralizes the possible corrosive effect of pure distilled water, it makes the very best quality of boiler feed. The economy that will result from using 99.8 per cent of the feed-water over again, when water must be bought, for instance, at $1 per 1000 cu. ft., requires very little study and a few figures to become obvious to the most incredulous.

When reciprocating engines are used with surface condensers, the foregoing advantages still obtain, except that the oil must be removed from the exhaust steam before it reaches the condensers, the location of the condenser and heater with respect to each other being as described for the turbine layout. When the latter arrangement is made, the results are about as described for the turbine installation, but when jet condensers

are used and the circulating water is such that the presence of sewage, salt or other foreign matter makes it inadvisable for boiler-feeding purposes, the temperature to which the boiler feed can be raised is limited by the quantity of steam exhausted from the auxiliaries at atmospheric pressure.

It is necessary to have a high vacuum in the condenser, in order to obtain the best results, in the case of engines running condensing. To secure this, all entrained air and vapors should be removed from the system, for which purpose it is usual to employ either wet or dry vacuum pumps. Every cubic inch of air removed by these pumps, however, means power used, and all air and vapors that can be eliminated without recourse to the pump means a gain in efficiency. In a closed steam cycle, or where the feed-water is used again in the boilers, the open heater, by its construction, performs to a greater or less extent the important function of relieving the air pumps, the vapor pipe permitting the air and gases liberated from the water free exit to the atmosphere.

That the open heater is receiving favorable consideration at the hands of engineers is proven by the fact that one of the largest all-turbine plants in course of erection near New York City is to have installed one 15,000-hp open feed-water heater. Another large installation in New Jersey has an order placed for a 3000-hp heater of the open type. A large turbine electric light plant at Detroit, Mich., has open heaters aggregating 15,000 hp in operation, and other instances might be mentioned where open heaters are replacing those of the closed type.

THREE-CENT FARE IN FORCE IN CLEVELAND

The zone plan of low fares is now being tested by the Cleveland Electric Railway. On Monday morning, Jan. 23, special cars bearing large signs, "Three-Cent Fare. No Transfers," were placed in operation on twenty routes, embracing all the lines within the district bounded by Wilson Avenue on the east, Clark Avenue on the south and Gordon Avenue on the west, these streets being on an average of about 2¼ miles from the Public Square, the heart of the city. The regular cars and system of operation are not interfered with in any way, except that, owing to the fact that the company has pressed every car into service, it is impossible to operate so many trippers night and morning. The regular cars charge 5 cents within the zone, as heretofore. The 3-cent cars operate at intervals of five minutes on all the lines, and run from the Public Square to the zone limits and return. In several instances they return by the same routes, while in others they form loops with other lines, and cars are operated around the loops in both directions. The new service necessitated the adding of 113 cars to the regular schedules.

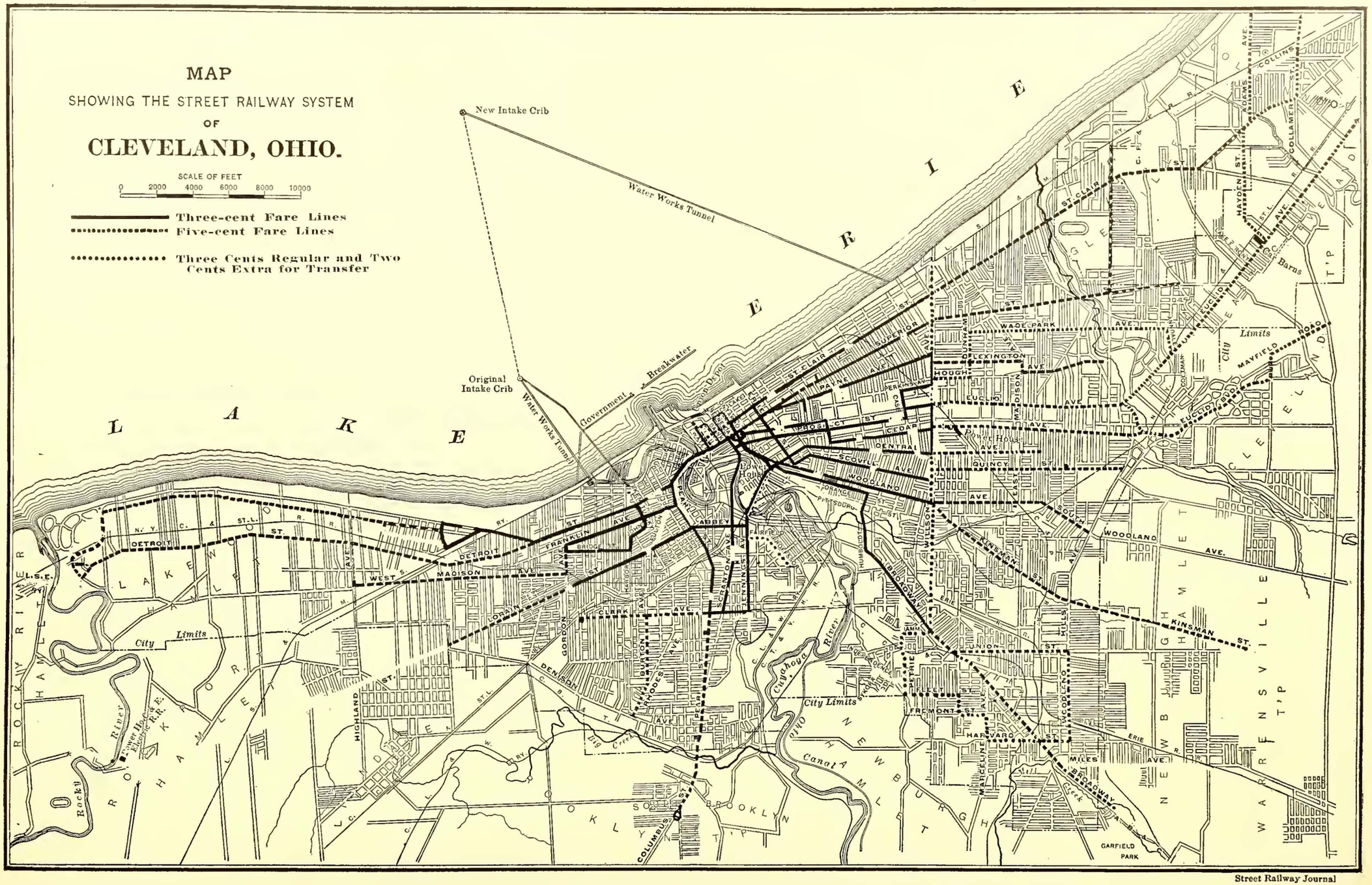
Of course, by reason of this plan the operating expenses of the system are increased something over $1,000 a day. The object of the test is to give the best possible service to determine what effect the low rate of fare will have upon the gross earnings of the company. Mayor Johnson has maintained that a 3-cent fare will cause people to ride short distances where heretofore they have walked, and he claims that the additional receipts will more than compensate for the smaller fare to the people within the zone. If the truth of this contention is made apparent to the company it would use the same cars for both services, but in the test it preferred to keep the two plans entirely independent and operate the 3-cent cars as if they were operated by a separate company, believing that by this plan a better test could be given than by any other. Only in the case of the Wilson Avenue crosstown line, the Fairfield line and the Abbey Street line, which are entirely within the zone, was it found necessary to make the two systems interchangeable. On these lines a passenger can ride for 3 cents, but if he wishes a transfer he pays 5 cents. For the convenience of passengers, five tickets are sold for 15 cents. These will be accepted on the 5-cent cars with 2 cents additional, or two of them will be accepted for one fare and 1 cent returned, amounting in either case to a 5-cent cash fare. The tickets bear the words, "Good for 3 cents toward fare on the Cleveland Electric Railway." In consequence, if the scheme is not adopted permanently, they will still represent only 3 cents.

The results of the test thus far are in no way conclusive and the company is not yet prepared to state what it thinks of the scheme, but, nevertheless, the results which are apparent are most interesting. In the first place, the service is unquestionably better than Cleveland has ever seen before. At all times of the day there are more cars than there have been heretofore during the heaviest rush hours. It is practically a rush-hour schedule from 5 a. m. to 7 p. m., which is the length of time the 3-cent fare cars are operated. One result is that the congestion at the Public Square is something terrific, and the schedules of all the cars, both 3-cent and 5-cent, are maintained with great difficulty. Under ordinary conditions the congestion in the heart of the city has been bad enough, but with 115 extra cars, all of them turning at the square, where formerly the majority of the extras ran through, a condition is made that cannot long continue. During the rush hours the situation is, of course, worse than at other times, because the cars have to make so many stops.

Many people were not familiar with the plans for the test and a great deal of confusion resulted. There was much wrangling over transfers, as they were neither given nor accepted on the 3-cent cars, even though the passenger desired to go to a point within the zone. Up to the present writing the scheme does not look like a success. On some of the lines people are riding very freely in the 3-cent cars, while in others they are practically empty. It is noticed that on the Euclid Avenue line, which traverses the aristocratic portion of the city, people do not take kindly to the low-fare cars. The lines which carry the workingmen are carrying a great many passengers. From the general talk at present, the greatest objection seems to be that separate cars are used. The people admit that it makes too much congestion and the movement of all cars is slower. The company will consider the advisability of making the fares interchangeable, as this would reduce the number of cars.

The result of a week's trial has shown that very few of the cars have earned their way and that the vast majority of them have been operated at a large loss. The officers of the Cleveland Electric Railway Company decline at the present time to give out any figures concerning the operation of these cars, they having agreed with Mayor Johnson not to publish the figures until the experiment was actually completed. At this writing the officials have not decided whether to discontinue the service at once or to allow it to continue for a few days longer. The Street Railway Journal will publish the full details of the conclusions arrived at from this most interesting test just as soon as the officials of the Cleveland Electric Railway Company are willing to give them out.

One of the bills introduced into the Massachusetts Legislature at the present session makes it compulsory upon the Boston Elevated Railway Company to give to passengers on its cars coming from South Boston to the South station a transfer check good on any car either on the surface or on the elevated railway going northward, and to give to any passenger on any of its cars, either on the surface or on the elevated, coming from the North to the South station, a transfer check good for transportation on any car of the company to South Boston. The object of this suggested legislation is to have established a transfer station for the Boston Elevated Railway Company at the South station.

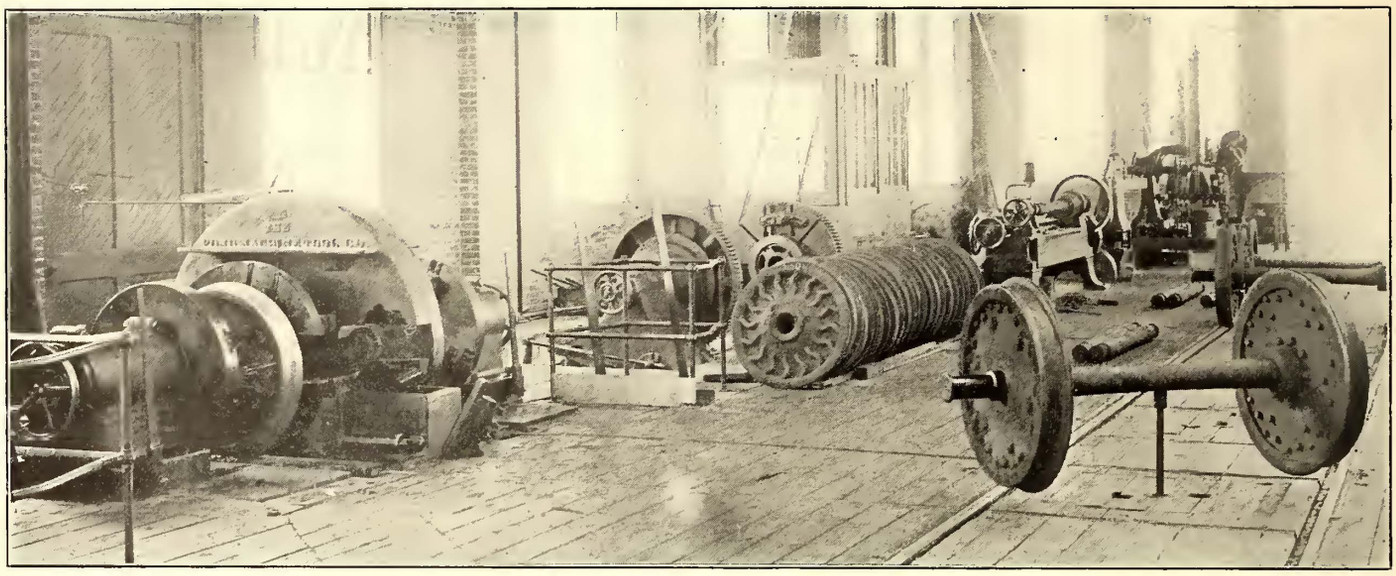

MAP
SHOWING THE STREET RAILWAY SYSTEM
OF
CLEVELAND, OHIO.
SCALE OF FEET
0 2000 4000 6000 8000 10000
Three-cent Fare Lines
Five-cent Fare Lines
Three Cents Regular and Two Cents Extra for Transfer
New Intake Crib
Water Works Tunnel
Original Intake Crib
Water Works Tunnel
Government Breakwater
LAKE ERIE
ROCKY RIVER
LAKEWOOD
ROCKY RIVER
City Limits
Rocky River
Big Creek
Cuyahoga River
Ohio Canal
City Limits
CLEVELAND
NEWBURGH
WARRENSVILLE T'P
BROOKLYN
Detroit
Madison Ave.
Franklin Ave.
Abbey
Scovill Ave.
Woodland Ave.
Kinsman St.
Broadway
Superior Ave.
St. Clair Ave.
Euclid Ave.
Wade Park Ave.
Mayfield Road
Denison
Clark
Lorain
Fremont
Erie
Miles Ave.
Garfield Park
Street Railway Journal

A TYPICAL SHOP EQUIPMENT FOR HANDLING STEEL-TIRED WHEELS

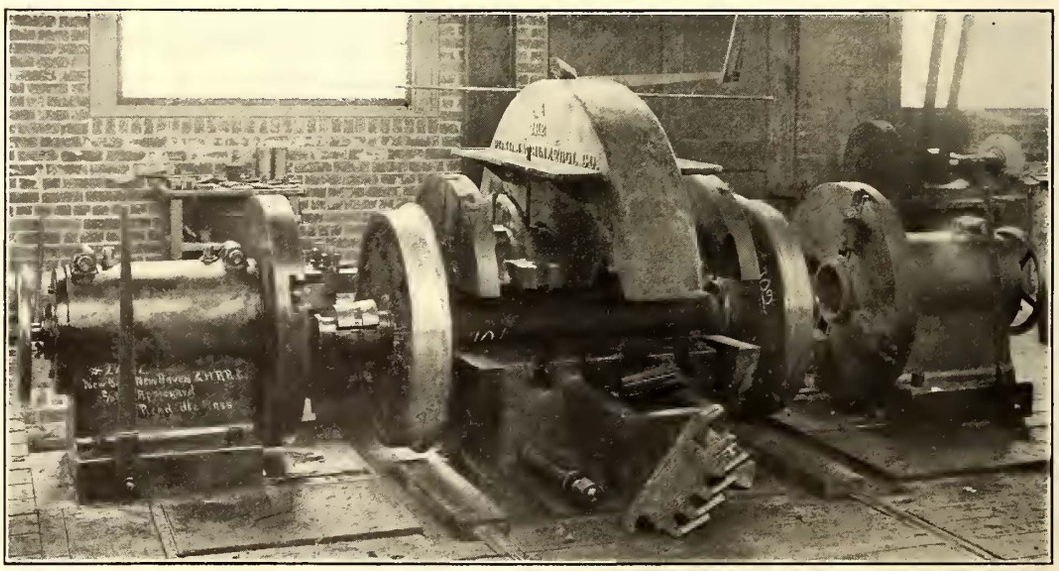
With the growing use of the steel-tired wheel in electric railway service, for more adequately withstanding the heavy duty imposed by the heavier weights and speeds and faster schedules now in vogue, the question of shop handling in keeping the wheels in the best condition has grown to be a problem of considerable importance. In many cases of electrical operation that might be cited, wheel problems of the magnitude of those met in steam railroad practice are incurred, which have come to demand careful study. For the best results it has been very generally found that this problem must be given very thorough treatment, including frequent inspections of wheels and truings in the lathe when worn badly in the face or flange; many economies may be effected in the handling as well as the effectiveness of the work; in this connection there is, indeed, much to be learned from the practice of the steam railroads in this direction.

The accompanying illustrations show the arrangement of equipment and facilities in a model wheel plant, a study of which will be instructive. This is the wheel department of the new Readville shops of the New York, New Haven & Hartford Railroad for the general handling of the steel-tired wheels which are used upon both its steam and electrically operated lines. Not only the arrangement but also the selection of this equipment is the result of many years of experience, and also a very careful study of the work. The arrangement of facilities represents a most desirable scheme for quick and economical handling of the work, while the tools selected enable the work to be turned out in the shortest possible time. It is, however, only recently that tools of the productive capacities of those shown have become available, and the result has been one of great advantage for economical operation, particularly as the improved Pond steel-tired car-wheel lathe, illustrated herewith, is capable of truing 42-in. wheels, with the hardest Krupp tires, at an average rate of six pairs per day of ten hours.

The general view below shows only a portion of the entire equipment in this shop plant, there being installed here three of the large 42-in. lathes, one of which appears at the left. At the right of this is a smaller car-wheel lathe which differs from the 42-in. center-driven lathe, in that it is arranged for face-plate driving; this allows of truing sets of wheels with motor gears in place upon the axles. Still, to the right of the latter tool, may be seen an axle lathe, a wheel press and, lastly, a car-wheel borer. A noticeable feature of the arrangement of this shop is the absence of overhead crane or hoisting facilities; the scheme of handling the wheel, as here arranged, entirely obviates the necessity of lifting of wheels into or out of the lathes.



A TYPICAL WHEEL SHOP FOR MACHINING STEEL-TIRED CAR WHEELS, SHOWING ARRANGEMENT OF AIR LIFT OPERATED BY FOOT VALVES IN FLOOR FOR QUICKLY HANDLING WHEELS TO THE RIGHT-ANGLE TRACK

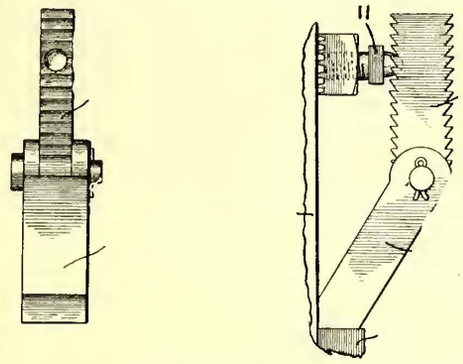


METHOD OF PLACING A PAIR OF WHEELS IN THE WHEEL LATHE, SHOWING APPLICATION OF CENTERING BUSHINGS TO THE AXLE JOURNALS

The lathe beds are set flush with the shop floor so that the wheels may be easily rolled in, being provided, moreover, with pits on the tool side for the convenience of the machine operators. Tracks consisting of 5/8-in. x 2-in. bar iron, planed with a groove in the middle for the wheel flanges, lead from the longitudinal shop track across to each lathe. The wheels are rolled into the shop on the longitudinal track, and at the junctions of

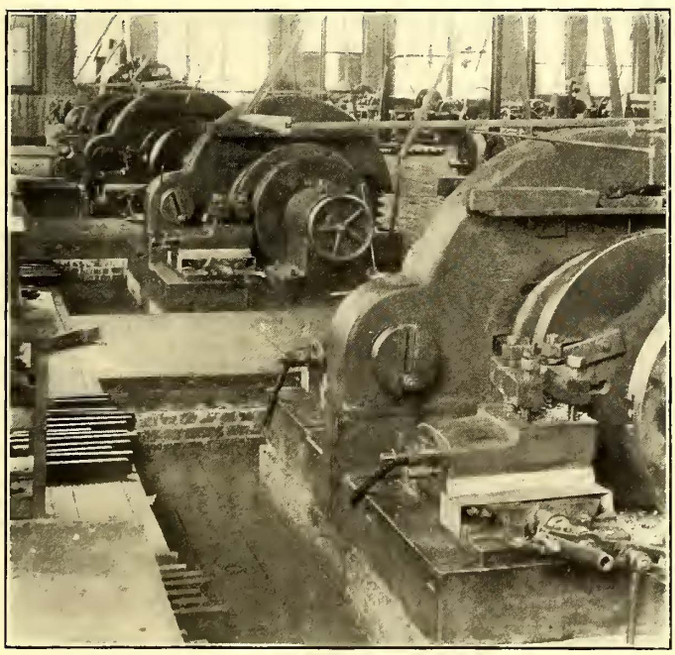
this track with each of the various tracks leading across to the machines, air lifts, operated by foot valves in the floor, are provided, which enable the wheels to be quickly lifted, swung around and thus tranferred from one track to another. In rolling the wheels into the lathes, these tracks save much time, as they are thereby rolled in absolutely central.

In handling the steel-tired wheels in the shop, they first go to the journal lathe, if the journals need truing, and thence to the car-wheel lathes. In putting a pair of wheels in the car-wheel lathe, first three-piece taper bushings, as shown in the



DETAILS OF THE "SURE GRIP" DRIVER MECHANISM USED ON THE CHUCKS FOR DRIVING DIRECT TO THE TIRES

detail view of one of the lathes, are put on the journals, then the wheels are rolled in and the tailstocks brought up. The adjustment of the chucks and the new "sure-grip" driver is the next step, and to the use of this new style of driver a large part of the increase in production is due. The chuck jaws in the face plates hold the tires rigidly, and by screwing up the set screws of the "sure-grip" driver the tires are firmly wedged between the driving plates and the chuck jaws, so that the full power of the machine can be utilized. The application of this

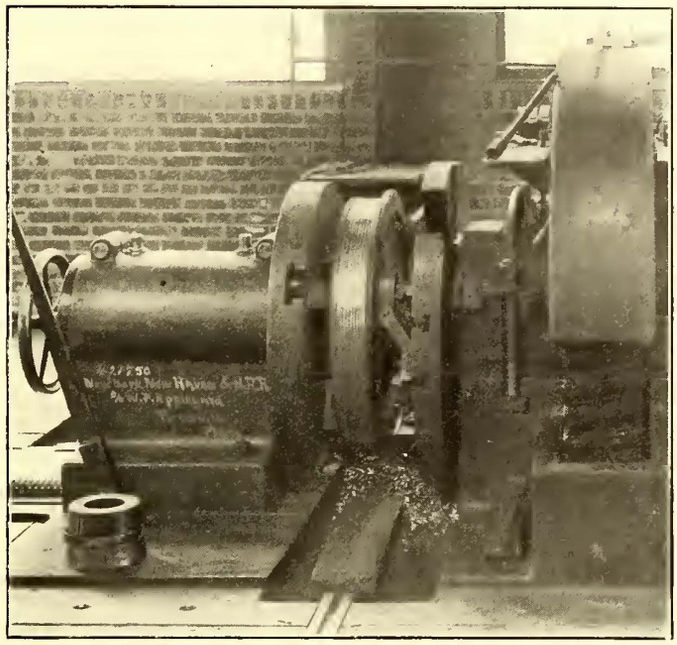


THE ARRANGEMENT OF PITS IN FRONT OF THE WHEEL LATHES TO PERMIT ACCESS BY THE OPERATOR TO THE TOOLS

special driving mechanism is illustrated in one of the detail half-tones, and also in constructional detail.

The self-hardening steel stock used for the cutting tools is of 3-in. x 1¼-in. section, which is large enough to prevent springing or breaking; the large cross section also has the advantage of carrying away rapidly the heat generated at the cutting edge. Especial care should be devoted to the shaping, as well as also the subsequent grinding of the tools; the correct cutting contours should be provided and strictly maintained in grinding. Examples of what may be said to represent the most desirable cutting shapes, as indicated by practice, are shown in the accompanying drawings.

The cut on the tread of each wheel should be started next to



VIEW OF A WHEEL IN THE LATHE TO SHOW THE DRIVER MECHANISM IN PLACE BETWEEN THE CHUCK AND THE TIRE

the flange, using a round-nose roughing tool with ⅜-in. to ½-in. feed, or whatever the tool will stand; this operation takes from twenty-four to forty-five minutes. The outer edge of the tire should next be rounded and a scraping tool applied to the tread, which is smoothed up in one or two revolutions of the lathe; this consumes five or six minutes, and the tread is then finished.

Next, the tops of the flanges are cut down to proper height, using a flat-nose tool, as indicated for this work in the drawing. The outside of the flange is roughed to something near the correct shape with the round-nose tool, and reduced, if too thick; it is finished with a flange tool which is the exact shape of one-half of the flange. Next, the back of the flange is roughed in the same manner as the other side, and is finished with another flange tool. These flange tools should be kept carefully to shape by grinding on the tops only.

It has been found that the output of the lathes is the greatest when the feed and depth of cut are at maximum, rather than when a high speed of cutting is used. The usual cutting speed is from 6 ft. to 10 ft. per minute, or, in general, whatever the tool will stand.

The actual time of taking out a pair of wheels and putting in another pair should not consume more than eight to twelve minutes, with wheels convenient to the lathe. Lathes with the equipment just described, with an experienced operator, should turn from five to seven pairs in ten hours, or an average of thirty-six pairs a week, reference being had particularly to the class of steel-tired wheels used in steam railroad service; for the type of steel-tired wheels ordinarily used in electric railway service, it is probable that this output would be increased by more than 50 per cent.

The provision of cutting tools properly shaped and ground for this work is one of considerable importance. Much difference of opinion may exist with machinists as to the proper tool shapes, but those illustrated in the drawings herewith have been found, as a result of extended experience, to be best adapted for the requirements of the work upon steel-tired wheels. As indicated, five classes of tools are required for

efficient work, in three of which cases both rights and lefts are necessary. It is recommended by the lathe builders, the Pond Machine Tool Company, that each lathe should be equipped, to provide for grinding, dressing, etc., with at least six right-hand and six left-hand roughing tools; two right-hand and two left-hand of each kind of flange tool; two sets of scraper blades; four flat-nosed tools and twenty-four cold chisels of 1¼-in. steel, dressed narrow and blunt, and a 5-lb. hammer to take out hard spots that may develop in the tires. The "hard spots" above referred to are frequently met in the use of steel tires; they are usually the result of variations in chemical composition in portions of tire, but often also are the result of local hardening, due to the unequal heating caused by skidding the wheels.

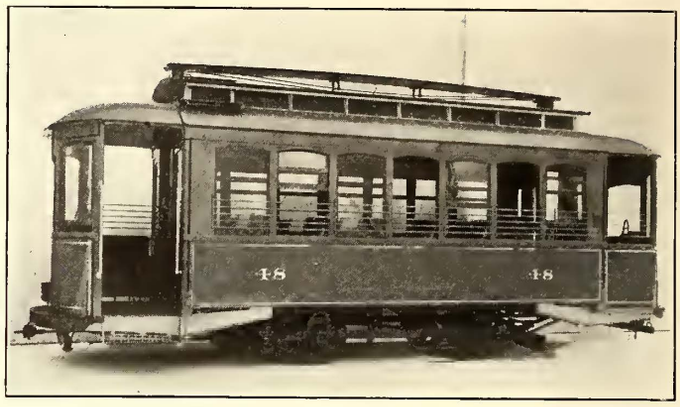
The lathe illustrated here is an interesting tool, having been especially designed by the Niles-Bement-Pond Company to enable the complete advantages of the use of the high-speed tool steels to be taken. This is made possible by the peculiarly smooth and powerful character of its worm-gear drive, and is greatly enhanced by the improved facilities provided for chucking the wheels by centering them in relation to the journal surfaces, and then rigidly gripping the tires themselves by special chuck jaws for the actual drive. The use of these chucks and chuck jaws, in connection with the special driving dogs attached to the centrally-driven plates, prevents any springing of the axle or crowding the wheels out of true sideways. For mounting the wheels in the lathe for turning, they are rolled into position, as shown, a removable section of the large driving gear having been lifted out to permit access for the wheels' axle; when the axle is in position, the gear section is replaced and clamped rigidly into place by means of a special key, which brings the section up into the pitch line.

The use of the special three-piece journal centering bushings is of great importance, as it is effective in bringing the trued tire faces concentric with the worn journal faces. This is obviously more logical than attempting to turn the tires when the axles have been centered in the lathe by means of the original axle centers; the journals are the determining points of the truth of revolution of the whole axle and pair of wheels, and the journal faces are subjected to inevitable wear. The use of the centering bushings results in bringing the trued tire faces concentric with the journal faces, no matter if the latter are worn badly eccentric.

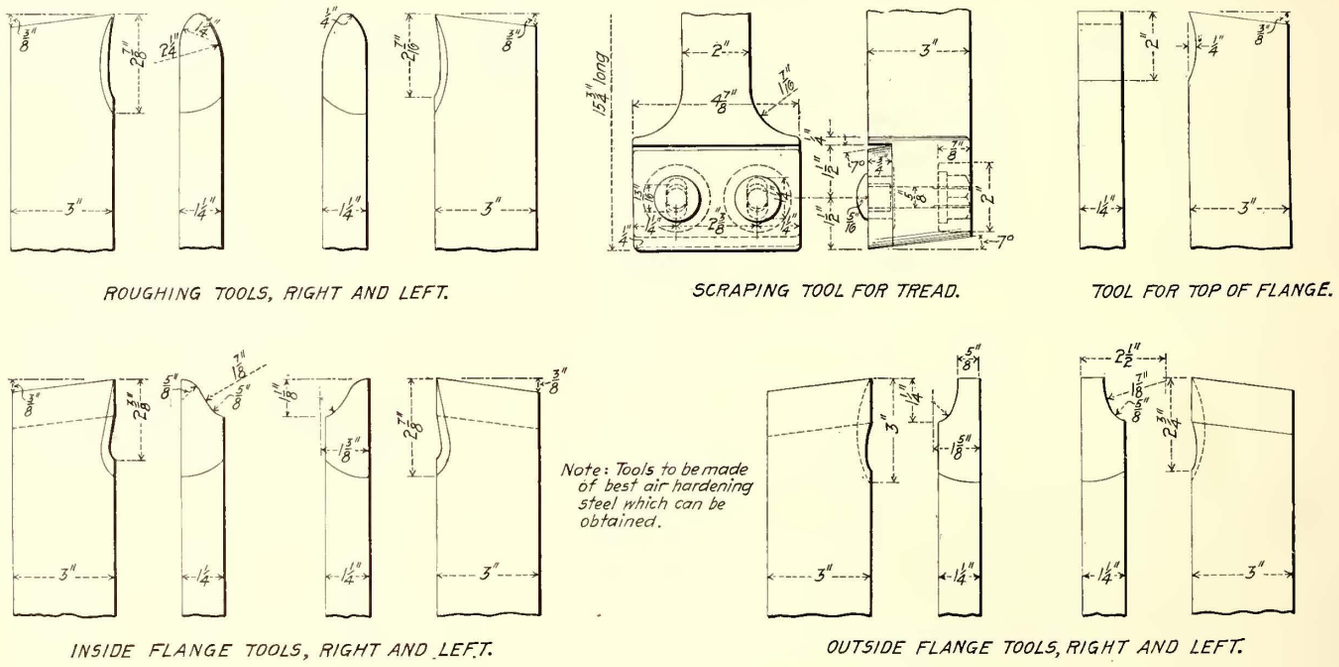
INTERESTING CARS FOR MOBILE, ALA.

Four interesting cars recently delivered to the Mobile Light & Railway Company, Mobile, Ala., by the American Car Company, are of the semi-convertible type built under the Brill patents.

The railway company operates the only electric system in Mobile, and has a trackage of 42 miles and 110 cars. The company also furnishes lighting. A popular amusement park in the suburbs is owned by the company, at which the repair shops also are located. Mobile is the metropolis and the only seaport of the State. It was founded by the French in 1711, and to-day is one of the chief ports in this country for the export of cotton, besides having a large trade in timber, naval stores and coal.



MOBILE SINGLE-TRUCK SEMI-CONVERTIBLE CAR WITH LONG-TRUSSED TROLLEY BOARD

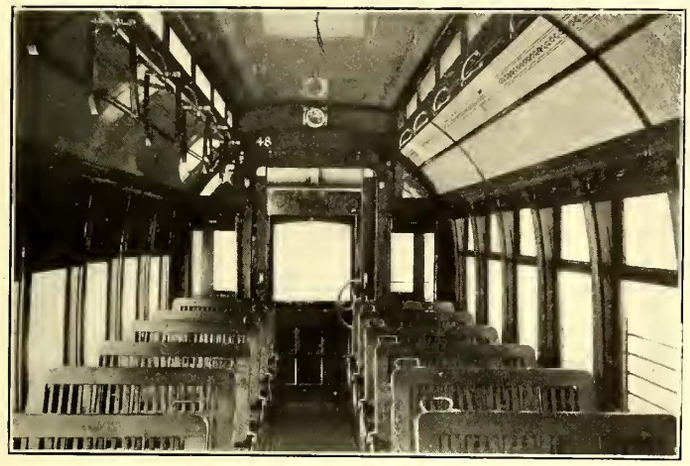


DETAILS OF CUTTING TOOLS THAT HAVE BEEN FOUND BEST SUITED TO WHEEL LATHE WORK

It is rare to see a long-trussed trolley board like that shown in the illustration. The purpose is to bring all the weight of the trolley pole and stand upon the car ends. The car seats are placed transversely, are 36 ins. long and are of the step-over type. They have slat seats with square spindle backs with corner grab handles. Each car accommodates twenty-eight seated passengers. The interior finish is cherry with bronze trimmings, and the ceilings are three-ply veneer bird's-eye maple. The platforms are arranged with one entrance, so that passengers must board the car at the rear end, the metal dasher being brought around to the body at the other side. Five-bar window guards are furnished for the closed sides of

vestibules as well as windows at the sides of the cars. The sashes in the vestibules drop into pockets, while those in the sides of the car are raised into pockets in the roofs when not in use.

The platform timbers are reinforced with angle iron and the car is unusually substantial throughout, including inside trusses

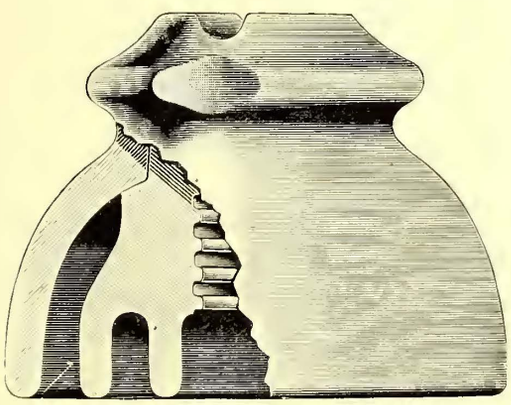


INTERIOR OF MOBILE CAR

as well as 12-in. x ⅝-in. sill plates. The side sills are 4½ ins. x 7¾ ins., and the end sills, 4½ ins. x 6⅞ ins. The thickness of the corner posts is 3¾ ins.; the side posts, 3¼ ins. The distance from the center to center of the side posts is 2 ft. 5 ins. The length of the cars over the body is 18 ft. 10 ins., and over the vestibules, 27 ft. 10 ins. The width over the posts at the belt is 18 ft. 2 ins., and over the water tables, 8 ft. 6 ins.; the height of the platform steps from the rails is 15¼ ins., and the height of the risers, 12 ins. The cars are equipped with angle-iron bumpers, "Dedenda" gongs and other Brill specialties, and are mounted on trucks of the same make, type No. 21-E, with 7-ft. 6-in. wheel base and 33-in. wheels, equipped with 40-hp motors.

RECENT PROGRESS IN HIGH-TENSION INSULATORS

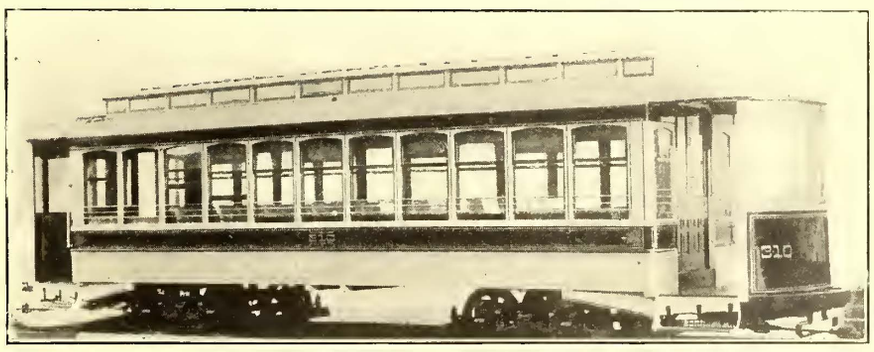
A type of high-tension insulators coming into extensive use on a number of transmission lines is shown in the accompanying cut. It is the product of the Lima Insulator Company, of Lima, N. Y., which has appointed the W. R. Garton Company, of Chicago, to act as its exclusive general Western agent. The Lima Company is making a specialty of the highest grade of high-tension porcelain insulators, and is planning to adopt such methods that its insulators will give the most satisfactory results. The company fully realizes the requirements in this class of insulators, and that unless every detail is given the necessary attention trouble may result. It is therefore proposed to place on the market insulators that will establish for themselves readily a reputation and place this produce at the top rung of the ladder. The W. R. Garton Company has also spent several years giving close attention to the requirements of high-tension work and is prepared to serve the trade intelligently and faithfully in this particular. The company's engineering knowledge and railway experience insures good judgment in this direction. The Lima Insulator Company will gradually increase its facilities until it is able to meet the demand in every particular, and will turn out a gas-fired, white and brown porcelain which will be pleasing to the eye, attractive in form and satisfactory in service. The Garton Company now records among its patrons for high-tension insulators large numbers of some of the most prominent properties in the country. It, therefore, anticipates for the new year a very largely increased trade.



A NEW TYPE OF GAS-FIRED HIGH-TENSION INSULATOR

SEMI-CONVERTIBLE CARS FOR GREATER NEW YORK

The New York & Queens County Railway has just received ten of the semi-convertible cars built by the J. G. Brill Company similar to the one illustrated. The railway company operates all the surface lines in Long Island City and extending to College Point, Flushing and Jamaica; in all, a system of 75 miles, and using 230 cars. Long Island City adjoins the northern side of the borough of Brooklyn, and has a long water frontage on the East River opposite the northern half of the borough of Manhattan, with which it is connected by several ferries. Its population, something over 160,000, is comparatively small, owing to the better transportation facilities from the business centers of New York and Brooklyn in other directions, but property has advanced considerably of late, and it is safe to say that the population will be enormously increased in the near future on account of the new Blackwell's Island Bridge, which will have four tracks for trolley cars and two tracks for elevated trains, and also the four-track tunnel which is being built by the Pennsylvania Railroad. The current of population, which like all other currents always flows in the direction of the least resistance, will soon after the completion of these great arteries flood this territory, and its proximity to the business centers of the borough of Manhattan will give it advantages over the borough of Bronx, which lies north of Manhattan Island. Some of the lines extend to several popular resorts on Flushing Bay, and others run to large cemeteries.



ONE OF THE FIVE SEMI-CONVERTIBLE CARS FURNISHED RECENTLY TO THE NEW YORK & QUEENS COUNTY RAILWAY

The new cars present a very pleasing appearance with their large windows and low window sills, and are excellently suited to the long runs on the suburban lines, both in summer and winter. The seating capacity of the cars is forty-four. The transversely placed seats are 37 ins. in length, leaving the aisle 24 ins. wide, and the longitudinal seats at the corners accommodate four persons each. All are upholstered in spring cane, the transverse seats having step-over backs and are of the manufacturer's latest type. The window sills are 24⅝ ins. from

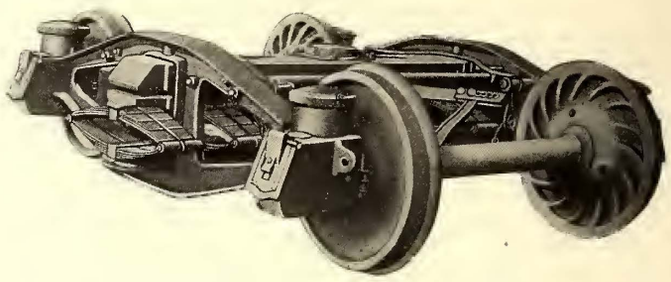
floor to top of sill and have arm rests bracketed upon them. The window guards, shown in the illustrations, are set in between the posts. The height of the lower sashes measured over the frames is 26½ ins., and over the upper sashes, 17¼ ins. They are capable of being raised with extraordinary ease into the pockets in the side roofs. The pockets in the wainscoting are arranged for the vestibule sashes. The platforms are 5 ft. long and strongly supported by angle-iron center knees which extend well back of the body bolsters, and by outside timber knees reinforced with angle iron. The side sills are of long leaf yellow pine 4 ins. x 7¾ ins., and end sills are 5¼ ins. x 6⅞ ins. White oak sill plates 12 ins. x ⅜ ins. extend well up the posts on the inside, to which they are securely screwed as an additional aid to firmness. The thickness of the corner posts is 3¾ ins., and of the side posts, 3½ ins. Sweep of posts, 1¾ ins. The general dimensions of the cars are as follows: Length over end panels, 30 ft. 8 ins., and over the vestibules, 40 ft. 8 ins. The width over the sills is 8 ft. 2½ ins., and over the posts at the belt, 8 ft. 6 ins. The height from the under side of the side sills over the trolley board is 9 ft. 9¾ ins.; from the rail to platform step, 16⅝ ins.; from step to platform, 14½ ins., and from platform to the car floor, 8 ins. The cars are all mounted on Brill No. 27-G trucks, with 4-ft. wheel base, 33-in. wheels and 3¾-in. axles. The weight of the car and trucks without motors and electrical equipment is 25,940 lbs.

A NEW DOUBLE TRUCK FOR HEAVY ELECTRIC CARS

The gradual approach of electric cars in size and weight to steam coaches has made it necessary for the builders of electric trucks to make a careful study of the best steam car trucks to see in what respects the best features of the latter could be adapted to electric railway conditions. An example of this may be noted in the changes which R. B. Corbett has made in the side-frame type of the well-known Bettendorf steam car truck to make it especially fitted for heavy electric cars 40 ft. to 50 ft. long. This truck, which is shown in detail in the accompanying illustrations, has been placed on the market by Mr. Corbett's firm, the Thompson-Bonney Company, of Brooklyn, N. Y. Probably one of the most difficult matters with which master mechanics and foremen have to contend in the line of running repairs is the wear of wheel flanges. In the heavy traction on some roads the wheel flange wear has increased 500 per cent, and on interurban railways where improperly designed trucks are used, the additional power consumption, and the frequent renewals of motors, armatures, fields and bearings, has in more than one way demanded the attention of expert service to see if these troubles could not be minimized.

Quoting from the Street Railway Journal of Aug. 20, 1904, on page 268, one truck designer, speaking of the faults of some trucks now in use, says: "Of course, the remedy is to reduce this lost motion to a minimum by a better construction of the trucks. By machine finishing the sides of the journal bearings and the inside of the journal boxes, this part of the lost motion can be reduced to at least 1-32 in. By adopting the equalizer bar type of truck the effect of the lost motion between the boxes and pedestals will be eliminated, as the boxes are held a fixed distance apart. Trucks which do not have their journal boxes connected by an equalizer bar could be made efficient, except for a very close shoe adjustment, by machine finishing the boxes and pedestals, but the rapid wear of these parts, due to friction between them when forced together by the application of the brakes, would soon increase the lost motion, so that the motor would then again be doing the aforesaid difficult stunt." (That is, the weight of the car body and truck is pushed against the brake-shoe.)

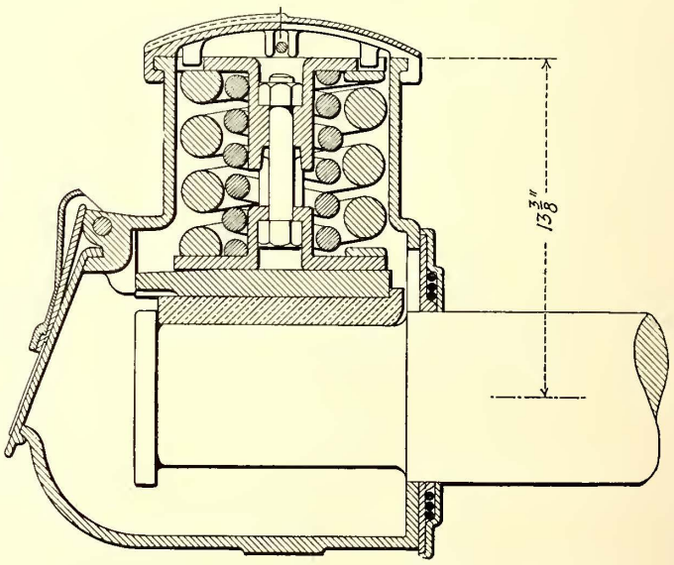
In trying to eliminate the faults of truck construction, the builder of this truck has produced a design which varies radically from other types now in use. One of its principal features is the construction of the side frame, which has the frame, column, spring seat and journal box combined into one steel casting. This departure in manufacturing retains all the good qualities of the old reliable arch-bar truck and corrects the objectionable features dependent on numerous parts. The absence of bolts and nuts on the bottom of the frame prevents the distortion of the truck and breaking of the journal boxes in cases of derailment. The use of cast steel instead of wrought iron gives the parts greater rigidity and enables the trucks to



A VIEW OF THE TRUCK COMPLETE

be kept more easily in true. Because of its flexibility and simplicity, this truck adjusts itself to the inequalities of the track, reducing derailment and flange wear to a minimum. It is claimed that there is at least 1000 lbs. saving in dead weight per car over any other type of truck. In this side frame there is but one piece. In one of the existing types there are forty-one pieces, and in others as many as ninety-three.

This truck has all the easy riding features of the equalized swing motion pedestal truck. The truck frame has over the journal bearing a spring barrel which is part of each journal box. Springs are placed within this barrel directly on the



ARRANGEMENT OF JOURNAL SPRINGS IN STEEL SIDE FRAME CASTING

wedges and brasses to permit the vertical movement of the axles within the boxes. This construction eliminates the great wear of journal boxes in pedestal jaws, which is the source of great expense in the present pedestal truck. It also wholly eliminates having the brake-shoes dragging and straining the motors.

The bolsters are made of open hearth steel, and are shaped in powerful hydraulic presses. After the center bearings, side bearings and guides are riveted in position upon the bolster it is subjected to a further test in a 100-ton hydraulic press. This insures the perfect alignment of all the parts in relation to each other.

The truck is equipped with either elliptic or coil bolster springs. The swing motion of the bolster may be obtained by the use of roller bearings, eye-bolt hangers, or with ball and socket spring side bearings.

The designer of this truck is aware that ball bearings have been attempted before, but believes that the results proved unsatisfactory, because the bolster was so imperfect that it did not admit of their true application. This bolster is of pressed steel of one piece, and the bearings are true to those on the top bolster of the car.

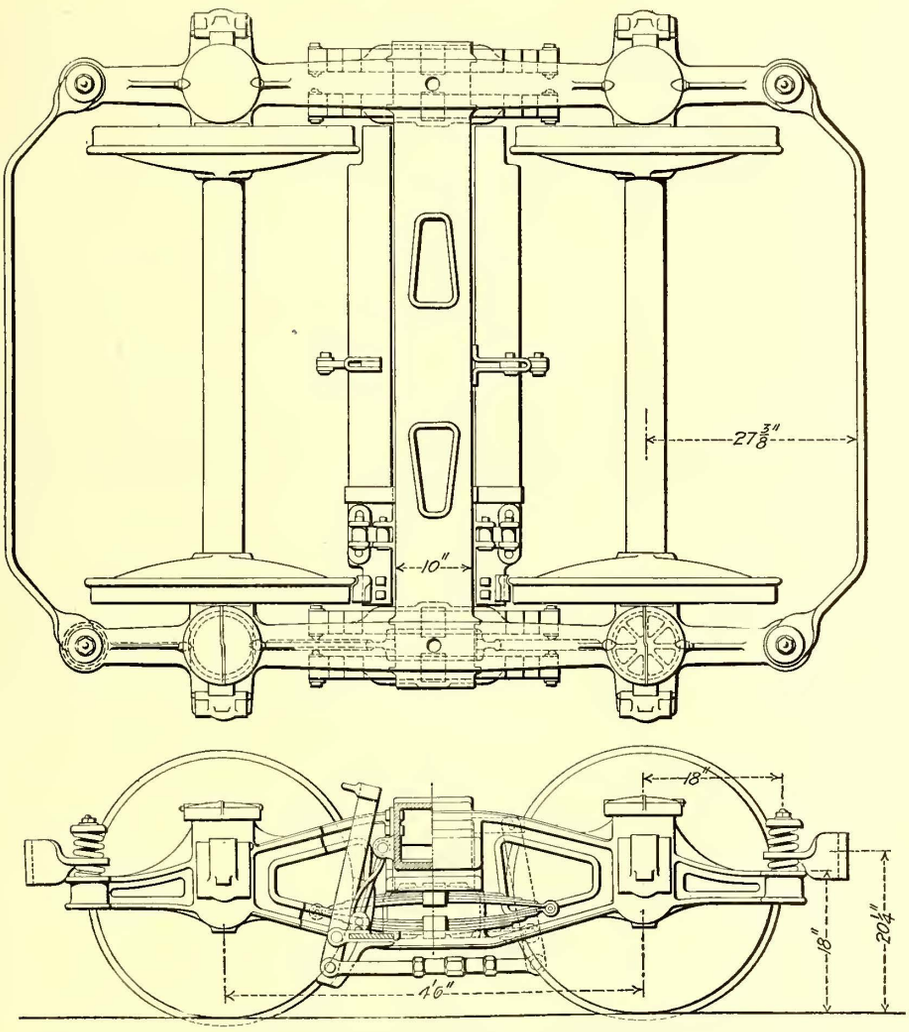
By reference to any of the modern locomotives, it will be found that the wrought-iron frame for locomotives has been abandoned. Cast steel is being used, being more rigid and more easily kept in tram. The same can be said of traction trucks. This type of truck construction has been in use under locomotives and under tank cars, carrying weights of 190,000 lbs., without failure and without derailment.

It is stated that in a test made by a committee appointed by the Master Car Builders' Association to test various styles of center plates, with a view to determining the amount of friction developed in curving, the style B ball center bearing used on this truck was the only one to turn under a load of 37 tons without cutting, which required a flange pressure of only 150 lbs. Another test has recently been made by loading a bolster equipped with this center bearing with 67,000 lbs. of pig iron. The flange pressure required to turn the truck under this load was less than 150 lbs.

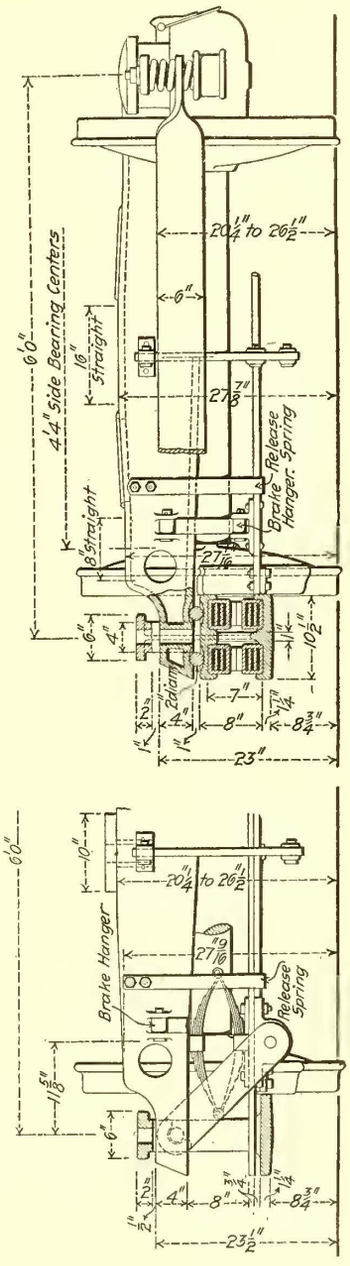
Special attention is invited to the following points in regard to the ball center and side bearings. These bearings are in service on more than fifty steam railroads under all classes of cars. Bearings that have been in use for more than four years and have made over 500,000 miles, show no perceptible wear. These bearings have withstood the hard usage of the heaviest engine tenders now built, as well as on light coaches, electric cars, etc.

The improved designs are claimed to embody all the advantages that an ideal bearing could possess. Every part is made of the best material under improved methods, and is fitted by special machinery having all parts interchangeable. There are no loose pieces, such as springs, rivets, bolts, screws, trunnions, spiders, etc., to get out of order, mislaid or lost when repairing cars. The balls are suspended, kept central by gravity, and as they constantly change position they will not wear flat, clog, freeze up or become lost. In summing up the advantages of this truck the following points are made: Simplicity; flexibility; absence of lost motion from the axle to the king pin; great strength, with freedom from wear and tear of rivets and bolts, struts, transoms and bridge framing; dependence on wheels and axles to keep it in alignment instead of transoms and cross framing; less truck, armature and motor repairs, and less wheel replacements.

Besides the trucks built by the Bettendorf Axle Company for passenger service, it has also had a great deal of experience in the construction of trucks for freight and tank car work.



PLAN, SIDE AND END ELEVATIONS OF STEEL SIDE-FRAME TRUCK DESIGNED FOR ELECTRIC TRACTION, SHOWING TWO DIFFERENT ARRANGEMENTS OF SWING-BOLSTER SUSPENSION



DETAIL OF SWING BOLSTER

MEETING OF ALLIS-CHALMERS ENGINEERS AND SALESMEN

During the last month the management of the Allis-Chalmers Company called together at its Reliance Works the principal outside representatives of the company to discuss the plans and policy of the company for the coming year. Owing to the important steps taken by the company during the past year, and the consequent complete reorganization of its staff, a view of the men who are behind the guns will be of interest. For this reason the group view which was taken during the meeting is reproduced on this page, together with a key to assist in identifying those who were present. Quite a number of the men shown have achieved a national reputation. Taken collectively, they represent an aggregation of energy and brains of which any manufacturing company may well be proud.

GROUP PHOTOGRAPH OF THE ENGINEERS AND SALES REPRESENTATIVES OF THE ALLIS-CHALMERS COMPANY

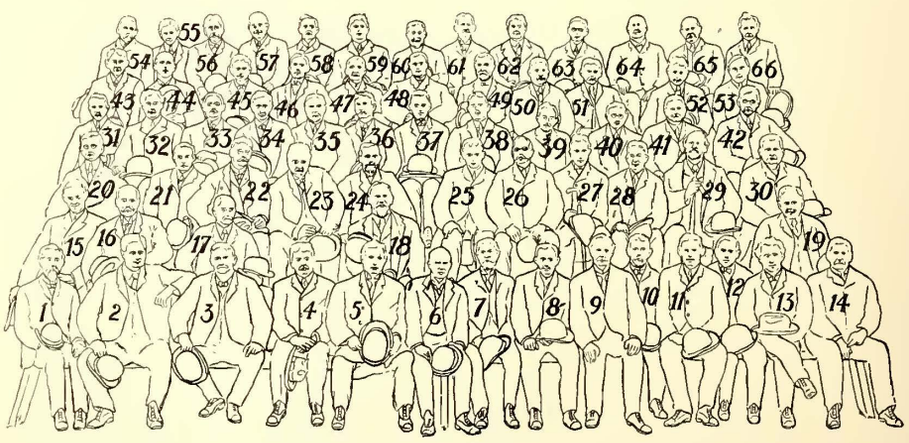
1. James Tribe. 2. G. C. Forgeot. 3. A. Niedermeyer. 4. W. J. Sando, Manager Pumping Engine Department. 5. W. H. Whiteside, General Manager of Sales Department. 6. W. J. Chalmers, Vice-President and Treasurer. 7. B. H. Warren, President. 8. A. M. Mattice, Chief Engineer. 9. Arthur Warren, Manager of Publicity. 10. B. A. Behrend, Chief Engineer of Electrical Department. 11. C. C. Tyler, General Superintendent. 12. W. M. S. Miller. 13. Ervin Dryer. 14. F. F. Coleman. 15. James Ashworth. 16. H. A. Allen. 17. W. W. Nichols, Vice-President and Secretary. 18. J. F. Harrison, Manager Flour Mill Machinery Department. 19. Almon Emrie, Superintendent Milwaukee Works. 20. W. G. Starkweather. 21. J. R. Jeffrey. 22. C. J. Printz. 23. H. S. Mitchell. 24. I. L. Skeith. 25. G. C. Henry. 26. Robert Mulford. 27. J. C. Buckbee. 28. H. Woodland, Assistant Treasurer. 29. Clemens Herschel, Manager Hydraulic Turbine Department. 30. C. A. Burns. 31. H. L. Wells. 32. Franklin Wharton. 33. H. V. Croll. 34. G. L. Tifft. 35. J. D. Millar. 36. W. C. Trout. 37. M. C. Miller. 38. W. A. Wood. 39. H. Schifflin. 40. J. A. Milne, Comptroller. 41. H. S. Pell. 42. G. S. DeWein. 43. H. J. Holden. 44. M. J. Furlong. 45. George T. Thomas. 46. W. E. Dodds, Superintendent of Construction. 47. Richard Hoppin. 48. H. C. Helvey. 49. Albert Hoppin. 50. A. J. Gates, Superintendent Chicago Works No. 1. 51. George L. Fisher. 52. W. N. Tanner. 53. Richard Barnard. 54. F. W. Greenleaf. 55. H. S. Mallalieu. 56. H. L. Keen. 57. J. O. Watkins. 58. R. J. Glendenning. 59. G. F. Collins. 60. R. D. Tomlinson. 61. C. A. Derby. 62. G. A. Berg. 63. J. C. M. Lucas. 64. W. O. Everett. 65. H. A. Hammil. 66. D. T. Jones. (See key group below.)

The Columbus, Buckeye Lake & Newark Traction Company has obtained a contract from the Government to handle mail for Kirkirsville, Hebron, Newark and other points along its line. The arrangement gives these towns much better service than they had from the steam roads.

During the storm of Jan. 25 the Boston & Worcester Street Railway Company made the excellent record of operating cars over its 45-mile route in better time than the Boston & Albany Railroad, which runs between the same cities. In spite of deep snow, the electric railway line had cars moving all the time, while railroad trains were either stuck in drifts or held at stations because of the impossibility of working switches.

NICKELUMEN

Nickelumen is not a babbitt metal, but is a nickel-tempered aluminized white bronze which fuses at a temperature sufficiently low to admit its being melted and recast from an iron vessel. It is claimed to have the remarkable quality of parting very slowly with the heat which it absorbs upon fusing, which makes it possible to pour it into journal bearings the same as babbitt is used; hence by its use a fine quality of bronze bushings can be secured without the expense of machine work. Its manufacturers, the New Era Manufacturing Company, of Kalamazoo, Mich., make the claim that its wearing quality equals the best red or yellow bronze. Nickelumen cannot be alloyed with babbitt metals which contain lead, as neither nickel nor alminum amalgamate with that metal under ordinary conditions.



KEY TO PHOTOGRAPH, ALLIS-CHALMERS ENGINEERS AND SALESMEN

LEGAL DEPARTMENT*

LAWS LIMITING HOURS OF LABOR

In the year 1902, the Supreme Court of Rhode Island, in pursuance of a request from the Governor of that State—under a law permitting him to take the advisory opinion of the highest court upon the constitutionality of pending legislation—expressed the view that a statute limiting the hours of labor of certain employees of street railway corporations to ten hours a day would be constitutional and valid. (In re ten-hour law for street railway corporations, 54 Atl., 602.) The Rhode Island court places its decision partly upon the ground that the proposed law deals with public corporations and the use of a public franchise, and therefore the statutory regulation in question is legitimate. But the principal ground was that the law concerned public health and safety, and therefore fell within the police power. Statutes of this class are not uncommon. The laws forbidding ordinary business and labor on Sundays are constitutional, not at all because of their incidental religious bearing, but because certain periods of rest are necessary for preserving the health of the community, and unless an arbitrary rest day were fixed, the spirit of competition would lead first one and then another to work excessively, and gradually the whole community would feel the necessity for continuous labor in order to keep up with the enterprising persons who were determined to get ahead by any possible means. On such ground, Sunday laws have been universally upheld throughout the United States, although many years ago they were declared unconstitutional by some courts because it was thought that they involved official recognition of religious observances.

The principle would be the same as to limiting hours of work generally that may be performed on any day and in any week, and whenever there is anything especially trying to the health in a given occupation, the courts approve of legislation limiting the hours as to that particular calling, although in one view this is special legislation. The leading case is Holden vs. Hardy (169 U. S., 366), in which the Supreme Court of the United States held that a statute of Utah which limited the hours of labor in mines to eight hours per day, except in case of emergency, was a valid exercise of the police power and not in conflict with the fourteenth amendment of the Federal Constitution. A decision of the same class, though not as clearly right, was People vs. Lochner (177 N. Y., 145), in which the New York Court of Appeals sanctioned a statute of that State limiting the hours of labor in bakeries.

It is probable that the courts generally would sustain legislation limiting hours of labor upon street railways, always provided the limitation fixed was reasonable. There is, in the first place, the consideration of the health of the employees themselves, which would suffer if compelled to work for excessive periods, and, growing out of that, there is the factor of the safety of the public, which might be endangered if men were permitted to work on street railways who, because of lack of proper rest, were unfit to perform their tasks. This consideration may not be as strong in the case of street railways as in that of steam railroads, but is probably strong enough as to either to uphold the legislation. In People vs. Lochner (supra) it was remarked in one of the prevailing opinions: "In this law, which restricts the working hours of employees in bakery and confectionery establishments, I think we may, fairly, perceive a statutory regulation, reasonably promotive of the public health, because compelling the master of such an establishment to conduct it in a manner the least capable of affecting his product prejudicially. We may, not unreasonably, assume that an employee may work too long for his health under the conditions, and that an impaired vitality and the possible development of organic diseases may be the result. If to obviate the possible consequences to the consumer of the food manufactured, the Legislature determines to interfere, by limiting, among other regulations, the hours of the workman, I do not think we should hold the interference to be without reason."

As to any occupation which directly affects the physical safety and comfort of the public, it will probably be held legitimate for the Legislature to provide against the impairment of vigor and alertness of employees through overwork.

As above intimated, the limitations of hours of labor, in order to be valid, must be reasonable, and as to the reasonableness of a law the court is the ultimate judge. Usually the discretion of the Legislature will not be overruled. If it be a mere question between legislative and judicial opinion as to reasonableness, where opinions may legitimately differ, the action of the Legislature will be allowed to stand. If, however, the court can say that a limitation is clearly unreasonable, the statute will be annulled as not being a proper exercise of the police power, and therefore unconstitutional.

Laws of this class generally provide, expressly or impliedly, that labor for more than a certain number of hours shall not be exacted or permitted, even though the employees consent or desire to work overtime. This is entirely proper, as the very theory of the legislation is to prevent impairment of physical condition by excessive exertion, and, to that end, not only to guard employees against mercenary domination of their employers, but also to save them from themselves.

CHARTERS, ORDINANCES AND FRANCHISES

ILLINOIS.—Eminent Domain—Exercise of Right—Street Railroads—Operation Through Rural Districts—Deflection from Highway—When Authorized.

1. Under Hurd's Rev. St. 1899, c. 131a, Section 1, providing that a street railroad may appropriate any property necessary for the construction of its road, a street or electric railroad constructed through rural districts may deflect from the highway when necessary, but must make an honest effort to follow the highway, and, unless it appears that it is in general following the highway, it has no right to condemn property upon the theory that it is necessarily deflecting or diverting from the highway.

2. Under the express provisions of Hurd's Rev. St. 1899, c. 131a, Section 3, a street railroad has no right to construct its road on any public ground outside of an incorporated city, town, or village, except upon the consent of the county board.

3. In condemnation proceedings by a street railroad proposing to construct its line through rural districts, evidence held insufficient to show that a digression from the highway was necessary because of inability of the road to follow the highway.

4. In so far as electric railroads incorporated as street railroads, under Hurd's Rev. St. 1899, c. 131a, Section 3, are authorized to travel through rural districts, it is upon the theory that they will be a benefit to the rural inhabitants, and not that only those living in towns where regular stations shall be maintained shall be the beneficiaries, and, if the country districts are so sparsely settled that the traffic along the roads through them will not support electric lines following such roads, their construction is not a public necessity, and the power of eminent domain cannot be called into action on their behalf.—(Hartshorn et al. vs. Illinois Valley Traction Co., 71 Northeast Rep., 612.)

INDIANA.—Eminent Domain—Street Railroads—Compensation to Property Owners—Interurban Railroads—Streets and Highways—Dedication to Public—Extent and Purposes.

1. It will not be presumed that a street railway company will violate its contract with the city, and an allegation in a complaint that it intends to do so, in advance of any act of the company constituting such violation, will not prevail against the presumption of good faith.

2. An abutting property owner is not entitled to an injunction against the construction of a street railroad if the use of the streets by the railroad in the manner proposed, and upon the conditions set forth in the contract between the railroad and the city, do not create an additional burden upon the street, and a deprivation of the property owner's beneficial interest therein. The mere anticipation of branches by the railroad of its contract with the city, and of consequent injuries to the abutting owner's property, will not entitle him to such an injunction.

3. The carriage of light express matter, passenger's baggage, and mail matter upon street cars does not constitute a ground of complaint on the part of abutting lot owners.

4. A street railroad is not an additional burden upon the street, and the owners of abutting real estate are not entitled to compensation on account of the appropriation and use of the street by such a road.

5. A railroad cannot construct a common passenger and freight railroad upon the streets of a city, in the absence of a license from

* Conducted by Wilbur Larremore, of the New York Bar, 132 Nassau Street, New York, to whom all correspondence concerning this department should be addressed.

the abutting lot owners, without compensation first assessed and paid or tendered.

6. A street, platted or otherwise laid out in a city forms a part of the highway system of the state, and becomes dedicated to the use of the public for all public purposes, present and prospective, consistent with its character as a public highway, and not actually detrimental to the abutting real estate; and it is not exclusively dedicated to the use of abutting property, or the convenience or profit of any or all of the inhabitants of the particular municipality in which it is situated.

7. The construction and operation of an interurban electric railroad to carry passengers, their baggage, light express matter, and mail, in trains consisting of one, or, by special permission of the board of public works, of two, cars, of the best and most approved pattern, is not an additional servitude upon the street for which the abutting property owners are entitled to compensation.

8. An electric railroad is liable in an action for damages to an abutting property owner for any special injury to his property occasioned by the negligence of the railroad in constructing or operating its road.—(Mordhurst vs. Ft. Wayne & S. W. Traction Co., No. 19,950, 71 Northeast Rep., 642.)

KENTUCKY.—Taxation—Street Railways—License on Cars—Ad Valorem Tax—Recovery Back Interest.

1. Where a street railway company in a city of the first class continued to pay the sum of $50 as a tax or license on each of its cars under an ordinance enacted before the enactment of the new constitution and the statutes thereunder, and no such tax or license was required by any law or ordinance subsequent to said new constitution, in an action by the city to recover certain taxes imposed under the new laws the company was entitled to a credit for such payments, as the new act relating to the government of such cities was a substitute for the old charter and all of its provisions.

2. Where, in an action to recover taxes, the defendant impeaches the record in the county clerk's office, and shows it was incorrect in placing defendant's tax too high, but in doing this it shows that it could have learned exactly what its tax was from the records made by the board of valuation and assessment, interest should be charged on the taxes for the years unpaid.—(City of Louisville vs. Louisville Ry. Co., 81 S. E. Rep., 701.)

MASSACHUSETTS.—Street Railways—Limitation of Fare—Validity—Authority of Selectmen.

1. Under Pub. St. 1882, c. 113, Section 43 (Rev. Laws, c. 112, Section 69), providing that a street railway company may establish the rates of fare, subject to its charter and the statutes, and in view of the course of legislation (Pub. St. 1882, c. 113, Sections 44, 45; St. 1898, pp. 747, 748, c. 578, Sections 23, 26; St. 1901, p. 113, c. 180) relating to limitations and revision of rates of fare, St. 1898, p. 743, c. 578, Section 13, providing that the selectmen of a town, in granting a location to a street railway company, may impose such conditions as the public interest may require, does not authorize them to impose a limitation on the rates of fare the company may charge.

2. The acceptance by a street railway company of a location granted by a town does not make valid conditions in the grant as to fares, which the town could not legally impose, nor does it make a contract as to fares between the company and the town.—(Keefe vs. Lexington & B. St. Ry. Co., 70 N. E. Rep., 37.)

MICHIGAN. — Highways — Commissioner — Authority — Street Railways—Franchise—Use of Streets.

Under Comp. Laws 1897, Section 6446, being part of an act to provide for the formation of street railway companies, and declaring that any company may construct and maintain a street railway in and along streets and highways of any township upon such terms as may be agreed on by the company and the township board, the authority conferred will include state and territorial roads within the territory of a township, for whose condition the township is responsible; and a highway commisioner could not maintain proceedings to disfranchise a railway which had authority from the township board to operate and construct its line within the township, on the ground that the board was usurping the jurisdiction or authority of said commissioner.—(Smith vs. Jackson & Battle Creek Traction Co., 100 N. W. Rep., 122.)

MICHIGAN.—Estoppel—Railroads—Change of Grade of Street—Acceptance of Damages.

A railroad operated its trains over the tracks of a street railroad company, and in a suit by a property owner on the street the street railroad was required to pay damages for raising the grade, but no damages were allowed for an additional servitude. Complainant acquiesced in the decree and accepted the damages. Held that complainant was estopped from thereafter claiming that the street railroad company existed only on paper, and that the operation of the road should be discontinued by the railroad company on the ground that it was not authorized to operate a street railway, as such, or as part if its line, without compensation to the abutting owner, because it imposed an additional servitude.—(Ilgenfritz et al., vs. Toledo & M. Ry., et al., 99 N. W. Rep., 878.)

NEW JERSEY.—Error—Review—Ruling—on Demurrer—Eminent Domain—Electric Railways—Additional Servitude—Consent of Abutting Owners.

1. When a demurrer is overruled and then withdrawn, the decision upon it cannot be reviewed on error; but if the final judgment appears by the record to rest solely on the pleading demurred to, or if a ruling at the trial on the question raised by the demurrer is presented in a bill of exceptions, that can be reviewed on error.

2. The right to construct and operate electric railways, with their incidental poles and wires, within the lines of public streets, for municipal travel, is included in the ordinary public easement, and imposes no additional servitude on abutting property.

3. In order to obtain the consents required for the construction of an electric railway in a public street in accordance with the act of April 21, 1896 (P. L. p. 329), the railway company agreed with an owner of land abutting on the street to give him, for his consent, a valuable option on the purchase of the company's bonds and stock. Held that the agreement was in violation of the policy established in that statute, and could not be enforced.

(Syllabus by the Court.)—(Montclair Military Academy vs. North Jersey St. Ry. Co., 57 Att. Rep., 1050.)

NEW JERSEY.—Eminent Domain—Procedure—Appointment of Commissioners.

The requirement of the act entitled "An act to regulate the ascertainment and payment of compensation for property condemned or taken for public use" (Revision 1900; P. L. p. 79) that the justice appointing commissioners shall, in the order of appointment, fix the date on or before which the commissioners must file their report, is not directory, but mandatory, and an order which omits to fix a day is fatally defective.—(Doughty vs. Atlantic City & Suburban Traction Co., 58 Att. Rep., 101.)

NEW JERSEY. — Dedication — Acceptance — Street Railroads—Grant of Rights in Street—Consent of Municipality.

1. Acceptance of dedicated streets is found in a resolution of acceptance, and in the passage by a municipality of an ordinance granting permission to a street railway company to lay its tracks therein, and conditioning its permission upon the grading and paving the streets in a specified way.

2. A traction company incorporated under the act of March 14, 1893 (P. L. p. 302), obtains no exclusive right for a location of a route by reason of having filed a description of its route in the Secretary of State's office. It must also have the consent of the municipal authority.

3. In estimating the number of lineal feet of property necessary to authorize the consent of a municipality to the construction of a street railway, the cross-streets are to be omitted.—(People's Traction Co. et al. vs. Atlantic City et al., 57 Atlantic Rep., 972.)

NEW JERSEY.—Contracts—Consideration—Railroads—Crossings—Regulation—Freight and Fare Charges—Authority of Courts.

1. A railroad company, incorporated under the general railroad law of 1873 (Gen. St. p. 2,638), was maintaining certain bridges whereby the highway was carried over its tracks at an elevation; the duty to maintain the bridges being imposed upon the railroad company in behalf of the public by statute (P. L. 1891, p. 169; Gen. St. p. 2,661). A traction company proposed to construct a line of tracks along the highway, and to that end desired to strengthen and reinforce the bridges, so that they would sustain the increased weight of traffic placed upon them by reason of the maintenance and operation of the traction road. By agreement between the railroad company and the traction company, the former gave consent that the latter might strengthen and reinforce the bridges, and the parties agreed thereafter to share equally the cost of their maintenance and repair; the traction company being given the right to repair the bridges on default of the railroad company to do so, and the railroad company agreeing to pay one-half the cost thereby incurred. Held that this consent and agreement of the railroad company furnished a valuable consideration to support reciprocal covenants on the part of the traction company.

2. An agreement made between a railroad company and a traction company, whereby the former gives consent that the latter may construct a traction road across the line of the railroad at grade, and settling as between these parties the mode of crossing, is not void because made without application to the chancellor to define the mode of crossing under the statute. P. L. 1895, p. 462; Gen. St. p. 2,717.

3. The prohibition of the act regulating the crossing of steam railroads by steam or electric railroads thereafter to be constructed (P. L. 1895, p. 462; Gen. St. p. 2,717) is intended for the benefit of the parties named in it; the railroad company, the traction company, and the municipal authorities being made by the act the representatives of different public interests.

4. Section 15 of the general railroad law of 1873 (Gen. St. p. 2643) vests in the railroad company an uncontrolled discretion to establish such rates of freight and fare as its own interests may from time to time require, subject, only, to the maximum rates prescribed by the section, and to the reserved right of repealer and modification of the Legislature.

5. The courts have no general supervisory jurisdiction over the question of freight and passenger rates.

6. An agreement, made between a railroad company and a competitor, that during a limited period the former company "will not reduce its present rates of fare, unless required by law," is not contrary to public policy as established in this State.—Rariton River R. Co. vs. Middlesex & S. Traction Co., 58 Atlantic Rep., 332.)

NEW YORK.—Elevated Road—Rights of Abutting Lessee—Damages to Leasehold Interest.

1. The city of New York leased land under an agreement which was practically perpetual, with periods for renewal and readjustment of rentals. Before it consented to the construction of an elevated road in front of the premises, a building had been erected on the lot by the lessee. The building and the lease were sold after the commencement of the operation of the road to plaintiffs, and the lease thereafter renewed. Held that plaintiffs were entitled to damages for the impairment of their leasehold interest, though, when the renewal was made, defendant's road was built and in operation.

2. The city of New York leased certain premises, giving a right to renewal, and the lessee erected buildings thereon. Thereafter an elevated road was built on the street on which the lands abutted. The lease, after such construction of th elevated road, was renewed. Held that there was no presumption that the rents reserved in the renewal lease were fixed with reference to the presence of the elevated road, so that the lessees suffered no damage by such erection.—(Storms et al., vs. Manhattan Ry. Co. et al., 71 N. E. Rep. 4.)

NEW YORK.—Pleadings—Allegations of Complaint—Failure to Controvert — Effect—Separate Defenses—Availability—Stipulations.

The allegation in the complaint in a suit to enjoin the maintenance of an elevated railroad in front of plaintiff's premises that none of the owners of the premises had consented to its construction and operation, and that none of the defendants had acquired the easements, property right, or ownership of plaintiff in the street, which is not controverted by the answer, must be taken as true, under Code Civ. Proc. Section 522.

2. The separate defenses in a suit to enjoin the maintenance and operation of an elevated railroad in front of plaintiff's premises that defendant had acquired easements so to do, either through a conveyance or through an estoppel, are unavailing, in the absence of a denial of the allegation in the complaint that none of the owners of the premises had consented to the construction and operation of the road, and that defendant had not acquired an easement so to do.

3. A party stipulating that certain allegations of a pleading are true cannot thereafter claim the contrary.—(Driscoll vs. Brooklyn Union Elevated Ry. Co., et al., 88 New York Suppl., 746.)

NEW YORK.—Easements—Conveyances—Reservation—Notice of Reservation — Rights of Vendor — Damages — Release by Grantee—Consideration of Release—Evidence.

1. Where property was conveyed with the reservation of all right to the easements of light, air, and access, and damages for interference therewith by the construction of a railroad in front of the premises, the reservation of the easements which were appurtenant to the premises was ineffectual as a severance, and the grantee could execute a release of the damages to the railroad company.

2. Where a vendor reserved as part consideration the right to damages to the premises from interference by a railroad company with the easements of light, air, and access, and the deed containing the reservation was recorded, the reservation was effectual between the parties, and the railroad company, procuring a release of the damages from the grantee, was chargeable with notice of the reservation and the equitable lien of the vendor.

3. Where, pending an action against a railroad company for damages for interference with plaintiff's easements of light, air, and access, the premises were conveyed with a reservation of the damages to the easements as part of the consideration, and the deed containing the reservation was recorded, the railroad company procuring a release of the damages from the grantee, and paying the consideration to the grantee, without the knowledge of the plaintiff was not released from the equitable lien of the plaintiff, the grantee having no authority from plaintiff to receive the money.

4. Where a railroad company procured a release of damages for interference with the easements of light, air, and access from a grantee of the premises, who acquired them by deed, which was recorded, reserving such damages to the grantor as part of the consideration, the amount of the consideration for the release may be adjusted in an action by the grantor against the company and the grantee to declare the grantee a trustee and the release void, and it was error to exclude evidence as to value of the easement.—(McKenna vs. Brooklyn Union Elevated R. Co. et al., 88 New York Suppl., 762.)

NEW YORK.—Eminent Domain—Action by Owners—Injunction.

Under Code Civ. Proc. Section 3379, providing, among other things, that defendant in eminent domain proceedings may continue in possession of the land, an order staying defendant from continuing any action against plaintiff in condemnation proceedings, which action accrued prior to the commencement of such proceedings, is unauthorized.—(Wait et al. vs. Hudson Valley Ry. Co., 88 New York Suppl., 825.)

NEW YORK.—1. Municipal Corporations—Contract for Excavation in Street—Elevated Railroad Supports—Duty to Protect —Injunction—Issues.

Where a contract between a city and one who had contracted to make an excavation in a street required him to protect the elevated railroad structure and tracks, and the railroad sued to enjoin him from making the excavation, claiming that his method of protecting the structure was inadequate, no question as to plaintiff's duty to support the structure was open to defendant.—(Interborough Rapid Transit Co. vs. Gallagher., 89 New York Supp., 152.)

NEW YORK.—Street Railroads — Leases — Passengers — Transfers—Lines Embraced in Contract.

1. By Railroad Law, Section 78 (Laws 1892, p. 1398, c. 676), authority is given any corporation owning or operating any railroad to contract with any other such corporation for the use of their respective roads or routes, or any part thereof; but that section contains a provision that "nothing in this section shall apply to any lease in existence prior to May the first, 1891." Section 104 (page 1406) provides that "every such corporation entering into such contract" shall give to each passenger paying a single fare a transfer entitling such passenger to a trip to ony point on any road embraced in the contract. Held that section 104 applies to contracts made pursuant to Section 78, and hence has no application to contracts made before the date specified in Section 78.

2. Where a street railroad company leased its lines to the H. Street Railroad Company prior to May, 1891, and after such date another railroad company leased its lines to the H. Company—the latter lease making no reference to the other lease, and there being no recital that the lessee was operating any railroad—and thereafter the lessee road consolidated with other roads, and the consolidated road leased all the lines to defendant, defendant was not required to give a transfer from one to the other of the lines leased to the H. Road.—(Topham vs. Interurban St. Ry Co., 89 New York, Suppl., 298.)

NEW YORK.—Street Railroads—Lease of Line—Statutes—Transfers—Refusal—Penalty.

1. Laws 1885, p. 525, c. 305, making it lawful for any street surface railroad company to contract with another such company for the use of their respective roads or any portion thereof, subject to certain provisions and restrictions, and Laws 1890, p. 1082, c. 565, and Laws 1892, p. 1382, c. 676, continuing the privileges of contracting and the obligations incurred thereby, are in pari materia, and for the purposes of construction must be read together.

2. Under those statutes providing that street railroads entering into such contracts shall carry or permit any other party to such contract to carry, between any two points on the roads or portions thereof embraced in the contract, any passenger desiring to make one continuous trip between such points for one single fare not higher than the fare lawfully chargeable by either of the parties for an adult passenger, the Legislature intended, in consideration of the privilege of contracting, to require that the lines so brought together under the contracts should carry passengers for one single fare between any two points on the lines, "to the end that the public conveyance may be promoted," as expressed therein.

3. Street railroads accepting the provisions of statutes permitting them to enter into a contract for leasing lines of other companies, as authorized thereby, are bound to assume the duties and obligations imposed by the statutes as a consideration for the privilege.

4. In an action to recover the penalty provided by Laws 1892, p. 1406, c. 676, Section 104, providing that any street surface railroad company operating the lines of another by lease or consolidation, permitted by the act, refusing on demand to issue a transfer to any person paying one single fare, entitling the passenger to one continuous trip to any point or portion of any road embraced in the contract, shall be liable to a penalty of $50 to be recovered by the person aggrieved, it appeared that defendant was the operating company of several leased lines, under a contract entered into pursuant to the statute. Plaintiff was a passenger on one of such lines,

and demanded a transfer to another of the leased lines, which was refused. Held that defendant's liability for the penalty could not be defeated because plaintiff's initial trip was on one of defendant's leased lines, to be completed on another of such lines, instead of on the defendant's line, to be completed on one or the other of the lessor company's lines.—(O'Reilly vs. Brooklyn Heights R. Co., 89 New York Suppl., 42.)

NEW YORK.—Appeal—Review by Court of Appeals—Street Railroads—Trespass—Action by Abutting Owner—Pleading—Evidence—Injunction—Harmless Error.

1. In trespass against a street railway company by an abutting owner, the issue was whether plaintiff had title in fee to land lying in front of his premises, between the center of the highway and the boundary of such premises. The judgment of the trial court was unanimously affirmed by the Appellate Division. Held that the Court of Appeals could not review the question of title on the ground that the only question involved was a construction of the deeds under which plaintiff claimed, where they were offered to establish his title, and no question of law was raised by an exception to their admission.

2. In an action against a street railway company for trespass in the use of the highway, evidence that the company had not complied with the statutory requirements to enable it to build a road is inadmissible, where failure of the company to comply with the requirements of the statute was not alleged in the complaint.

3. Plaintiff, being the owner of land abutting on a street, brought trespass against a street railway company for using the same, but failed to establish his title to the street. Held that he was not entitled to an injunction, as an abuttor on the street, against the railway company, for having built in violation of law, where the action was based on ownership in fee, and on trespass against his rights as such owner.

4. Where, in trespass against a street railway, the court has held that plaintiff was not entitled to recover, admission of improper evidence on the part of both parties on the question of damages is harmless error.—(Kennedy vs. Mineola, H. & F. Traction Co., 71 N. E. Rep., 102.)

NEW YORK.—Eminent Domain—Elevated Railroads—Damages to Abutting Property.

Where, on proceedings by an elevated railroad to acquire a right of way on a street, it appeared that the fee and rental value of an abutting owner's property had been substantially diminished since the building of the elevated structure, and there was no claim of benefits arising from the propinquity of the railroad, an award of 6 cents as compensation was palpably erroneous.—(In re Brooklyn Union Elevated R. Co., 88 New York Suppl., 426.)

OHIO.—Jurisdiction of Federal Circuit Court—Case Involving Questions of Impairment of Contract—Obligation—Equitable Jurisdiction to Restrain Enforcement of Ordinance Reducing Street Railway Rates—Constitutional Law—Validity of Municipal Reduction of Street Railway Rates—Impairment of Contract Obligation—Municipal Corporations—Right to Renew Street Railway Grant Before Expiration of Original Grant.

1. An objection that no question as to the impairment of contract obligations could arise from the enforcement of a municipal ordinance reducing street railway rates, because the right to regulate such rates was expressly reserved in a prior ordinance, cannot be successfully urged to defeat the jurisdiction of a Federal Circuit Court of a suit to enjoin such enforcement, where complainant relies wholly upon contracts alleged to have resulted from subsequent ordinances which, it was in substance asserted, had deprived the municipality of the power to exercise such reserved right.

2. Jurisdiction of a Federal Circuit Court of a suit to enjoin the enforcement of a municipal ordinance reducing street railway rates cannot be defeated on the theory that a lack of delegated power to adopt the ordinance withdrew from the case any question as to the impairment of contract obligations, where the municipality's defense is that certain other ordinances asserted as contracts did not deprive it of its continued power to exert authority over such rates, because the state law prevented it from abrogating, by subsequent contracts, the right of regulation expressly reserved in a prior ordinance.

3. Equity will entertain jurisdiction of a suit to restrain, as impairing contract obligations, the enforcement of a municipal ordinance reducing street railway rates on a section only of a consolidated line, in view of the public interests and of the controversies, confusion, risks, and multiplicity of suits which would necessarily be occasioned by resistance to the enforcement of the ordinance.

4. The requisite written acceptances of various municipal ordinances for the consolidation and extension of street railway lines, which secured to the public, for the limited time during which the privileges therein granted should continue, the benefit of a single fare of not more than 5 cents for a continuous passage over the whole length or any portion of the consolidated and extended lines, created a contract right to charge that rate, which could not afterwards be reduced by the municipality over a portion of the consolidated lines, under the authority of a right to regulate fares, reserved in an ordinance adopted before the consolidation, granting a renewal franchise to the corporation which then owned that portion of the lines.

5. A municipal contract which secures to the public for a term of years the benefit of a single fare of not more than 5 cents for a continuous passage over the whole length, or any portion of consolidated and extended street railway lines does not violate the provision of Bates's (Ohio) Anno. Stat. 1897, Section 2502, that a municipal corporation shall not, during the term of a street railway grant, or renewal thereof, release the grantee from any obligation or liability thereby imposed, because such contract deprives the municipality of the right to regulate fares over a portion of the consolidated lines, reserved in an ordinance adopted before the consolidation, granting a renewal franchise to the corporation which then owned such portion of the lines.

6. The right to renew street railway grants, conferred upon municipal councils by Bates's (Ohio) Anno. Stat. 1897, Section 2501, may be exercised prior to the expiration of the original grant, although the language of such section is that "the council may renew any such grant at its expiration."—(City of Cleveland, Appt., vs. Cleveland City Railway Company, 24 Supreme Court Rep., 756.)

OHIO.—Street Railroads—Hamlets—Construction of Road in Streets—Consent of Hamlet.

Hamlets in existence at the time the Municipal Code of 1902 went into effect were municipal corporations, and thereafter, if they had a population of less than 5000 at the last federal census, they are villages; and a street railway company is without authority to construct its road on or above their streets or roads without their consent.—(Electric St, R. Co. vs. Hamlet of North Bend (two cases). 70 N. E. Rep., 949.)

PENNSYLVANIA.—Street Railways—Location of Route.

Where an act under which a street railway company incorporated provides that it shall have a continuous route, and it locates a portion of it on a street already occupied by the tracks of another company, in constant use, over which tracks it has no right to run, it has no continuous route, within the provision of its charter.—(Altoona Belt Line St. Ry. Co. vs. City Pass. Ry. Co., 58 Atlantic Rep., 477.)

PENNSYLVANIA.—Street Railroads—Grant of Rights in Street—Conditions—Injunction—Parties—Forfeiture of Franchise.

1. The supervisors of a township granted to a street railway company the right to lay its tracks on a highway, but stipulated, as a condition of the grant, that the company should not charge a fare exceeding a certain amount. Held that where the company, after the construction of its road, charged a fare exceeding the amount stipulated, owners of property abutting on the road, who had no contract with the company as to the rate of fare, were not proper parties to a bill by the township authorities to restrain the company from collecting a greater rate of fare than that stipulated in the contract.

2. Where a township granted a franchise to a street railway company to occupy a highway, the grant providing that, if the road was not built within a time specified, "then this franchise and all the rights thereunder to be null and void," no action on the part of the township to complete the forfeiture was required where the road was not built within the time designated.—(Millcreek Tp. et al. vs. Erie Rapid Transit St. Ry. Co., 58 Atlantic Rep., 613.)

TEXAS.—Street Railroads—Fares—Half Rates to School Children—Statute—Constitutional Law — Mandamus — Corporations — —Date of Incorporation—Presumption.

1. Where a street railroad, defendant in mandamus proceedings to compel it to issue to a school child half-fare rates on its lines, pursuant to Act April 10, 1903 (Acts 28th Leg. [1903] p. 182, c. 116) was sued as a corporation, and answered as such, it will be presumed, in the absence of evidence showing when it was incorporated, that it is subject to the constitution of the State in force at the time of, and subsequent to, the passage of the act.

2. Where is appears in mandamus proceedings to compel a street railroad company to issue to a school child half-fare rate on its lines, pursuant to Act April 10, 1903 (Acts 28th Leg. [1903] p. 182, c. 116), that the right of the company to charge the full fare which it insisted should be paid did not vest until after Const. 1876 went into effect, the company is in no position to assert the invalidity of the act as impairing the obligation of a contract, in view of the provision of that Constitution that all privileges and franchises granted by the Legislature, or created under its authority, shall be subject to its control.

3. Where no evidence is offered in mandamus proceedings to compel a street railroad company to issue to a school child half-fare rates on its lines, pursuant to Act April 10, 1903 (Acts 28th

Leg. [1903] p. 182, c. 116), tending to show that the rate provided for in the statute is such as not to leave the company a sufficient income to pay repairs and a fair income on its investment, the company is in no position to assert the invalidity of the law, as depriving it of property without due process of law, and denying it the equal protection of the law.—(San Antonio Traction Co. vs. Altgelt, 81 S. W. Rep., 105.)

VIRGINIA.—Municipal Corporations—Street Railways—Control of Streets—Vested Rights—Competing Lines—Ordinance—Limitation of Time for Completing Line—Right to Take Advantage of Breach.

1. Where a street railway company has lines of railway constructed in territory under authority of the board of county supervisors, and the territory is subsequently incorporated as a city, the control of the streets, including those on which railway lines have been built, passes from the board of supervisors to the municipal authorities.

2. Where a street railway company merely has permission for the laying of a double track on a street which is subsequently included within the limits of a city, but the company took no advantage of the right to lay a double track, and used a single track, in disobedience of the orders of the city authorities, it has no vested rights which will prevent the city from granting to another street railway company the right to put down a double-track car line on the street.

3. Where a street railway company had the right to put down a track for the operation of its lines within a limited time, but failed to put the track down in the time limited, the waiver of the forfeiture of the company's franchise by the state or municipality is not the granting of a new right.

4. Where the failure to complete a street railway within the time limited for its construction is due to an injunction being granted against the company by a competitor, the right to put down the line is not lost by the expiration of the period limited.

5. The failure to complete a street railway line within the time limited for its construction cannot be taken advantage of in a private action by a competitor to enjoin construction of the line, but any forfeiture can be enforced only on behalf of the public at the election of the state.—(Newport News & O. P. Ry. & Electric Co. vs. Hampton Roads Ry. & Electric Co. [two cases], S. E. Rep., 839.)

ASSAULTS, EJECTMENTS, ETC.

INDIANA.—Carriers—Street Cars — Transfers — Ejection — Assault—Actions—Complaint—Evidence.

1. A street car company is bound to protect a passenger from assault and injuries by its servants, and is liable for breach of such duty, regardless of whether the servant committing the assault was acting within the scope of his employment or not.

2. Where, in an action for an assault on a passenger, defendant street railway company appeared, answered, and made defense, admitting that at the time of the accident it was engaged in hauling passengers for hire in the city in question, and the evidence showed the occurrence to have taken place in one of the streets in such city, and that plaintiff was ejected with force from one of the "company's" cars by one of the "company's" employees, the jury was justified in finding that defendant was the "company" referred to.

3. Where a passenger on a street car paid his fare to the conductor and asked for a transfer to a line belonging to the same company to which he was entitled to transfer, and the conductor, by mistake, gave him a wrong transfer, the passenger, on proper explanation, was entitled to be carried on the line to which he had requested a transfer.

4. Where unnecessary force was used in ejecting plaintiff from a street car, he was entitled to recover for the assault, without regard to whether he was entitled to the rights of a passenger.—(Citizens' St. Ry. Co. vs. Clark, 71 N. E. Rep., 53.)

MASSACHUSETTS.—Carriers—Street Railway—False Imprisonment—Ejection from Car—Transfers—Harmless Error.

1. A regulation of a street railway company requiring a passenger changing from one line to another to produce a transfer or pay his fare is reasonable.

2. The rules of a street railway company required that a passenger, on transferring from one line to another, should produce a transfer, or pay his fare on the second line. Plaintiff, on leaving a car in order to transfer to another line, was not given a transfer by the conductor of the car he was leaving, but such conductor shouted to the other conductor that plaintiff had paid his fare, and that he should be passed. Plaintiff refused to pay a fare on the car to which he transferred, and was ejected by the conductor. Held that the conductor had no right to disregard the rule, and had a right to eject plaintiff.

3. Plaintiff was guilty of an evasion of fare, within the meaning of Rev. Laws, c. 111, Section 251, imposing a penalty on any one evading payment of fare on street cars.

4. The rules of a street railway required that a passenger, on transferring from one line to another, should produce a transfer, or pay his fare on the second line. Plaintiff, on leaving a car in order to transfer to another line, was not given a transfer by the conductor of the car he was leaving, but such conductor shouted to the other conductor that plaintiff had paid his fare, and that he should be passed. Plaintiff refused to pay a fare on the car to which he transferred, and he was arrested at the instance of the conductor, who afterwards made a complaint. Rev. Laws, c. 111, Section 251, provides a penalty for evading payment of fare on a street car. In an action by plaintiff for false imprisonment, plaintiff offered to show that he had a conversation with the superintendent relative to the prosecution, and that an officer of the company asked for a continuance of the hearing on the complaint. Held that, while there was nothing to show that it was within the scope of the conductor's duty to cause plaintiff's arrest, yet, if it had been, the arrest was justified, because of plaintiff's violation of the statute, and hence the exclusion of the offered evidence was harmless.—(Crowley vs. Fitchburg & L. St. Ry. Co., 70 N. E. Rep., 56.)

MISSOURI.—Carriers—Passengers—Assault by Conductor—Liability of Carrier—Corporations—Damages—Elements—Excessiveness.

1. Where a conductor, while engaged in the service of a street railway company, in charge of one of its cars, willfully assaulted a passenger, the company, though a corporation, is liable therefor.

2. Where a passenger on a street car was willfully assaulted by the conductor, he was entitled to recover not only for physical injuries sustained, but for pain and suffering, and for the disgrace and humiliation he was subjected to by reason of the assault.

3. Where plaintiff, a passenger on a street car, was willfully assaulted by the conductor, who kicked plaintiff in the mouth and face and knocked out three of his teeth, a verdict in favor of plaintiff for $1,000 was not excessive.—(O'Donnel vs. St. Louis Transit Co., 80 S. W. Rep., 315.)

NEW YORK.—Carriers—Responsibility to Passengers—Unanticipated Assaults.

A street railway is not a guarantor of the safety of its passengers under all circumstances, but is required only to exercise requisite care, and it cannot be held responsible for an assault by one passenger on another, which its servants had no reason to anticipate.—(Stutsky vs. Brooklyn Heights Ry. Co., 88 New York Suppl., 358.)

TEXAS.—Carriers — Street Railroads — Passengers — Ejection — Justification—Actions—Burden of Proof—Instructions—Damages—Excessiveness.

1. Plaintiff, a passenger on a street car, on being asked for his fare, handed the conductor a transfer folded. The conductor returned it with a demand that plaintiff unfold it, which plaintiff refused to do. Thereupon the conductor demanded a nickel, and the second time demanded that plaintiff unfold the transfer, when plaintiff replied, "Damned if I am going to unfold it; unfold it yourself," whereupon the conductor seized plaintiff, threw him on the floor against a seat, and ejected him from the car. Held that plaintiff's language was neither profane nor obscene, and that his conduct was no justification for his ejection.

2. Where, in an action for the ejection of a passenger, one of the court's instructions was prefaced by the clause that, if the jury believed from the preponderance of the evidence that the conductor politely requested defendant to pay his fare, etc., the refusal of the court to charge that if the jury believed from the evidence that plaintiff's misconduct, if any, caused or proximately contributed to cause his injury, they should find for defendant, was not error, on the ground that such instruction would have cured the alleged error in the previous one, in that it in effect placed the burden of proof on the defendant.

3. In an action for ejection of a passenger, an instruction that the burden was on plaintiff to prove by a preponderance of the evidence the truth of the facts alleged, and that the jury should decide the issues submitted on a preponderance of the evidence, was proper.

4. An assignment of error not accompanied by a proposition of law will not be considered on appeal.

5. Where plaintiff was wrongfully ejected from a street car, and it appeared that the conductor jerked him from the seat, and that his back was injured by striking the end of another seat, for which plaintiff was attended by a physician, and from which he suffered at the time of the trial, a verdict for $500 damages was not excessive.—(El Paso Electric Ry. Co. vs. Alderete, 81 S. W. Rep., 1246.)

LIABILITY FOR NEGLIGENCE

MINNESOTA.—Street Railways—Defective Tracks—Indemnity to City.

1. Under the terms of an ordinance of the city of St. Paul, defendant was permitted to build its street railway tracks over the Rice Street Bridge, and to operate its cars thereon, upon condition that it was to indemnify the city for recoveries against it from injuries received by persons using the adjacent highway. The ordinance was accepted by defendant, and thereafter a lady was thrown from a carriage by reason of defects in maintaining the portion of the highway occupied by the tracks, for which she recovered from the city. Held in an action for the indemnity provided for in the ordinance, that defendant was liable upon findings of the trial court supported by the evidence.

2. Whether the requirement of the defendant company by the city to construct the tracks in a certain manner relieved the defendant was not involved in this case, as it had adapted itself to the demands of the municipality, and the claim for indemnity arose from failure to repair, rather than in the construction thereof, under findings of the court.—(City of St. Paul vs. St. Paul City Ry. Co., 100 Northwest Rep., 472.)

MISSOURI.—Carriers—Street Railroads—Derailment—Defective Switches—Injuries to Passengers—Res Ipsa Loquitur—Evidence—Witnesses—Instructions.

1. Error in the admission of evidence over objection was cured by the court's subsequently striking the same and directing the jury not to consider it.

2. Where, in an action for injuries to a passenger on a street car by reason of an alleged defective switch, there was evidence that the switch was in the same condition at the time it was examined by a witness, eight days after the accident, as it was at the time of the accident, his evidence as to its condition when he examined it was not objectionable as too remote.

3. In the absence of abuse, the exercise of the court's discretion in permitting the introduction of evidence in rebuttal which should have been introduced in chief will not be reviewed.

4. In an action for injuries to a passenger by a derailment of the car, caused by a defective switch, proof of the fact of derailment and of the injury was sufficient to establish a prima facie case of the carrier's negligence, which, unless explained, entitled the passenger to a recovery.

5. In an action for injuries to a passenger by a derailment of the car, caused by a defective switch, the fact that the cause of the accident was shown did not preclude the court from instructing the jury that proof of the derailment and of plaintiff's injury was sufficient to create a presumption of negligence on the part of the carrier.

6. An instruction that a street railway company is bound to exercise the highest degree of care reasonably practicable for the personal safety of its passengers, and that such care should be used for the purpose of safely operating its cars and trains, in having its tracks and switch appliances kept in a reasonably good and safe condition, and for such purpose it was bound to exercise the highest degree of care reasonably practicable in inspecting and keeping its tracks, switch appliances, etc., in good and reasonably safe working order and position, was not misleading.

7. An objection that such instruction was general was cured by other instructions, which limited plaintiff's right to recover to the specific negligence charged, and instructed that plaintiff could not recover merely because he was a passenger and received his injury, if any, without fault on his part.

8. That a passenger, injured by a derailment caused by a defective switch, testified that the switch was defective, and on cross-examination admitted that he had only casually observed the same and could not tell its manner of operation, did not authorize an instruction as to the credibility of plaintiff's evidence; such statements not being necessarily in conflict.

9. Where a requested instruction given substantially covered other instructions requested and refused, such refusal was not error.—(Logan vs. Metropolitan St. Ry. Co., 82 S. W. Rep., 126.)

MISSOURI.—Street Railroads—Crossing Accident—Driver of Vehicle—Contributory Negligence—Last Clear Chance—Application of Doctrine—Sufficiency of Evidence—Verdict for Plaintiff—Approval by Lower Court—Peremptory Instruction for Defendant—Refusal—Right of Appellate Court to Review—Presumptions in Favor of Verdict.

1. A judgment for plaintiff in a street railroad crossing accident case should not be reversed on appeal for the trial court's refusal to peremptorily instruct for defendant, unless, after giving plaintiff the benefit of the most favorable construction of all the evidence, and every reasonable inference in his favor that may be drawn therefrom, no other reasonable conclusion can be reached than that he was guilty of contributory negligence.

2. The Court of Appeals may review the refusal of a peremptory instruction for defendant by the lower court, though the jury has found a verdict for plaintiff which the lower court has approved.

3. The failure of the driver of a vehicle to pause, before crossing a street railroad track, until a moving car has passed out of his line of vision, so as to give him a clear view of the track, is contributory negligence as a matter of law, precluding recovery against the company for an ensuing collision with a car coming from the opposite direction.

4. Evidence in an action against a street railroad company for the death of a horse in a collision with its car examined, and held not to warrant the application of the doctrine of last clear chance in favor of plaintiff.—(Asphalt Granitoid Const. Co. vs. St. Louis Transit Co., 80 S. W. Rep., 741.)

MISSOURI.—Non-Suit—Setting Aside—Discretion of Court—Pleading—Suit by Next Friend—Appointment.

1. A defect in a petition by an infant, suing by next friend, because of failure to allege that the person acting as next friend had been duly appointed, may be raised by answer.

2. Where the court on motion set aside a non-suit without assigning a reason for sustaining the motion, the court on appeal will not consider the evidence, but it will be presumed, in the absence of any showing to the contrary, that the court's action was warranted by the facts disclosed by the record.

3. Where the court sets aside a non-suit on motion of plaintiff, it devolves on defendant on appeal to show that the court abused its discretion; and that the evidence may have shown that plaintiff was not entitled to recover will not establish the fact; otherwise the court on appeal must consider the evidence.—(Cohn vs. Metropolitan St. Ry. Co., 81 S. W. Rep., 846.)

NEBRASKA.—Negligence—Proximate Cause—Question for Jury—Street Railroads—Injury to Passengers—Presumptions—Verdict.

1. Where the proximate cause of an injury depends upon a state of facts from which different minds might reasonably draw different inferences, it is a proper question for the consideration of a jury.

2. The violation of any statutory or valid municipal regulations established for the purpose of protecting persons or property from injury is of itself sufficient to prove such a breach of duty as will sustain a private action for negligence, if the other elements of actionable negligence concur. Omaha Street Railway Company vs. Duvall, 58 N. W. 531, 40 Neb. 29, followed and approved.

3. Street railway companies are common carriers of passengers. As such they are bound to exercise, for the safety of their patrons, more than ordinary care. They are required to exercise the utmost skill, diligence and foresight consistent with the business in which they are engaged, and are liable for the slightest negligence. Lincoln Street Railway Company vs. McClellan, 74 N. W. 1074, 54 Neb. 672, 69 Am. St. Rep. 736, followed and approved.

4. The law presumes that one injured while being transported by a common carrier was injured in consequence of the latter's negligence, and to escape liability it must show that it has discharged the full measure of its legal duty, and was in no wise to blame for the accident, unless defendant's negligence contributed thereto. Lincoln Street Railway Company vs. McClellan, 74 N. W. 1074, 54 Neb. 672, 69 Am. St. Rep. 736.

5. Action of the trial court in refusing to enter judgment on a verdict not agreed to by all of the jury is correct.—(Lincoln Traction Co. vs. Heller, 100 N. W. Rep., 197.)

NEW JERSEY.—Trolley Line—Collision With Vehicle—Negligence—Evidence.

1. The rule with respect to the use by vehicle of a common highway on which a trolley line is operated requires that reasonable care should be exercised, by one about to cross such highway, not to drive in front of an approaching car, which, in spite of reasonable care in its operation, may strike him; and that the car must not be allowed to strike a vehicle so crossing its tracks if reasonable circumspection and control on the part of the motorman will suffice to prevent it.

2. If, from the testimony in a case, the jury may legitimately find that when the plaintiff started to cross the trolley tracks laid in a public highway it was apparently safe for him to do so under the conditions within his observation, one of which was a trolley car sufficiently distant to be checked, or if need be, stopped before it should reach him, the question of the plaintiff's contributory negligence is for the jury.

3. If, in such case, the jury do not find that the plaintiff was negligent in crossing the highway when he did, the question whether the collision could have been avoided by the exercise of reasonable care on the part of the motorman in the operation of his car is also one of fact for the jury when the testimony submitted to them will sustain the inference that the motorman did not have his car under proper control, in view of the conditions within his observation.—(Conrad vs. Elizabeth, P. & C. J. Ry Co., 58 Atlantic Rep., 376.)

NEW YORK.—Street Railways—Injury to Passenger—Violent Starting of Car.

Evidence that a passenger on an electric street car—a woman seventy-five years old—was thrown down while standing in the aisle, about to take a seat, because of an unusual, violent forward lurch of the car in starting, is, in the absence of evidence of contributory negligence, sufficient to go to the jury on the question of the company's negligence.—(Harty vs. New York & Q. Ry. Co., 88 N. Y., Supp., 422.)

NEW YORK.—Negligence—Owner of place of Public Amusement—Independent Contractor—Liability.

Defendant owned and managed a park for public amusement for an admission fee. Plaintiff paid the admission fee and entered the park to witness an exhibition of fireworks as advertised by defendant. During the exhibition a rocket was discharged which struck plaintiff and injured her. A third person whose business was that of exhibitor of fireworks did all the work in connection with the sending off of fireworks, under a contract with defendant to give the exhibition, and defendant had no control over the details of the work nor over the men who performed it. Held, that defendant was not liable, though the third person was negligent.—Deyo vs. Kingston Consol. R. Co., 88 N. Y., Supp. 487.)

NEW YORK.—Street Railways—Personal Injuries—Pedestrians—Use of Street—Paramount Right—Contributory Negligence—Negligence.

1. In an action for personal injuries by one who was run over by a street car while she was crossing the street, evidence examined, and held insufficient to support a verdict for plaintiff both on the issue of contributory negligence and on the issue of negligence of defendant.

2. Though a pedestrian has a right to cross a street between crossings, he is bound to use due diligence to discover the approach of a car, and, if a car is approaching within such distance that he would not have time to pass in safety, it is his duty to wait and accord to the street railway company its paramount right to the use of the track between intersecting streets.

3. If plaintiff, in crossing a street between crossings, passed behind a south-bound wagon, and stepped immediately on the north-bound track of a street railway, without looking or waiting to discover the approach of a car from the south, she was guilty of contributory negligence.

4. If plaintiff, in crossing a street between crossings, hurriedly passed in front of a south-bound wagon and onto the street car track in front of a north-bound car which was in plain sight, and there was nothing to obstruct plaintiff's view, she, knowing that the wagon would prevent her retracing her steps, was guilty of contributory negligence in not exercising greater care to discover the approach of the car.

5. Where plaintiff started to cross a well-lighted street between crossings, where there was nothing to obstruct her view, the driver of an approaching street car had a right to assume that plaintiff would stop and allow it to pass.

6 The fact that the driver of a street car which was approaching plaintiff, who was crossing a street between crossings in plain view of the car, was temporarily engaged in conversation with a passenger in answer to a question, did not necessarily constitute negligence, since, if he had been looking ahead, he would not have been expected to stop the car.—(Barney vs. Metropolitan St. Ry. Co., 88 N. Y. Supp., 335.)

NEW YORK.—Street Railways—Personal Injuries—Excessive Damages—Setting Aside Verdict.

In an action against a street railway company for personal injuries, the evidence was sufficient to show negligence of defendant; and it appeared that after the injury plaintiff was almost wholly disabled, and had a hacking cough, and chronic inflammation of the spleen, kidney and other organs and paralysis of the throat. Three physicians testified for defendant that they had examined plaintiff and found slight wounds, and that his condition had grown much worse at the time of trial, but attributed this to consumption, which they stated was a germ disease, and also testified that they found no injury to plaintiff's lungs when the accident occurred, and that the injuries they found would not produce consumption. A verdict for plaintiff awarded him $6000 damages, and, on motion to set it aside, the court stated he would entertain the motion as to excessive damages, and afterward set the verdict aside; stating that the evidence showed almost conclusively that plaintiff had tuberculosis, which could not be produced by the injury; that it was clear that the verdict must be based on the theory that plaintiff's condition at the time of trial was due to the injuries, and was against the weight of the evidence. Held, that it was error to set verdict aside; the verdict being merely excessive, and not showing that it was the result of a disregard of the evidence, or of instructions that plaintiff could not recover for injuries from tuberculosis.—(Pesant vs. Metropolitan St. Ry. Co., 89 N. Y. Supp., 314.)

NEW YORK.—Carriers—Injuries to Passengers—Assault—Complaint—Construction—Proof—Rules—Carrying of Packages—Verdict—Evidence—Acts of Conductor—Discretion.

1. Where a complaint charged that the conductor of defendant's street car, on which plaintiff was riding, unlawfully threatened to eject plaintiff therefrom, and did wrongfully, unlawfully beat and assault her, by reason whereof she was injured and greatly bruised, etc., but did not allege that she was actually put off the car, it stated a cause of action for assault and battery only, and not for ejection.

2. Where a complaint by a passenger on a street car alleged a cause of action for assault only, and not for ejection, and the proof showed that plaintiff, on being told by the conductor that she could not ride while carrying a large steel cage in her hand, left the car without being forcibly expelled, it was error to charge that, if plaintiff was illegally compelled to leave the car, she was entitled to such damages as the evidence warranted.

3. A rule of a street railway company forbidding the carrying of cumbersome packages into their cars by passengers is reasonable.

4. Where a passenger boarded a street car carrying a cage 2½ ft. high and 2 ft. square, a verdict finding that such package was not cumbersome, within a rule prohibiting passengers from carrying cumbersome packages into the cars cannot be sustained.

5. The decision of the conductor of a street car that a package carried by a passenger was "cumbersome," within a rule of the company prohibiting passengers from carrying cumbersome packages on board the cars, should be sustained unless such determination was unreasonable and willful.—(Ray vs. United Traction Co., 89 N. Y. Supp. 49)

NEW YORK.—Street Railroads—Vehicles—Injuries to Driver—Contributory negligence.

Where plaintiff attempted to drive diagonally across defendant's street car tracks, between street crossings, and placed himself in such a position that a collision was imminent unless the car was stopped to prevent it, plaintiff was guilty of contributory negligence, and could not recover for injuries sustained in such collision.—(Zerr vs. Interurban St. Ry. Co., 88 N. Y. Supp., 353.)

NEW YORK.—Railroads—Person near Track—Negligence—Instructions—Contributory Negligence—Recovery—Sufficiency of Evidence.

1. The engineer of an approaching train, who discovers, in time to stop his train, that a beam which is being hoisted into a building adjacent to the track projects across the track, while a person standing in a window sill at the other end, and endeavoring to adjust the sling on the beam, is placed in a position of peril by the train's approach, is negligent in failing to stop, if he could do so after realizing the gravity of the situation.

2. In an action against a railroad company for injuries to a person standing in the window sill of a building adjacent to the track, and endeavoring to adjust a sling on a beam being hoisted in the building, and projecting over the track, the defendant cannot complain of instructions that such person was a trespasser, and was bound to show by a preponderance of evidence that he was wholly free from contributory negligence, and that the act of defendant's engineer in striking the beam with the locomotive was willfully negligent, and not the result of a mere error of judgment.

3. Where a person standing in a window sill of a building adjacent to a railroad track, and endeavoring to adjust a sling on a beam being hoisted into the building, and which projected across the track, did all that he could reasonably be expected to do to escape injury from an approaching train, the engineer of which had timely notice of his exposed condition, and could have saved him by stopping the train, such person's negligence in being in such dangerous position became remote, and was not contributory to the accident resulting from the engineer's failure to stop.

4. In an action against a railroad company for injuries to a person standing in the window sill of a building adjacent to the track, and endeavoring to adjust a sling on a beam being hoisted into the building, and projecting across the track, the engineer of an approaching train which struck the beam testified that he could have stopped the train within 100 ft., and that he noticed the beam over the track and plaintiff's perilous position, when the front of his locomotive was one building north of J. Street, which he guessed was about 80 or 90 feet away. Actual measurements, however, showed that the distance was 175 ft. Held, that a verdict for plaintiff based on the engineer's negligence, was sustained by the evidence.—(Fitzgibbon vs. Manhattan Ry. Co., 88 N. Y. Supp., 341.)

NEW YORK.—Street Railroads—Collision with Vehicle—Right of Way over Tracks.

The cars of a street surface railroad company have the right of way on the tracks, and it is the duty of a person driving on the tracks to get out of the way of a car coming up, so as not to make it slow down or stop, and if he fails to do so, and is injured, the railroad company is not liable.—(Belford vs. Brooklyn Heights R. Co., 88 N. Y. Supp., 267.)

NEW YORK.—Carriers—Street Railroads—Setting Down Passengers—Defect in Street—Evidence—Similar Occurrences.

In an action against a street railroad company to recover for its negligence in stopping the car at night where there was a deep hole in the street into which a passenger fell when alighting from the car, evidence that another person had previously fallen into the same hole in the same way when alighting was admissible, not to show that the place was in a dangerous condition, but that defendant had notice of its condition.—(Holzhauser vs. Brooklyn Heights R. Co., 88 N. Y. Supp., 269.)

NEW YORK.—Appeal—Findings of Trial Court—Street Railroads—Personal Injuries—Evidence.

1. The Appellate Court will be slow to reverse a judgment of the trial court for defendant where the only evidence was the uncorroborated testimony of the plaintiff.

2. That plaintiff did not bring suit against a street railway company for personal injuries which were alleged to be very serious until several weeks after the accident, though one of the attorneys was plaintiff's nephew, and that the amount demanded was entirely inadequate to the injury alleged, tended to justify a judgment in defendant's favor based on the uncorroborated testimony of the plaintiff.—(Hartman vs. Interurban St. R. Co., 88 N. Y. Supp., 352.)

NEW YORK.—Trial—Instructions—Evidence.

Where, in a suit for personal injuries, the court instructed that plaintiff was entitled to recover compensation for the loss of earnings, but there was no proof in the record as to what were the loss of earnings, a judgment in his favor cannot be permitted to stand.—(Kane vs. Metropolitan St. Ry. Co., 88 N. Y. Supp., 162.)

NEW YORK.—Street Railroads—Collision with Vehicle—Injury to Passenger—Negligence—Question for Jury—Condition of Track—Duty of Street Car Company.

1. Where evidence showed that the street car on which plaintiff was a passenger was moving rapidly at the time of a collision with a truck, and that plaintiff would not have been injured had not the attempt of the driver of the truck to get out of the way of the car been defeated by the wheel of the truck catching in a disused frog in the track, thereby causing the truck to swerve on snow and ice and hit the car, it was a question of fact for the jury whether defendant maintained the street at a point where the frog was in a reasonably safe condition.

2. A street car company, on making use of a public street which was safe prior to that time, is liable to a passenger injured in a collision between the car and a truck, if the cause of the accident was the failure of the company to restore the street to its former safe condition.—(Freeland vs. Brooklyn Heights R. Co., 88 N. Y. Supp., 264.)

NEW YORK.—Appeal—Nonsuit—Consideration of Evidence—Pleadings—Amendment to Conform to Proof—Street Railways—Injuries to Passenger—Res Ipsa Loquitur.

1. On appeal from an involuntary nonsuit, plaintiff is entitled to the most favorable view of the evidence which the jury might properly have taken.

2. Where the complaint in an action against a street railway company for personal injuries alleged that plaintiff, believing herself in great peril, and to save herself, jumped from the car in which she was riding, and fell upon the ground, and the evidence developed that plaintiff did not recollect what occurred, and one of her witnesses testified that she fell on the platform of the car, the evidence did not substantially change her claim, and the pleadings might properly have been deemed amended to conform to the facts, under Code Civ. Proc., section 723, providing that the court may, upon trial, amend any pleading to conform to the proof, where the amendment does not change substantially the claim or defense.

3. Evidence that, while plaintiff was riding in defendant's street car, flames and smoke appeared in various parts of the car, creating a panic, so that while plaintiff was attempting to escape from the car she was injured, was sufficient to justify an inference of negligence, so that it was error to dismiss the complaint.—(Dorff vs. Brooklyn Heights R. Co., 88 N. Y. Supp., 463.)

NEW YORK.—Street Railways—Injury to Passengers—Negligence—Complaint—Amendment to Conform to Proof.

Where the evidence showed that while plaintiff was a passenger on defendant's street car a fuse used in connection with the electrical appliances blew out, and a flame enveloped the front of the car, and passengers shouted, and plaintiff became frightened, and in the melee was pushed from the car—facts authorizing the submission of the question of defendant's negligence on the principle of res ipsa loquitur—plaintiff should be allowed to amend the complaint to conform to the proof, though it alleged the burning of the fuse was caused by negligent management of the car in putting on too heavy a current; it being clear that the defendant could not be prejudiced by such amendment.—(Williams vs, New York & Q. C. Ry. Co., 89 New York Supp., 669.)

NEW YORK.—Railroads—Failure to Fence Track—Statutes—Injuries to Animals—Liability—Construction.

1. A railroad is liable for injuries to animals on its right of way caused by its failure to comply with Laws 1892, p. 1390, c. 676, section 32, requiring every railroad corporation to maintain fences on the sides of its road of height and strength sufficient to prevent cattle, horses, sheep and hogs from going on its road from the adjacent land, etc.

2. Under Laws 1892, p. 1390, c. 676, section 32, requiring every railroad to fence the sides of its road to keep out cattle, horses, sheep, etc., but declaring that no railroad need be fenced when not necessary to prevent horses, cattle, sheep, etc., from going on its track from the adjoining lands, a railroad company was not bound to fence its right of way within the city of New York to keep out horses pastured on certain city blocks, where a public highway intervened between such property and the railroad's right of way.—(Lee vs. Brooklyn Heights R. Co., 89 N. Y. Supp., 652.)

NEW YORK.—Carriers—Street Railroads—Injuries to Passengers—Negligence.

Where plaintiff, a passenger on a street car, was injured by being struck in the eye by the conductor's transfer punch, which fell from his pocket as he hurried through the car to readjust the trolley pole, the railway company was not liable therefor, since it was not a casualty which could reasonably have been anticipated or foreseen.—(Cheyene vs. Van Brunt St. & E. B. R. Co., 89 N. Y. Supp., 626.)

NEW YORK.—Street Railroads—Injury to Pedestrian—Negligence.

Where a fender on the rear of a car fell, and there was no evidenec to show it had not been properly strapped up, nor any to show what caused it to fall, nor that the conductor knew of the same, the railway company is not liable to a traveler on the street injured thereby.—(Klyachko vs. Central Crosstown R. Co., 88 N. Y. Supp.)

NEW YORK.—Trial—Evidence—Cross-Examination—Explanation of Contradiction.

In an action against a street railroad company for personal injuries, the motorman testified on direct examination that he put on the reverse when he struck plaintiff's wagon, so that the car went backward, and on cross-examination stated that near a corner, which from some of the evidence appeared to be the place where the accident happened, he had no power on, because there was a "breaker" there where the power was cut off. On redirect he was asked if there was a "breaker" at or near this corner, and the question was excluded on the ground that he had already testified there was. Held, error; the witness being entitled to explain the seeming contradiction.—(O'Donnell vs. Interurban St. Ry. Co., 88 N. Y. Supp., 1016.)

NEW YORK.—Carriers—Injury to Passenger—Action—Instructions—Contributory Negligence—Action—Evidence—Record of Accident.

1. A cripple, on entering a street car, set down one of his crutches and grasped the jamb of the car door to swing himself into a seat, and the driver closed the door so forcibly as to injure one of the cripple's fingers. There was nothing in the appearance of the passenger to apprise the driver of the car of the manner in which the passenger would attempt to take his seat. In an action for injuries, the court instructed that defendant owed plaintiff a duty, as a common carrier, to see that he got on the car with safety, after the car had been stopped to receive him as a passenger. Held, that the instruction was erroneous, as imposing on defendant not merely the duty of affording the passenger a reasonable opportunity to get on the car, but making it an insurer of the safety of the passenger until he had taken his seat.

2. The passenger was not guilty of contributory negligence.

3. In an action against a street railroad company for injuries sustained by a passenger, it was error to strike out the evidence of dependant to the effect that it had no record of the accident.—(Shadletsky vs. New York City Ry. Co., 88 N. Y. Supp., 1014.)

NEW YORK.—New Trial—Setting Aside Verdicts—Evidence.

Where, on the issue of damage to a dress, resulting from an accident, there was no evidence of the actual value of the dress just

before the accident, but only as to its value or cost when new, which was some months before, so that the verdict could only have been in the nature of a guess or compromise, the discretion of the trial justice in setting aside a verdict for damages was not abused.—(Leigh vs. Interurban St. Ry. Co., 88 N. Y. Supp., 959.)

NEW YORK.—Street Railroads—Collisions with Teams—Negligence of Driver.

1. Where both the motorman of a street car and the driver of a truck were at fault in calculating that there was space enough for the car to pass, there could be no recovery for an injury to one of the horses on the truck, caused by a collision of the car with the truck.

2. A driver of a truck, who, when backing it against the curb to unload, did not leave room enough for street cars to pass, but unnecessarily occupied the tracks and left his team with a young boy, who, from lack of judgment or discretion, did nothing to avert a collision when he saw an approaching car, was guilty of negligence, so that for an injury to one of the truck horses, caused by a collision, there could be no recovery.—(Gass vs. New York City Ry. Co., 88 N. Y. Supp., 950.)

NEW YORK.—Carriers of Passengers—Personal Injuries—Street Railways.

Where, in an action for personal injuries received while alighting from defendant's street car, the weight of the testimony is to the effect that the injuries were received by stepping off the car before it stopped, a judgment for plaintiff should not be permitted to stand.—(Lynch vs. Interurban St. Ry. Co., 88 N. Y. Supp., 935.)

NEW YORK.—Street Railroads—Drivers of Teams—Reciprocal Rights.

The drivers of a team and a street car have equal rights and, where the night is dark, and a street car is lighted up, the driver of a wagon cannot impose on a street car company the duty to exercise greater vigilance than the law required of himself, by driving without any lights on his wagon, against recognized custom and regulations, relying on the vigilance of the street car driver.—(Koehler vs. Interurban St. Ry. Co., 88 N. Y. Supp.)

NEW YORK.—Carriers—Injuries to Passengers—Negligence—Sudden Stops.

The mere fact that a street car suddenly stopped, so as to precipitate a passenger through the front window of a car, was not sufficient to show negligence, in the absence of any evidence that the stoppage was more than usually violent, or that there was a greater jerk than the ordinary one incident to the stopping of any car.—(Johnson vs. Interurban St. Ry. Co., 88 N. Y. Supp., 866.)

OHIO.—Carriers—Ejection of Passenger—Assault—Words of Provocation—Damages.

1. Words of provocation may be considered in mitigation of punitive, but not compensatory, damages.

2. In an action for personal tort, the compensatory damages which may be recovered from the principal for the wrongful and unlawful act of its agent are not subject to mitigation, nor is the liability of the principal for such damages defeated, by proof that the act which caused the injury was provoked or induced by abusive language used by the plaintiff to such agent.

3. Where, in such action, the jury, by the direction and instruction of the court, is restricted to the allowance of compensatory damages only, it is not error to refuse to charge "that, in determining the question of compensatory damages to the plaintiff, they may consider, in mitigation thereof, the provocation brought about by the insulting words used by the plaintiff to defendant, if they find such words were used."—(Mahoning Valley Ry. Co. vs. De Pascale, 71 N. E. Rep., 633.)

PENNSYLVANIA.—Street Railroads—Collision—Nonsuit.

Plaintiff, suing a street railroad company to recover for injuries, testified that he was driving a two-horse delivery wagon at night, when he collided at a cross-street with one of defendant's cars. The collision occurred before the wagon reached the tracks. The car was only 40 ft. away when plaintiff looked up the track, and was lighted up in the usual manner. Held, that a nonsuit was properly entered.—(March vs. Traction Co., 57 Atlantic Rep., 1131.)

PENNSYLVANIA.—Street Railways—Release.

On an issue as to the validity of a written release of damages for injuries received on a street railway track four disinterested witnesses, including a physician, testified that plaintiff was conscious at the time the paper was read to him; that he comprehended its contents, accepted the money consideration, and signed it; and it appeared that he used the money weeks afterwards with full knowledge of where it came from, and made no offer to return it before bringing suit. Held, that the release was a bar to an action for the damages.—(Laird vs. Union Traction Co., 57 Atlantic Rep., 987.)

PENNSYLVANIA.—Street Railways—Collision—Evidence.

Evidence in an action to recover for personal injuries caused by a collision between plaintiff's sleigh and a street railway car examined, and held to require the direction of a verdict for defendant.—(Dunkle vs. City Passenger Ry. Co., 58 Atlantic Rep., 268.)

RHODE ISLAND.—Master and Servant—Injuries to Servant—Action—Evidence—Declaration of Manager—Admissibility—Res Gestæ—Instructions.

1. In an action against a street railway for injuries to a conductor owing to the alleged negligence of a motorman, evidence that, on the day following the accident, defendant's general manager, who knew nothing of the accident until that day, stated to the foreman of the car barns that the motorman in question was not a regularly broke-in man and was not competent, was not admissible as res gestæ.

2. In an action against a street railway company for injuries to a conductor owing to the alleged negligence of a motorman, it was competent for plaintiff to prove that the manager of defendant had knowledge of the incompetency of the motorman.

3. In an action against a street railway company for injuries to a conductor owing to the alleged negligence of a motorman, evidence that, on the day after the accident, defendant's general manager, in a conversation with the foreman of the car barns relative to the accident, stated that the motorman in question was not competent, was not admissible on the ground that the statement was made by the manager, acting within the scope of his authority, and was a statement made to a subordinate in the course of conducting the business.

4. Where the charge, as a whole, states the law correctly, it is not error for the court to refuse a particular request already embodied in the charge.

5. In an action against a street railway company for injuries to a conductor owing to the alleged negligence of a motorman, the erroneous admission of declarations made the next day by defendant's general manager to the superintendent of the car barns to the effect that the motorman in question was not competent was prejudicial error.—(Havens vs. Rhode Island Suburban Ry. Co., 58 Atlantic Rep., 247.)

RHODE ISLAND.—Carriers—Passengers—Inception of Relation—Preparation to Board—Assumption of Dangerous Position—Proximate Cause.

1. One who, after signaling an approaching street car which is about to round a curve, places himself in such close proximity to the track that he will inevitably be struck by the overhang of the car when it rounds the curve, assumes the risk incident to the dangerous position which he has taken, and cannot hold the street railroad company liable for his injuries.

2. One who signals an approaching street car which is rounding a curve has no right to assume that the car will stop at any particular point on the curve, and until he is given to understand by some act of the motorman or conductor that he can safely attempt to board the car, or until the conditions are such that he can do so, the street railroad company is under no legal duty to him.

3. The act of one who places himself within the reach of the overhang of a street car as it rounds a curve, and not the subsequent act of the motorman of the car in accelerating its speed, is the proximate cause of injury to such person resulting from being struck with the overhang of the car.—(Garvey vs. Rhode Island Co., 58 Atlantic Rep., 456.)

RHODE ISLAND.—Injuries to Wife—Action by Her—Judgment—Action by Husband—Res Adjudicata—Carriers—Negligence—Instructions.

1. A judgment will not be reversed because the jury credited the testimony of the lesser number of witnesses on a disputed issue of fact.

2. A judgment in favor of defendant in an action by a wife against a carrier for injuries was not a bar to an action by the husband for loss of her services.

3. In an action against a street railway company for injuries sustained by a passenger who was standing in a car, and was thrown down when it rounded a curve, it was proper to refuse to instruct that, if the jury found that the car was not going at an improper speed, they should find for defendant, since the irregular motion might have caused the injury.—(Brierly vs. Union Ry. Co., 58 Atlantic Rep., 451.)

RHODE ISLAND.—Street Railways—Injury to Child—Contributory Negligence.

A child eight years old, accustomed to being on the street alone, who, seeing an approaching street car, starts to run across the street in a diagonal direction, when, to get across the car track ahead of the car, she, if going in the most direct line, must go 16 feet before the car goes 85 feet, at most, is guilty of contributory negligence.—(Poland vs. Union Ry. Co., 58 Atlantic Rep., 653.)

RHODE ISLAND.—Street Railroads—Injuries to Pedestrians—Insane Persons—Duty of Motorman—Presumptions—Guardian—Contributory Negligence.

1. Where a person of full age and apparently possessed of his faculties was seen on the track by a street railway motorman, the latter was entitled to assume that such person was actually of sound mind, and to act on such presumption.

2. In an action for death of plaintiff's husband, who was insane, by his being struck by a street railway car while he was at large and unattended, the fact that he was at large did not necessarily constitute contributory negligence on the part of the custodian.—(Simpson vs. Rhode Island Co., 58 Atlantic Rep., 658.)

RHODE ISLAND.—Street Railways—Injury to Passenger—Negligence—Riding on Platform—Pleading necessity.

The declaration for injury to a passenger on a street car by being thrown from it by a sudden jolt while standing on the rear platform need not show it was necessary for plaintiff to stand there; it not being negligence per se for a passenger on a street car, though it is propelled by electricity, to ride on the platform.—(Brunnchow vs. Rhode Island Co., 58 Atlantic Rep., 656.)

TEXAS.—Street Railroads—Persons on Track—Negligence—Contributory Negligence—Assumption of Risk.

1. One waiting to board an approaching street car, who took a position which was safe with reference to the ordinary cars which the street railroad used, and with which he was familiar, having no notice up to the time he was struck by it that an approaching car was of a greater width than the ordinary cars, was not guilty of contributory negligence.

2. Nor did he assume the risk of such car's striking him.

3. City ordinances required a street railroad to stop cars in the shortest time and space possible on the first appearance of danger to persons on or moving toward the track, and on the approach of danger to any person to give an alarm by blowing a whistle. Defendant's motorman on a car of extraordinary width saw plaintiff assume a position which was in fact dangerous, in view of the width of his car, and knew that persons signaling a car all stopped close to the track. His car was a special one, and had orders not to stop for ordinary passengers, and he proceeded without either stopping or checking the car, or giving the danger signal, until he struck and injured plaintiff. Held, that the jury were warranted in finding that the motorman saw plaintiff's danger and was guilty of negligence, although the motorman stated that he did not know the dimensions of his car, or the reach of the step which struck plaintiff.

4. The rule that an engineer or motorman may act on the theory that a person on or near the track, who sees a train or car approaching, will get out of the way of danger, has no application after it becomes reasonably apparent that this will not be done.—(Denison & S. Ry. Co., vs. Craig et al., 80 Sw. Rep., 865.)

TEXAS.—Carriers—Injuries to Passengers—Contributory Negligence—Question for Jury—Evidence—City Ordinance—Pleadings—Variance.

1. In an action against a street railway for injuries to a passenger attempting to alight, where there was evidence that at the time of the accident the car was within a few feet of the crossing where plaintiff expected to leave the same, and was going at a slow rate of speed, so that it was not dangerous to disembark at that time, a finding that plaintiff, who was injured in consequence of an electric shock which threw him from the car, was not guilty of contributory negligence, was warranted.

2. In an action against a street railway for injuries to a passenger caused by an electric shock which threw him from the car while he was preparing to disembark, the car being within a rew feet of the crossing at which he expected to leave, and moving slowly, it was not error to refuse to admit in evidence a city ordinance making it an offense for a passenger to jump off of a moving street car.

3. Whether a passenger preparing to disembark from a slowly moving street car within a few feet of the crossing at which he expected to leave was guilty of contributory negligence was a question of fact.

4. In an action against a street railway for injuries to a passenger while preparing to alight, where the petition alleged that plaintiff was thrown from the car by reason of an electric shock, and the particular ground of negligence relied on was that defendant permitted the car to become overcharged with electricity, the fact appearing in evidence that plaintiff had one foot on the ground at the time he was thrown did not constitute a variance.—(Denison & S. Ry., Co. vs. Johnson, 81 Southwestern Rep., 780.)

VIRGINIA.— Street Railroads — Negligence — Death — Action — Damages — Instructions — Pleading— Witnesses — Refreshing Memory.

1. Where a declaration is in two counts, and there is evidence to sustain one of them, so that defendant cannot demur to the evidence, and the one not sustained by the evidence is good in form, the court, on request of defendant, should instruct the jury to disregard the count not sustained.

2. Where, in an action against a street railroad for the death of one killed by being run over by a car, the negligence alleged in the declaration was excessive speed, it was error to instruct on failure to give warnings.

3. Code 1887, Section 3384, declares that, where there appears to be a variance between the declaration and proof, there may be an amendment of the declaration, if it will not prejudice the opposite party, or the jury may find the facts, and the court give judgment according to the right of the case. Held that, in case of a variance between the evidence and allegations, the correct practice is to object to the evidence when offered, or move to exclude it; the attention of the court being thereby called to the variance, and an opportunity afforded to meet the emergency under the statute.

4. It is proper to refuse an instruction where there is no evidence to support it.

5. In an action against a street railroad for the death of one run over by a car, an instruction that failure to look for an approaching car by a person about to cross a street railway track, especially at a street crossing, was not negligence, as a matter of law—the street car having no superior right to that of a pedestrian, and the question being whether a prudent person, acting prudently, would have thought it necessary to do so—was erroneous, as misleading.

6. While, generally speaking, one who is about to cross a street railroad should look and listen for cars, it is not an inflexible rule; and the question is whether a prudent man, acting prudently, would have thought it unnecessary to do so.

7. Where, in an action for death, there is no evidence of payment by plaintiff of doctors' bills and burial expenses, an instruction authorizing their recovery is erroneous.

8. In an action for death, evidence that deceased left a family, and followed a trade which gave practically constant employment, is sufficient to warrant an instruction that the jury, in estimating the damages for his death, may take into consideration compensation for the loss of his care, attention, society, and comfort to his family, and for solace to them for the sorrow, suffering, and mental anguish occasioned by his death.

9. In an action against a street railroad for the death of one run over by a car, plaintiff's evidence showed that deceased was walking outside defendant's track, with his back turned to an approaching car, when he attempted to cross the track, and that he had not taken more than two steps when he was struck, and that he was deaf. Defendant requested an instruction that it was the duty of a person approaching a street car track to exercise the care which ordinarily prudent persons would exercise, and make such use of his faculties as ordinarily prudent persons would make use of under the circumstances, and that, if such person were deaf, it was more imcumbent on him to exercise his sight, and that if deceased failed to exercise such care, and his failure contributed to the accident, the jury should find for defendant. The instruction was given, with the addition that if the jury further found that the motorman saw or might have seen deceased go on the track, or approach it with apparent intention to cross it, and thereafter used ordinary care to stop the car, they should find for defendant. Held that defendant was entitled to the instruction, and its modification was error.

10. It was error to refuse the charge that, if deceased stepped in front of a moving car of defendant when the car was so close on him that a collision could not be avoided by the utmost care on the part of defendant's servants, the jury must find for the defendant.

11. In an action for the death of one run over by a street car, it was not error to receive testimony of a witness objected to as giving the rate of speed 80 feet from the scene of the accident.

12. The testimony of the witness was not inadmissable because of the fact that at the time he observed the car he was in his storehouse, 25 feet from the door.

13. A witness may be allowed to refer to the stenographic report of his evidence at a former trial for the purpose of refreshing his memory.

14. Stenographer's notes of testimony on a former trial may not be referred to for the purpose of contradicting a witness.—(Portsmouth St. Ry. Co. vs. Peed's Administrator, 47 Southern Rep., 850.)

VIRGINIA..—Street Railroads—Electricity—Trolley Wires—Intersecting Lines—Fire—Liability—Contributory Negligence—Witnesses—Leading Questions—Harmless Error—Expert Testimony—Bill of Exceptions.

1. Where plaintiff's goods were burned by fire caused by an electric current introduced by telephone wires coming in contact with the live wires of an intersecting railway line, the question whether

the defendant railway company used due care in construction of its line, intersecting the telephone line, was for the jury.

2. It was immaterial to plaintiff's right of recovery whether the defendant company or the telephone company had the prior or superior right in erecting their respective wires, as it was the duty of both to exercise due care to see that their wires did not come in contact.

3. Where, in an action against a street railway company for fire caused by the alleged negligent manner in which it constructed its wires at a point where they intersected telephone wires connecting with plaintiff's building, the manner in which the telephone line had been constructed was before the jury, it was not error to refuse to instruct that the law presumed that the telephone company in erecting its line used all ordinary precautions for making its wires safe.

4. Plaintiff was not guilty of contributory negligence in failing to use a device to be attached to telephone wires entering houses to guard against the admission of an unusual and dangerous flow of electricity.

5. When and under what circumstances a leading question may be put is in the discretion of the trial court, and, as a general rule, is a matter which cannot be assigned as error.

6. Any error in permitting a leading question was harmless where the witness had already testified to the matter called for by the question.

7. Evidence showing by which party a witness was summoned is admissible to show that that party thought him worthy of credence.

8. In an action for damages from fire on electric wires, an expert witness was asked whether or not a certain kind of fuse was in common use, and answered that he did not know. On the next day he was called and asked if he had made inquiries about its use, and whether or not he could make any statement in addition to that made the day before. Held that, his knowledge on the subject was not of such a character as to fit him to answer the question.

9. The answer expected to a question which is not permitted to be answered must be shown in the bill of exceptions.—(Richmond & P. Electric Ry. Co., vs. Rubin, 47 Southeastern Rep., 834.)

WASHINGTON.—Carriers—Care Required.

A carrier is not bound to do everything that can be done to insure the safety of its passengers, but need exercise only the highest degree of care consistent with the practical conduct of its business.—(Johnson et ux. vs. Seattle Electric Co., 77 Pacific Rep., 677.

WASHINGTON.—Carriers—Passengers—Inception of Relation—Intending Passengers—Degree of Care Required—Negligence—Contributory Negligence—Assumption of Risk—Instructions Harmless Error.

1. In an action for injuries to one attempting to board a street car, a charge that defendant's servants were not required to exercise the highest degree of care possible to avoid an accident, but only the highest degree of care reasonably practicable under the circumstances, and consistent with the proper discharge of their other duties, and that by the term "highest degree of care" was meant the degree of care which would be exercised under like circumstances by careful and experienced employees, was not open to the objection of reducing the degree of care required of defendant's servants while looking after passengers to that of ordinary care, and of excusing the conductor from looking after plaintiff while he was engaged in performing his duties.

2. A street car company is not an insurer of the safety of its passengers, but, when it exercises towards them the highest degree of care consistent with the practical conduct of its business, it performs towards them its full legal duty, and is not liable even for injuries which might have been foreseen and prevented, if the means required to prevent them would involve a burden amounting to a practical prohibition of its business.

3. In an action against a street railway company, a charge, without further qualification, that the duty of the conductor and motorman towards the passengers on the car is to exercise the highest degree of care consistent with the proper discharge of all their other duties, while incorrect, was not reversible error, where there was no evidence to the effect that the injury to plaintiff was caused by the fact that the conductor or motorman was engaged in the performance of another duty, and therefore could not look out for plaintiff.

4. A motorman who obeys signals given him by the conductor, and who does not see or know that to obey such signals will result, or will be likely to result, in an injury to an intending passenger, is guilty of no negligence.

5. It was negligence for a street car conductor, no matter what other duty he was performing, to start his car at the time an intending passenger was in such a position that he could have seen her in the act of boarding the car, and he looked in her direction.

6. A street car conductor was not negligent in giving the signal to start the car, where he ceased other work while the car was stopped, and looked back to the entrance to ascertain if any one else was entering, or desirous of entering, and saw no one.

7. A person who approached a street car from the rear in a crowded thoroughfare, out of the sight of the conductor, and did not reach it until after the signal to go ahead had been given and the car had started, and then seized the handrail and attempted to board, though others standing by appreciated her danger and sought to warn her by hallooing, was guilty of contributory negligence.

8. Street railway employees are not required to exercise the highest degree of care to ascertain whether or not a particular person walking or standing on a public street desires to become a passenger, but ordinary care is all that is necessary in such cases.

9. One intending to board a street car, who approached it from the rear, and was in a position where the conductor, in looking out for intending passengers, would not ordinarily have seen her, and who was not seen by the conductor, who did look out towards the rear before giving the signal to start, was not a passenger.

10. In an action against a street railway company, the court charged that if the conductor was engaged in collecting fare or making change for a passenger, and, after the car had stopped, and before starting the same, was in a position where he could see the rear entrance of the car, and, before giving the signal to start, looked to see if there were any other persons about to board the car, and exercised reasonable care under the circumstances, and did not see plaintiff approaching the car or attempting to board the same, he was not negligent. Held that, while the matter relating to the making of change for a passenger was not pertinent to the balance of the instruction, nor to any evidence in the case, the instruction was not objectionable as taking from the jury the question as to what is and what is not a proper time to take up fares.

11. The fact that the clause was not pertinent did not necessitate a reversal, as it was not prejudicial.

12. One who came running towards a street car from the rear, and seized the handle bar and attempted to board the car after the signal had been given and the car was starting forward in the usual manner, assumed all the natural risks incident to such an attempt to board the car, and could not hold the street railway company responsible for injuries caused thereby.—(Foster vs. Seattle Electric Co., 76 Pacific Rep., 995.)

WASHINGTON.—Carriers—Passengers—Extent of Contract—Boarding Wrong Car—Expulsion—Evidence—Character of Conductor.

1. Where a street car company operated some of its cars on a certain line from A. to C., and others only from A. to B., a point intermediate between A. and C., and plaintiff, whose destination was C., boarded a car bound only for B., without asking the conductor whether the car went to C. or not, and there was no system of transfers from cars going only to B. to those going beyond to C., and plaintiff did not ask for any such transfer, even if there had been such a system, there was no contract to carry plaintiff beyond B.

2. A statement by the superintendent of the company, who was on the car, after arriving at B., that he would tell the conductor on the car bound for C. to pick plaintiff up, did not constitute a contract to carry plaintiff to C. without additional fare, at least in the absence of evidence of any custom to so transfer passengers without the payment of additional fare.

3. A further statement by the superintendent, made the next day, that he had intended to tell the conductor to pick plaintiff up, but had forgotten to do so, was no part of the original contract, and showed, at most, no more than an intention to authorize gratuitous carriage of plaintiff to C.

4. The expulsion, without excessive force or inexcusable negligence, of one who presents no evidence of a right to free passage, and who does not pay his fare, affords such a one no cause of action.

5. In an action by a passenger for ejection from a street car, evidence as to the general character and disposition of the conductor who ejected plaintiff was properly excluded, as the only subject for inquiry was the character and disposition of the conductor on the particular occasion.

6. Where a complaint for the ejection of a passenger from a street car was based merely on the breach of the contract of carriage, and did not allege the employment of an incompetent conductor, evidence of the general character and disposition of the conductor who ejected plaintiff was properly excluded.

7. Where a street car bound only for B. was boarded by a passenger for C., who made no inquiry as to the destination of the car, it was immaterial, on the question of his contract of carriage, that the car which he boarded left at about the time that the car for C. ordinarily left.—(Braymer vs. Seattle R. & S. Ry. Co., 77 Pacific Rep., 495.)

LONDON LETTER

[*From Our Regular Correspondent.*]

In these columns last month a statement was published to the effect that the London, Brighton & South Coast Railway, acting under the advice of its electrical engineer, Mr. Philip Dawson, had decided to electrify a portion of its suburban service, and that the single-phase high-tension system had been decided upon. There is nothing much to add to that statement, although a good deal has recently appeared in the daily press, as the decision of this railway to use electricity on a portion of its system has elicited a great deal of interest. As already stated, the section of the line to be electrified is between Battersea Park and Peckham Rye, from which two points an extension will later on be made to Victoria Station on the one hand, and London Bridge Station on the other hand, which will complete the loop from station to station.

Mr. Samuel White, the managing director of the Bristol Tramways Company, is naturally interested in the success of the Bristol Royal Infirmary, the more so as his brother, Sir George White, is the president of it. He has just devised an ingenious plan for assisting the Infirmary by placing in all of the Bristol tramcars a box in which contributions can be made for the purpose of wiping out the deficit of that institution. Mr. White reckons that if only a shilling a day is put into each of the boxes, the large sum of £5,000 or £6,000 a year will be raised, a sufficient sum to put the Royal Infirmary in a very comfortable financial position.

The new electric railway operated by the North Eastern Railway Company from between Newcastle and Tynemouth has introduced rather a curious problem to railway managers. This railway company has notified the public that it will not guarantee to supply them with first-class carriages on this particular line. This is, of course, the outcome of the electrification scheme as the North Eastern Railway Company evidently finds it much more convenient to have only one class of carriage on a short line of this kind, as such a plan doubtless assists in the prompt despatch of trains from station to station. This action has given rise, however, to a great deal of discontent among those who are in the habit of traveling first-class, and especially among the holders of first-class annual passes. Meetings have already been held in Newcastle to discuss the matter; one of these meetings being recently presided over by the Duke of Northumberland. A number of resolutions were passed, and strong representations have now been made to the directors of the North Eastern Railway Company on the subject, the special object being to have the words which are now inserted in the first-class contract tickets for 1905 deleted, the words being "This ticket is available in first-class carriages only, if, and when such carriages are provided on the trains." It will be interesting to note the result.

It was recently announced in these columns that the Belfast Corporation Tramways were to be immediately electrified. Messrs. J. G. White & Company having received the contract for the complete scheme of electrification. It will be remembered that the Belfast Tramway system has, up to the present moment, been owned by the Belfast Street Tramways Company, but last year the Belfast Corporation decided to take over the tramways itself and electrify them. The handing over of the tramways to the Corporation was made the occasion of an interesting ceremony, when Mr. J. Barber Glenn, secretary of the company, gave a luncheon to the Lord Mayor and members of the tramways committee. At this luncheon Mr. Glenn handed Sir Samuel Black, Town Clerk, of Belfast, the document authorizing the transfer of the undertaking from the Tramways Company to the Belfast Corporation, and speeches by the Lord Mayor, Sir Samuel Black, Mr. Glenn, Sir Daniel Dixon and others followed congratulating the Corporation on having secured the tramways system, and on the speedy decision to immediately electrify it. It is interesting also to note that Mr. Glenn drove the last car on the Saturday night on which the company's control terminated, as he had driven the first car in 1872.

An interesting feature in the transportation problem of London is the largely increased numbers of petrol omnibuses which are now to be seen in the streets running on various routes from Charing-Cross to the southern districts, and from Oxford Circus out into the northwestern districts. It is too soon yet to be able to give any statistics as to their commercial success, but it would appear from the gradual appreciation of the shares of the two most important omnibus companies of London, that these companies are increasing their traffic receipts to a considerable extent, and these increases are popularly ascribed to the success of the motor omnibuses. These omnibuses are able to carry about twice the number of passengers that the horse omnibuses can convey, and perform their journey in a very much shorter time, so that now that their novelty has worn off they are being well patronized by the public, and are forming a more serious competition to the electric tramways in the south of London. At the same time, the London County Council claims that it is getting its electric service continually into better condition, and expects to show a substantial profit for the year. It will be of great interest to see the next annual statement, as it will be remembered that during the previous year the tramways did not show a very good balance sheet, largely owing, perhaps, to the amount of construction work that was going on at the same time.

It will be remembered that reference has been made to the experiment which the Huddersfield Town Council is making with reference to the carrying of coal on its tramway system. At a recent meeting of the Council it was voted that an agreement be entered into with Messrs. J. H. Sykes & Company, woolen cloth manufacturers, Gosport Mills, Outlane, to convey coal to their mill from the Hillhouse railway sidings at 1s. 9d. per ton.

The members of the Bournemouth Town Council have reason to congratulate themselves in the termination of the arbitration between themselves, representing the tramways, and the Poole & District Electric Traction Company, extending over a period of two years. It is now decided that the Bournemouth Corporation is to pay the company £112,000 plus two agreed sums of £5,500 and £350, respectively, although the company originally claimed a sum from three to four times that amount. The Bournemouth Corporation is now going to commence immediately the construction of considerable tramway track.

Among the private bills recently deposited for the next session of Parliament, there is an important scheme for the supply of electric power in London, more especially in the manufacturing districts which lie along the river, the title being the Administrative County of London and District Electric Power Company. The proposed company has a capital of £5,000,000, and among the promoters mentioned in the bill are Lord Armstrong, Mr. Douglas Vickers (of Vickers & Maxim), Sir James Joicey, M. P., Sir G. T. Taubman-Goldie, Sir Andrew Noble, Mr. A. F. Yarrow, Mr. Eric Hambs, M. P., Mr. Leonard Cunliffe, and Mr. G. F. McCorquodale. The bill authorizes the erection of three central generating stations for the purpose of supplying electric power to large consumers, such as the present local authorities and companies engaged in electric lighting, as well as to railway companies, docks, and large works. The bill, however, does not authorize the company to deal with electric lighting, and that this is not intended is also shown by the fact that the maximum price which can be charged is fixed at 1½d. per unit.

The electric lighting and traction scheme of Kilmarnock Corporation has now been completed. The electrical station and car houses have been erected on the north bank of the river Irvine, at Riccarton. The engineering portion of the work was in the hands of Messrs Kennedy & Jenkin, London, and the station has been equipped with the most up-to-date machinery and plant. The engine room contains four 20-hp Bellis & Morcom engines, coupled to dynamos supplied by Messrs. Dick, Kerr & Co. The jet condensing plant was provided by Messrs. Mirrlees, Watson & Company, Glasgow, and the switch-board was built by Messrs. Cox-Walkers, Darlington. The tramway route consists of half a mile doube line, and 3¾ miles single line. There are two main routes; one from Beansburn to Riccarton, and the other from the railway station to Hurlford. Passing places are arranged about every third of a mile, and where there is only a single line it has been laid as far as possible to one side so as to allow of doubling later on, if required. The opening ceremony of the tramways was performed by Lord Howard de Walden, Lord of the Manor, and created a great amount of public interest.

Recently a special train consisting of forty-two wagons left Dick, Kerr & Company's Preston Works, carrying 250 tons of electrical machinery being shipped in connection with that company's contract for the complete equipment of the Tokyo Densha, Tetsudo Kabushiki Company's tramways. This tramway system when finished will cover over 60 miles of line, and operate some 250 cars. The complete installation is being carried out by Dick, Kerr & Company, under the supervision of a staff of their engineers, and it is surprising to learn that the only effect the war has had on the progress of the work is in connection with the transportation of the machinery from Yokohama to Tokyo, the railway being congested with war material. A. C. S.

Emergency transfer tickets, good for five cents, are being issued to passengers on the Kings County Elevated road in Brooklyn, in case of blocks. The tickets are good on any of the Brooklyn Rapid Transit lines, and if both elevated and surface lines are blocked at the same time the tickets may be redeemed.

PARIS LETTER.

(From Our Regular Correspondent.)

The year 1904 was not at all unfavorable to the majority of French tramways. The principal companies in Paris, Nice, Bordeaux, Algiers, etc., show considerable and even large increases, ranging from $60,000 to $80,000 in the case of the larger concerns. The surface contact companies are not, however, making a good showing, and continue their policy of obtaining concessions for trolley lines wherever possible and replacing surface contacts.

The good fortune of the tramways has not been shared by the Paris General Omnibus Company, whose receipts amount to only Frs. 44,712,936 for the year, a decrease of over a million francs as compared with 1903. The receipts of this company have been going down steadily for several years, and a reorganization of the lines is essential before any improvement can be expected. The Technical Commission, which has been considering the omnibus situation and tramway affairs in Paris, is still busy reporting on the latest propositions made by the government. The former proposals which the commission put forward were returned and have been considerably revised. It is stated in some quarters that the Omnibus Company will benefit by a supplementary concession of thirty years, which will terminate in 1940 instead of 1910, as now. In return for this, the company will probably be asked to reduce fares and establish a system of shorter routes. It has also been stated that the Est Parisian Tramway Company, now operating a very large system in the east of Paris and environs, will have its sphere of influence reduced.

The General Council of the Seine-et-Oise Department has just approved an important electric railway project having a total length of about 150 miles and to cost $3,000,000. The scheme will have to be approved by the government before contracts are made.

About the middle of December a convention was signed between the French and Spanish Governments regarding the establishment of light railway lines across the Pyrenees between the two countries. This has already been noticed in these columns in previous letters. There are three schemes, and electricity is expected to be the motive power. The original projects were made on the basis of steam traction, but with the substitution of electric traction, the cost was reduced considerably in the estimates submitted, owing to the possibility of using heavier grades and smaller radius curves. Ten years are allowed for the work to be completed, and owing to the natural difficulties of the enterprises the time is not excessive.

The new double-truck cars used by the Metropolitan Railway on its new line 3, and described in the STREET RAILWAY JOURNAL for Dec. 31, have given good satisfaction, and the company is considering the question of transforming its existing single-truck cars, which are naturally harder on curves. The receipts of the Metropolitan Railway for 1904 reflect the opening, in October last, of line 3, but in any event they are good as compared with the preceding year. The total number of passengers carried was 117,550,521 (1903, 100,107,619), with total receipts of Frs. 20,348,954 (1903, Frs. 17,296,839). During the last ten days of the year the company carried a daily average of about 500,000 passengers on the 20 miles of lines now open to public service.

In Italy the government is seriously considering the various propositions of "repurchase" of its railways, and the question is arousing quite a deal of interest in traction circles there.

In Spain, the steam lines between Sarria and Barcelona are now being replaced by electric lines, the trolley being used. A new tramway line has been commenced at Barcelona, just now the center of several promising traction and power transmission schemes. Among other important lines about to be commenced are the Baeza-Ubeda, and another, already authorized, between Saragossa and Aragon.

M. V.

LORAIN RAILS, ETC., FOR YOKOHAMA

The Yokohama Electric Railway Company has indirectly placed the contract for the rails, crossings, etc., for the construction of its Yokohama-Kanagawa section—about 5 miles long—with the Lorain Steel Company's branch of the United States Steel Corporation.

This will be the first contract of its description which the Lorain people have secured from Japan. The rails—70-lb. girder—will be rolled at Johnstown, Pa., while the Lorain, Ohio, mills will turn out the crossings, etc. Shipment will be made in February and March, overland to the Pacific Coast.

The contract was secured through the British electric engineering and contracting firm of L. J. Healing & Company, of Yokohama, who are represented on this side by Francis A. Cundill, of 96 Wall Street, New York City.

B. R. T. ANNUAL MEETING

At the annual meeting of the stockholders of the Brooklyn Rapid Transit Company on Friday, Jan. 27,, the four directors whose terms had expired were re-elected for three years. They are Edwin W. Winter, Norman B. Ream, Henry Seibert and Timothy S. Williams. Of the 450,000 shares of the company, 264,235 were voted. The election of Mr. Winter as a director means that he will be continued as president of the company at the meeting of the directors, which will be held this week.

The directorate of the Brooklyn Rapid Transit Company, in addition to the four members re-elected, consists of A. N. Brady, A. R. Flower, H. C. DuVal, W. G. Oakman, E. N. Harriman, H. H. Porter, J. G. Jenkins, R. Somers Hayes and D. H. Valentine. The annual meeting of the stockholders of the American Railway Traffic Company was held at the same time as that of the Brooklyn Rapid Transit Company. The American Company has the contract for removing the ashes and rubbish from the city dumps and operates ash cars over the system. The old board of this company was re-elected as follows: E. W. Winter, T. S. Williams, J. F. Calderwood, J. L. Wells and C. D. Meneely.

THE STORM

Last Wednesday's storm was the worst with which electric railway managers have ever had to contend, and for transportation in general was the severest since the blizzard of 1888, with which it seems all comparisons must, of necessity, be made. The storm had its beginning on Tuesday, and before the snow had ceased to fall, at midnight, on Wednesday, it had spent its power over all that territory extending westward from the coast to the Mississippi, and as far south as Tennessee. The amount of snow that fell was not so very large, but the low temperature and particularly the high wind contributed to making it almost impossible for transportation of any kind to be continued.

Early on Wednesday morning reports came from all over the territory affected that trains were delayed, and that trolley lines were, with difficulty, keeping their lines in operation. By 12 m. on Wednesday conditions assumed a serious aspect, especially for those working any considerable distance from their places of business. In New York surface lines had already begun to be abandoned, and the reports from the suburban lines, both steam and electric, indicated that hours would be consumed in making the trip that usually takes only a short time.

Things continued to get worse as the day wore on, and in the evening the problem of how best to get home was the one of greatest concern. Many of those living in the suburbs and who commute on the steam lines, arranged to stay in the city.

In New York the entire system of the New York City Railway Company, operating all the surface lines in Manhattan Borough, was practically at a standstill, for the fine dry snow had drifted into the conduit and so lodged there as to defy all efforts to continue lines in operation. Even on Broadway cars were kept in operation only with the greatest difficulty. The elevated and the subway cared for the overflow of traffic from the surface lines. On the elevated it was a question of combating the storm and caring for additional traffic, while on the subway the problem was one of transporting the additional traffic that sought the shelter of the tube. The appreciation by the public of the service given by the Interborough Company, operating the subway and the elevated lines, has taken that form which public appreciation always takes—acknowledgment through the press.

In Brooklyn the Brooklyn Rapid Transit made a record that has received fitting public acknowledgment. All the "L" lines were kept in operation, and while service had to be abandoned on several of the surface lines, the discontinuance of traffic was announced publicly. The trunk lines were all kept running, and the lines that had to be abandoned were in regular operation again on Thursday. General Manager Calderwood, of the company, did a public service that long will be remembered. He communicated with all the large employers of labor in the city, and requested them to dismiss their help early, because of the uncertainty of the transportation, and so as to lessen the strain on the system that reaches its peak between the hours of five and six o'clock. His request met with a ready response.

In Jersey City and Newark, the service was all that could be expected, considering the territory covered and the possibilities that an open country offers for the piling up of drifts.

The story as regards the rest of the territory affected by the storm is mainly a reiteration of what has been said about the service in the metropolitan district. Abandoned cars on the suburban lines were not infrequent, and where service in cities was not abandoned entirely, the reason, in most cases, is to be found in peculiar local conditions.

ANNUAL MEETING OF THE SOUTH SIDE ELEVATED, CHICAGO

The annual meeting of the stockholders of the South Side Elevated Railroad was held in Chicago, Jan. 26. President Leslie Carter's report showed the following figures on earnings and expenses during the last three years:

EARNINGS

	1904	1903	1902
Passenger	$1,523,421	$1,629,360	$1,433,828
Other earnings	49,898	49,477	48,477
Miscellaneous	1,509	473	1,538
Total	$1,574,829	$1,679,310	$1,483,843

EXPENSES

	1904	1903	1902
Maintenance of way	$64,946	$64,325	$57,443
Maintenance equipment	129,035	132,847	107,145
Conducting transportation	415,478	422,857	364,736
General expenses	153,410	158,160	149,957
Loop rental	207,104	216,183	183,057
Total	$969,975	$994,375	$862,338
Net earnings	$604,853	$684,934	$621,505
Bond interest	33,750	33,750	33,750
Dividends	409,149	409,133	409,124
Surplus for year	$161,954	$242,051	$178,631

The balance sheet as of Dec. 31 compares as follows:

ASSETS

	1904	1903
Cost of property	$12,312,338	$12,350,880
Cost of property, construction and extension	1,313,942	.....
Capital stock in treasury	92,400	92,400
Material and supplies on hand	45,084	41,416
Due from individuals and companies	7,978	5,655
Due from agents	5,182	5,627
Current assets	14,500	49,446
Cash on hand	176,085	7,720
Cash on hand, construction and extension	817,578	.....
Total	$14,785,091	$12,553,146

LIABILITIES

Capital stock	$10,323,800	$10,323,800
Funded debt	3,110,000	750,000
Current liabilities	161,377	386,387
Depreciation	50,000	65,000
Reserve	1,139,914	1,027,959
Total	$14,785,091	$12,553,146

The road carried 30,468,424 passengers, or a daily average of 83,247, during the year, as compared with an average of 89,280 in 1903 and 78,566 in 1902. The proportion of expenses to earnings was 61.6 per cent, compared with 59.2 per cent in 1903 and 58.1 per cent in 1902.

President Carter in his report explained the relative decrease in business for the present year.

"In the business of this company," said he, "1903 was a year filled with special occurrences, which brought increased patronage, and consequently large gains in earnings. The year 1904 was in complete contrast, since it was destitute of these special events. In 1903 there were Washington Park races, public parades and celebrations, which attracted travel. Labor troubles on competing lines, which taxed our full resources in November, continued to increase receipts all winter. The year 1904 had none of these. It is in these items that we find the decrease in earnings in comparing the two years. Of course, much of this was expected, as it was apparent that some of the causes for increase in 1903 would not be repeated. It is stated now that it may be made clear to those interested who have not closely followed these events. The regular business continued, notwithstanding the comparative dullness of trade, and this may be shown by comparing the daily average travel of 1902—namely, 78,566 passengers—with the daily average travel of 1904—namely, 83,247 passengers—a gain of between 5 per cent and 6 per cent. The estimates of traffic, on which the new extensions now under construction are recommended, are based on the receipts of 1902, and not on the exceptional receipts of 1903."

Concerning the sale of bonds for the new extensions and the progress of the work, President Carter said:

"Since the last annual meeting you have authorized the execution of a mortgage of $8,000,000 to build and equip the extensions provided for by the ordinance of the Common Council passed in 1903. These bonds were sold to the highest bidder at 97½, the bonds to be delivered, $3,000,000 in August, 1904, $2,500,000 May 1, 1905, and at least $1,500,000 of the remainder May 1, 1906. Your directors took immediate advantage of the temporarily depressed state of manufactures to enter into contracts for steel and cement on favorable terms. The purchase of the necessary real estate has been pushed with all promptness, and most of the right of way has been acquired. Very few condemnation suits will be necessary, and it now seems apparent that the right of way will be ready in ample time for the erection of the steel structure. The foundations for the third track and for the main or east and west line in Englewood are being put in rapidly. The erection of the steel structure will be commenced by March 1, if the weather permits, and it is hoped that the third track, from Forty-Third to Twelfth Street, and the east mile of the Englewood line—that is, to Sixty-Third Street and Harvard Avenue—will be ready for operation in time for the autumn business. The east mile of the Chicago Junction Railroad Line to Lake Avenue and Forty-First Street should be ready to open soon after those just mentioned. The maintenance of structure and equipment has been scrupulously cared for, and these important details are kept in as good condition as at any time in the past. Although the number of passengers was less than during the prior year, the frequency of trains and number of cars were maintained, with the intention of giving our patrons the best service our facilities permit. The thanks of the management are tendered to each and every one who has taken part in the work of a year which was not marred by one unfortunate or unpleasant occurrence."

Chauncey Blair retired from the board of directors and C. H. Hulburd was elected to succeed him. The old officers were re-elected as follows: Leslie Carter, president; T. J. Lefens, vice-president; H. F. Haidy, secretary and treasurer; Marcellus Hopkins, general manager.

THE STREET RAILWAYS OF NEW HAMPSHIRE

The report of the Railroad Commissioners of New Hampshire to the State for the year ending June 30, 1904, says:

"The returns of the electric railway corporations do not disclose the hoped-for improvement in their balance sheets. The reduction of the cost of coal to normal prices, and some economies in operation, which managers have been able to bring about, have, to a small extent, lessened the expenses of some roads; but the fact remains that, excepting the Concord, which has but nominal fixed charges; the Manchester, which serves about 70,000 people, and the Chester & Derry, which is practically owned by a few men who operate it, charging little or nothing for their services, no street railway in New Hampshire earned operating expenses and fixed charges.

"Corporations that operate 18 electric railways made returns to the board as of June 30.

"The Springfield is a New Hampshire terminal of a Vermont road. The Portsmouth, Dover & York is a Maine road, with less than three miles of track in this State. The Claremont is operated in connection with light and power plants, in whose accounting its balance sheet is merged. The Nashua is leased to the Boston & Northern of Massachusetts, operated as a part of that system, and its returns are necessarily estimates which disclose its volume of business and little more. Of the other fourteen, three, as stated above, earned a divisible income, five did not make money enough to pay operating expenses, and six failed to pay for operation and fixed charges.

"The aggregate deficits of these eleven roads for the year was $95,028.17, and the sum of the divisible incomes of the other three was $50,149.10, leaving an excess of deficits of $44,879.07.

"The Manchester street railway stands out conspicuously as the only one in New Hampshire that earns and pays regular dividends, which is mainly due to the fact that there are within reach of its lines about 70,000 people, who contribute an average of $4 per capita to its receipts.

"The condition of electric roads amalgamated under the name of the New Hampshire Traction Company is cited at length, showing a total deficit for two years of $722,490.23. Concerning this corporation the report states 'to arrest this rapid descent into bankruptcy a drastic plan of reorganization has been resorted to. This plan if consummated will wipe out the old stock and floating debts, convert the bonds into stock, and leave the company without interest charge, and, with this relief and the expected increase in business it is hoped it can proceed and work out its solvency."

Commenting in general on the failure of many electric roads to prosper, the commissioners say "our State lacks the populous centers which are the guarantee of the income of an electric road.

"The average community can be relied upon to pay from $3 to $4 per capita for street railway service, and when this will not support a road dependent upon local patronage it cannot prosper."

ST. CATHARINES, NIAGARA & TORONTO ELECTRIC RAILWAY SOLD

MacKenzie & Mann, who own the Canadian Northern Railway, have bought the St. Catharines, Niagara & Toronto Electric Railway. This gives the Canadian Northern a line from Toronto to Niagara Falls. The St. Catharines, Niagara & Toronto Railway formerly was a steam road, called the Niagara Central. As originally constructed, it extended from Niagara Falls to St. Catharines. As it was not very successful it was turned over to another company, which changed the motive power to electricity. A branch line was built to Port Dalhousie, on Lake Ontario, and two large steamers were put on to connect with Toronto. This provided connections with the Niagara Falls Park & River Railway, the Gorge Route, and the Buffalo & Niagara Falls Electric Railway, operating between Buffalo and Niagara Falls. Later the company took over the St. Catharines Street Railway. As the Hamilton, Grimsby & Beamsville Electric Railway, operating east from Hamilton, terminates within 6 miles of the line from St. Catharines to Port Dalhousie, it is the expressed intention to complete this link, thus giving complete connection by electric railway from Hamilton to Buffalo and all points reached by the Buffalo radial lines.

BRILL TEAK CARS FOR MANILA

The Manila Electric Railroad, Light & Power Company—the American capitalized concern—which is building some 45 miles of electric traction system in and around the capital of the Philippines, has placed an order with the J. G. Brill Company, of Philadelphia, for fifteen cars, to be built of teakwood and steel, so as to withstand the ravages of the white ant, which destructive insect is very much in evidence in the Philippine Islands, and, in fact, in all tropical countries.

These cars will be the first of their description to be shipped from the United States. A Belgian concern—La Metallurgique, of Brussels, as noted in the STREET RAILWAY JOURNAL at the time—secured the former car contracts let by the Manila Company. The Brill cars will be of convertible type, and are to measure 35 ft. over all. They will be equipped with Westinghouse 40-hp motors. Shipment will be made inside of three months.

ANNUAL MEETING OF NEW ENGLAND STREET RAILWAY CLUB

The annual meeting and banquet of the New England Street Railway Club was held Jan. 26, as announced, at the Brunswick Hotel. The meeting was held in the afternoon and resulted in the election of the following officers:

President—Edward E. Potter, general superintendent, Union Street Railway, New Bedford.

Vice-Presidents—Massachusetts, Paul Winsor, assistant to vice-president, Boston Elevated Railway, Boston; Connecticut, Norman McD. Crawford, manager, Hartford Street Railway, Hartford; New Hampshire, L. N. Wheelock, manager, Claremont Street Railway, Claremont, N. H.; Vermont, A. J. Crosby, superintendent, Springfield Street Railway, Springfield, Vt.; Rhode Island, J. E. Thielsen, superintendent, Providence & Danielson Street Railway, Providence, R. I.; Maine, George E. Macomber, manager, Augusta, Winthrop & Gardiner Railway, Augusta, Maine.

Secretary—John J. Lane, Boston.

Treasurer—N. L. Wood, with C. N. Wood Electric Company, Boston.

Executive Committee—J. H. Neal, chief of department of accounts, Boston Elevated Railway, Boston; H. E. Farrington, superintendent of car repairs, Boston & Northern Street Railway, Chelsea; W. D. Wright, superintendent of equipment, the Rhode Island Company, Providence, R. I.; E. A. Sturgis, superintendent motive power and machinery, Worcester Consolidated Street Railway, Worcester; C. E. Sprague, with General Electric Company, Boston; John C. Bradley, Bradley Car Manufacturing Company, Worcester; F. A. Barbey, street railway supplies, Boston.

Finance Committee—President Potter, James F. Wattles, with Rand Avery Supply Company, Boston; M. C. Brush, general manager, Newton Street Railway, Newton.

Vice-President Winsor presided at the banquet in the evening and Dan Prendergast acted as toastmaster. The speakers included George W. Bishop, of the Massachusetts Railroad Commission; Prof. George F. Swain, of the Boston Transit Commission; Howard F. Grant, of Seattle; Fuller C. Smith, of the Vermont Railroad Commission; Hon. E. P. Shaw; B. F. Chadbourne, of the Maine Railroad Commission, and A. C. Whittemore, of the New Hampshire Railroad Commission.

EXCELLENT SHOWING OF A TEXAS ROAD

The Northern Texas Traction Company, operating in Fort Worth and Dallas, Tex., through the ownership of local systems in those cities, and an interurban electric railway between the cities, has just reported earnings for December, 1904, and for the year ending Dec. 31, 1904, that show not only a remarkable increase over figures for the same periods in 1903, but a growth that ranks the company high as regards successful management. The system comprises a total of 60 miles of track, the gross earnings of which, according to the report for the last year, were at the rate of $9,000 per mile. The increase in gross earnings for the year was $99,316, while the increase in net was $34,472. For December, the increase in gross earnings was $13,095, while the increase in net was $13,578. Operating only about three years, and already on a 3 per cent. dividend basis, the company last year earned more than 5 per cent. Following is the statement for December and for the year:

December—	1904	1903
Gross receipts	$55,165	$42,170
Operating expenses	30,583	31,252
Net earnings	$24,581	$10,917
Fixed charges	9,570	9,484
Surplus	$15,011	1,433
Year ended Dec. 31.		
Gross receipts	$564,710	$465,394
Operating expenses	316,529	261,357
Net earnings	$248,181	$204,037
Fixed charges	121,043	111,370
Surplus	$127,138	$92,667

SEOUL SYSTEM TO BE EXTENDED

The electric traction system in Seoul, the capital of Korea, is to be extended. The equipment, etc., will be purchased in the United States. Seven more miles of road—single track—will be built.

The power house, which at present is equipped with two 120-kw Westinghouse generators, will be further equipped with machines of 500-kw capacity, in two units, and the existing rolling stock, consisting of twelve cars, each having 25-hp Westinghouse motors, will be supplemented with fifteen 28-ft. cars for passenger use, and five freight cars.

The system was built by the Seoul Electric Company, which was recently reorganized under the laws of the State of Connecticut, with a fully paid-up capital of $1,000,000. The name of the concern is now the American-Korean Electric Company. The American contracting firm of Collbran & Bostwick, of Seoul, control one-half of the stock, while the Emperor of Korea owns the balance.

THE APPLEYARD SITUATION

Another of the Appleyard properties in Ohio has been placed in the hands of a receiver. On the application of certain creditors, the Columbus, Grove City & Southwestern Railway was placed in the hands of J. G. Schmidlapp and Myron Wilson, who are receivers for the other properties.

Experts representing the Attorney-General of New York, committees representing the stockholders of the various roads, and experts representing the receivers are all at work endeavoring to untangle the details of the numerous transactions in which A. E. Appleyard was involved. The statement is made in the Dayton Daily "News" that the Ohio directors of the various properties did not authorize the raising of loans from the German Bank, of Buffalo, on the credit of the various lines.

John G. Webb, of Springfield, who was formerly identified with the Appleyard properties, in an interview gives Mr. Appleyard's side of the collapse of the Buffalo Bank. He says that Appleyard purchased the bank stock at $700 a share, and that in a few months he awoke to find that he had lost in the deal $386,000. Mr. Webb asserts that Appleyard has done nothing criminal, and that he has been sinned against. He says that the Dayton, Springfield & Urbana, and the Columbus, London & Springfield bonds, which Mr. Appleyard used as collateral with the German bank, are gilt-edge securities, as the roads were bonded for much less than they cost to build.

A special despatch from Buffalo, dated Tuesday, Jan. 31, says that Mr. Appleyard has been indicted by the Supreme Court Grand Jury for having obtained from the German Bank $50,000 on bonds now said to be worthless.

EXHIBITION AT THE INTERNATIONAL RAILWAY CONGRESS

Arrangements for conducting an exhibit of railway appliances in Washington, D. C., from May 3-14, in connection with the International Railway Congress, have been completed. The exhibit will be held on Monument Grounds, which is part of the Government reservation, but which has been placed at the disposal of the general committee of arrangements by special act of Congress. The committee is proposing to erect a large building for the housing of the smaller and lighter exhibits, in which a charge of 50 cents per square foot will be made. Those exhibits which require power or large space or are excessive in weight will necessarily be housed outside the main building in booths which will be erected by exhibitors, and for the ground so occupied a charge of 10 cents a square foot will be made. The membership fee in the exhibition association required of all companies or individuals making exhibits is $50. Exhibitors proposing to erect their own booths, pavilions or exhibit structures will have access to the ground on and after March 20, 1905. The exhibition building to be erected by the committee is expected to be ready for the installation of exhibits therein by April 15, 1905. All communications in regard to exhibits should be sent to J. Alexander Brown, secretary and director of exhibits, 160 Broadway, New York.

A. L. IDE REPRESENTED IN THE EAST

A. L. Ide & Sons, of Springfield, Ill., have recently given a more important representation to their interests on the Atlantic coast by establishing a large office at the Bowling Green Building, New York City, in charge of J. G. Robertson, who for many years has had successful charge of their Western business from the St. Paul headquarters. Associated with him are S. J. Fuller and G. B. Ferrier. In order that Mr. Robertson and the staff might meet socially the men with whom much of his Eastern business will be transacted, H. L. Ide gave a dinner on Tuesday evening, Jan. 24, at the Hotel Astor, at which some thirty were present. The party included H. L. Ide, J. G. Robertson, S. J. Fuller, G. B. Ferrier, T. Beran, Calvin W. Rice, F. C. Bates, F. H. Larkin, J. M. Wakeman, F. R. Lowe, T. C. Martin, J. D. Andrews, Jr., T. B. Arnold, E. W. T. Gray, W. L. Conwell, F. B. Slocum, C. G. Wingate, A. S. Vance, E. W. Goldschmidt, W. Bigelow, F. B. De Gress, W. S. Rugg, D. H. McDougall, H. W. Rowley, W. L. Fairchild. Brief and felicitous speeches were made by Messrs. Ide and Robertson, the toastmaster being Mr. Martin. The party then were entertained by Mr. Arnold, a celebrated amateur in card tricks.

THE WASHINGTON, BALTIMORE & ANNAPOLIS PROPOSITION

George T. Bishop, of the Bishop-Sherwin syndicate, which has taken up the Washington, Baltimore & Annapolis proposition, announces that subscriptions to the underwriting are coming in at a rate that indicates over-subscription. The construction of the road will be in charge of Mr. Bishop, who has had long experience in such work, and the engineering will be in the hands of the Roberts & Abbott Company, of Cleveland. It is the intention to put the work through as rapidly as possible, and it is expected that the road will be in operation within eighteen months. The main line from Baltimore to Washington will be double-track overhead trolley construction. The present Washington, Berwin & Laurel line will be improved and extended to connect with the Annapolis, Washington & Baltimore, at present a steam road, which is to be equipped with electricity. This will be done this year, giving the company a line from Washington to Annapolis, independent of the main line.

INSTITUTE ANNUAL DINNER

A great deal of interest is being manifested in the annual dinner of the American Institute of Electrical Engineers, to be given at Waldorf-Astoria, in the grand ball room, on Wednesday, Feb. 8, and devoted especially to signalizing the triumphs of electric traction. There will be a number of interesting speakers, and an original menu has been prepared appropriate to the occasion. Two novel features will also be introduced, namely, a mutoscope exhibition of steam and electric railway work and the taking of a picture of the ball room and company by means of special Cooper Hewitt illumination. A great many applications have already been made for tickets, and in order to prevent disappointment it is earnestly requested by the dinner committee that members will send in their requests at once so that there may be no disappointment as to seating.

REMOVAL OF DUST FROM CARS BY MACHINERY

The Central Railroad of New Jersey has recently introduced at its Jersey City yards a vacuum plant for car cleaning. The car-storage tracks for a distance of some 3600 ft. have been equipped with air pipe, from 2 ins. to 5 ins. in diameter, and comprising a total length of about 19,000 ft. At short intervals this pipe is tapped, and from these cocks is run the flexible hose, which may be taken in the car either by door or window. At the foot of the hose is a metal pipe with the usual flat triangular head, through which the dust and dirt is drawn by the vacuum or exhaust fan located a distance away. The operator runs the head over the cushions, carpets, curtains, wood-work, etc., removing all dust. The dust, thus removed, passes first through two dust separators, the first of which clears the air of the heavy particles. The second separator draws the air through water in which corrosive sublimate is used, and completes perfectly the purification.

BROOKLYN COMPANY RECOGNIZES BLIZZARD SERVICES OF MEN

Recognition by the Brooklyn Rapid Transit Company of the efficient service of its employees during last week's storm has taken the substantial form of a contribution from the company to the amount of $250 to the Employees' Benefit Association. Accompanying the contribution was the following short but appreciative note from Vice-President and General Manager Calderwood, of the company, to George W. Edwards, the secretary of the association:

Jan. 28, 1905.

Mr. G. W. Edwards, Secretary, Brooklyn Rapid Transit Employees' Benefit Association, No. 1 Jamaica Avenue, Brooklyn:

My dear Mr. Edwards.—As a slight recognition of the splendid manner in which our employees, especially the trainmen, rose to the occasion during and after the recent blizzard, and by their prompt, efficient and thorough efforts cleared the lines for traffic, we desire, on behalf of this company and its officers, to make a contribution to the Brooklyn Rapid Transit Employees' Benefit Association, and have handed your treasurer a check for $250, receipt for which is enclosed.

Considering the duration and severity of the storm, and the extent of territory involved, the quick lifting of the blockade, permitting the speedy resumption of traffic, was not only a commendable achievement, but a great accommodation to the traveling public. Yours very truly, (Signed) J. F. Calderwood,

Vice-President and General Manager.

NEW PUBLICATIONS

Cyclopædia of Applied Electricity. Published in five volumes containing about 2500 pages, over 3000 illustrations. Bound in three-quarters red leather. List price $30.00; special introductory price $18.00. Published by the American School of Correspondence, at the Armour Institute of Technology, Chicago.

This work is the most comprehensive work on electricity and its practical applications that has yet been published and will prove invaluable to electricians, engineers, engineering students, and others who have occasion to use electricity in any form. To be able to turn quickly to any phase of electricity as used in our great industries is of immense value to both the busy practical man and the engineering student. The text has been prepared by acknowledged authorities, is fully indexed, and written with a view to the needs of the busy practical man. As these books have been designed for text books a great deal of attention has been given to practical examples, and each volume is supplemented with a list of review questions by means of which the reader can test for himself the knowledge which he has acquired of the subjects treated. The scope of the series is well represented by the titles of the several volumes, as follows: Part I., Current Measurements, Wiring, Telegraph; Part II., Dynamos, Motors, Storage Batteries; Part III., Lighting, Railways, Power Stations; Part IV., Alternating Currents, Power Transmission; Part V., Telephony, Index. The third volume is the one which takes up electric railways, and the treatise on this subject is well prepared. In addition to a description of the various appliances employed in electric railway work, and a discussion of their use, a particularly valuable chapter is given on the operation of cars and methods of testing for faults. The subject matter and engravings are well up to date, an important feature in a book of this kind.

PERSONAL MENTION

MR. C. A. MORENO has resigned as chief engineer of the United Railways Company, of St. Louis, to become connected with the Bainbrick-Bates Construction Company, in which he has become financially interested.

MR. A. L. DRUM has resigned as general manager of the Indiana Union Traction Company to become general manager of the Chicago & Milwaukee Electric Railway Company. Mr. Drum will assume the duties of his new position on March 1.

MR. S. S. NEFF has resigned as general superintendent of the Mexico Electric Tramways, Ltd., of Mexico City, Mexico, owing to ill health. The division superintendents are reporting to General Manager W. W. Wheatly, of the company.

MR. RICHARD McCULLOCH, assistant general manager of the United Railways Company, of St. Louis, presented a paper before the Washington University Association, of St. Louis, on Jan. 31, entitled "The Evolution of the Street Railway."

MR. W. B. GRAY, formerly secretary of the Demerara Electric Company, Ltd., of Demerara, British Guiana, has been appointed manager of the company in place of Mr. H. P. Bruce, who has resigned to accept the position of manager of the Cuban Electric Railway Company.

DR. M. W. HISSEY, president of the Southeastern Ohio Railway, Light & Power Company, of Zanesville, Ohio, is laid up with two broken arms. Four weeks ago he fell on the ice, breaking his left arm, and a few days ago he had another fall, which fractured his right arm in two places.

MR. W. B. WATSON, who has been connected with the Virginia Passenger & Power Company, of Richmond, in the auditing department of the company and as cashier for ten years, has resigned from the company to become superintendent of the Norfolk Railway & Light Company, of Norfolk, Va.

MR. T. W. SHELTON, formerly electrical engineer for the Northern Ohio Traction & Light Company, has been appointed general superintendent of the Fort Wayne & Springfield Traction Company. The line from Fort Wayne to Decatur is soon to be placed in operation. It will be one of the first lines in the country to use the single-phase system.

MR. R. J. FLEMING, general manager of the Toronto Railway Company, of Toronto, Ont., is on a visit to some of the cities in the United States in connection with street railway matters. Mr. Fleming, who assumed the position of general manager of the company on Jan. 1, succeeding Mr. E. H. Keating, resigned, was assessment commissioner of Toronto, and for four years was Mayor of the city.

MR. F. C. JOHNSTONE, a young electrical engineer connected with the installation of the tramway system in Manila, P. I., is dead. Mr. Johnstone was a resident of Franklin, Pa. He went to Manila in the employ of J. G. White & Company, of New York, and while there became ill. Returning to the United States, he took up residence in California, thinking to recuperate there. His condition soon became worse, and he finally succumbed to consumption.

MR. CHARLES H. BAKER, who founded the Snoqualmie Falls Power Company, of Seattle and Tacoma, and who since its beginning six years ago has been the active president and chief engineer thereof, and who also, as manager and chief engineer, promoted and planned the White River Power Company, has sold a controlling interest in both companies to a party of capitalists, who have elected Mr. N. H. Latimer, manager of the Dexter Horton Bank, of Seattle, as president. Mr. Baker is planning an early trip to Japan and China for pleasure and business. While in the Orient, he proposes to explore the water power and electrical possibilities of Japan and China, with a view to the development by American capital.

MR. H. P. BRUCE, formerly general manager of the Demerara Electric Company, Ltd., of Demerara, British Guiana, has accepted the position of general manager of the Cuban Electric Railway Company, of Havana. This company operates what is known as the Regla system, and is distinct from the Havana Electric Railway. For some time past the management of the Cuban Electric Railway Company has been in the hands of Mr. George F. Greenwood, general manager of the Havana Electric Railway Company. Mr. Greenwood has found, however, that his duties as manager of the Havana property have been such as to require all of his time, so that a separate manager for the Cuban Electric Railway Company has been necessary.

MR. ELLIS M. BROWN has resigned as electrical engineer of the Philadelphia & Reading Railway Company and the Atlantic City Railroad Company to become general manager of the Brown Engineering Company, of Reading, Pa., consulting and contracting engineers. Mr. Brown was connected with the Reading Company and its allied interests for five years. During that time he was made responsible for some of the most important work carried out by the company. Among other things, he designed and installed the power station and the electrical equipment of the Reading Company's locomotive repair shops at Reading, Pa., and supervised the reconstruction of the Cape May, Delaware Bay & Sewall's Point Electric Railway. To his credit are several features of the electric railway installation that make materially for the success of the road. A graduate of the Worcester Polytechnic Institute, Mr. Brown pursued a post-graduate course at the institute, and has been honored with the degrees of B. S., M. S. and E. E.

MR. CALVERT TOWNLEY, who recently resigned from his duties as general agent of the Westinghouse Electric & Manufacturing Company in New York to become assistant to the president of the New Haven Railroad, was entertained at dinner at the Hotel Astor, New York, on the evening of Friday, Jan. 27, by some of his former associates. The affair was a very informal one, and the feature of the evening, after a brief complimentary speech by Mr. Charles A. Terry and a response by Mr. Townley, was the very remarkable exhibition of card magic and legerdemain given by Mr. Thomas B. Arnold, the Eastern representative of the Latrobe Steel Company, who is described as a veritable wizard in tricks of this nature. Others present were Messrs. Frank H. Taylor, William F. Zimmermann, F. B. H. Paine, E. W. T. Gray, Newcomb Carlton, T. W. Siemon, Paul T. Brady, Seth C. Adams, W. C. Webster, C. B. Humphrey, Charles F. Scott, F. N. Kollock, Jr., E. St. John, D. C. Manson, F. L. Townsend, W. C. Ward, W. E. Drake, H. P. Jones, George E. Miller, J. M. Curtin, W. L. Conwell, W. S. Rugg, O. T. Smith, C. C. Owens, P. R. Owens, Charles Robbins, H. D. Prichard, W. H. MacGregor and J. K. Robinson, of Iquique, Chili. Mr. George Westinghouse sent a telegram regretting his inability to be present.

MR. EDWARD H. MULLIN, of the General Electric Company, whose sudden death was chronicled last week, was widely known in electrical and journalistic circles, where his genial disposition, strong personality and marked literary ability made him extremely popular. Among his other duties, Mr. Mullin had charge of the relations between the General Electric Company and the technical press. In this capacity his newspaper training was of the highest value, and he succeeded in establishing a bureau in New York through which the technical and daily press could secure authentic and prompt information relating to all of the advances in the electrical art accomplished by the General Electric Company. Mr. Mullin also latterly acted as confidential representative of his company in many matters, and was its official host whenever foreign engineers or capitalists desired to visit its works or become acquainted with its methods.

E. H. MULLIN

He was born in Castlederg, Ireland, in 1859, and was graduated with the degree of B. A. in the honor course in Physics and Chemistry by Queen's University, Belfast, in 1881. He then attended Edinburgh University, where he received the degree of M. D., but never practiced medicine. From 1887 to 1895 he was on the editorial staff of the New York Evening "Sun." In 1895 he joined the staff of the New York "Times," where he had charge of all technical reporting, including the X-rays discovery, the articles on which were highly commended by Mr. T. A. Edison, Prof. Rood, of Columbia College, and others. During this and the following three years he was editor of the Bookbuyer, and a contributor to various literary and technical journals, for which he wrote signed and anonymous articles on electrical matters. His services with the General Electric Company commenced on Feb. 1, 1898. Mr. Mullin was elected an associate of the American Institute of Electrical Engineers May 16, 1899, and was elected a manager on the board of directors, May 20, 1902. He was a thirty-second degree Mason, a member of the Engineers', Press, Lotos and Transportation clubs, vice-president of the New York Electrical Society, and vice-president of the Association of American Advertisers. He was buried Jan. 28, from his home in Milburn, N. J.

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 Available for Dividends
AKRON, O.						
Northern Ohio Tr. & Light Co	1 m. Dec. '04	76,615	41,537	35,078	24,514	10,564
	1 " " '03	71,654	41,290	30,363	23,266	7,098
	12 " " '04	895,731	486,980	408,751	273,664	135,087
	12 " " '03	882,276	482,575	399,701	268,132	131,569
AURORA, ILL.						
Elgin, Aurora & Southern Tr. Co	1 m., Dec. '04	38,504	22,467	16,036	9,333	6,703
	1 " " '03	35,583	23,143	12,440	9,256	3,184
	6 " " '04	240,090	130,267	109,823	55,839	53,484
	6 " " '03	242,261	140,030	102,231	55,118	47,112
BELOIT, WIS.						
Rockford, Beloit & Janesville R. R. Co.	1 m., Dec. '04	8,755	5,230	3,526	2,649	877
	12 " " '04	127,564	74,369	53,195	32,287	20,908
BINGHAMTON, N. Y.						
Binghamton Ry. Co.	1 m., Dec. '04	20,946	10,414	10,532	------	------
	1 " " '03	19,158	9,669	9,489	------	------
	6 " " '04	137,628	69,873	67 756	41 925	25 830
	6 " " '03	128,187	64,191	63,997	38,141	25,856
BUFFALO, N. Y.						
International Tr. Co.	1 m., Dec. '04	344,987	196,580	148,407	141,849	6,558
	1 " " '03	325,464	190,073	135,392	134,365	1,027
	6 " " '04	2,252,729	1,149 284	1,103,444	833 341	270,104
	6 " " '03	2,174,765	1,164,777	1,009,988	796,444	213,543
CHICAGO, ILL.						
Aurora, Elgin & Chicago Ry. Co	1 m., Dec. '04	30,516	20,010	10,506	------	------
	6 " " '04	267,540	136.475	131,046	------	------
Chicago & Milwaukee Elec. R. R. Co	1 m., Dec. '04	39,427	17,520	21,907	------	------
	1 " " '03	24,085	10,318	13,767	------	------
	12 " " '04	464.655	179,038	285,618	------	------
	12 " " '03	292.247	98,627	193,620	------	------
CLEVELAND, O.						
Cleveland, Painesville & Eastern, R. R. Co.	1 m., Dec. '04	17,093	10 692	6,401	6,638	†237
	1 " " '03	15,621	10,172	5,449	6,568	†1.120
	12 " " '04	225,751	136,021	89,730,	80,250	9,480
	12 " " '03	214,631	127,149	87,482	78,007	9,475
Cleveland & Southwestern Traction Co	1 m., Dec. '04	37,071	22,435	14,636	------	------
	1 " " '03	33,418	21,709	11,709	------	------
	12 " " '04	445,362	293,615	181,746	------	------
	12 " " '03	445,168	264,232	180,936	------	------
Lake Shore Electric Ry. Co	1 m., Nov. '04	54,336	31,967	22,369	20,371	1,998
	1 " " '03	46,819	33,732	13,087	20,371	†7,284
	11 " " '04	605,096	400,267	204,829	224,079	†19,250
	11 " " '03	570,069	360,459	209,610	220,375	†10,764
COVINGTON, KY.						
Cincinnati, Newport & Covington St. & Tr. Co	1 m., Nov. '04	83,287	46,844	36,443	16,792	19,651
	1 " " 03	80,807	49,452	31,355	16,483	14 872
	11 " " '04	928.177	555,460	372,717	185,051	187,666
	11 " " '03	905,073	534,510	370,563	181,184	189,379
DETROIT, MICH.						
Detroit United Ry.	1 m., Dec. '04	392,757	*238,690	154,067	93,619	60,448
	1 " " '03	357,029	*227,631	129,398	87,110	42,288
	12 " " '04	4,584,582	*2763092	1,821,490	1,075,786	745,704
	12 " " '03	4,425,836	*2613976	1,811,860	1,000,000	811,860
DULUTH, MINN.						
Duluth St. Ry. Co	1 m., Dec. '04	53,711	28,119	25,592	21,097	4,495
	1 " " '03	51,467	30,718	20,749	15,834	4,915
	12 " " '04	619,172	326,049	293,123	202,602	90,521
	12 " " '03	622,044	345,327	276,717	186,590	90,127
FORT WORTH, TEX.						
Northern Texas Traction Co	1 m., Dec. '04	55,165	30,583	24,582	9,571	15,011
	1 " " '03	42 170	31,253	10,918	9 484	1,433
	12 " " '04	564,711	316,529	248,181	121,043	127,138
	12 " " '03	465,394	261,357	204,037	111,371	92,667
HANCOCK, MICH.						
Houghton County St. Ry. Co	1 m., Nov. '04	16 692	10,783	5,909	3,324	2,585
	1 " " '03	15,094	10,391	4,703	2,827	1,875
	12 " " '04	196,189	133,930	62,260	39.809	22,451
	12 " " '03	189,448	121,937	67,511	34,840	32,671
HOUSTON, TEX.						
Houston Elec. Co	1 m., Nov. '04	42,983	26,246	16,738	8,284	8,454
	1 " " '03	30,736	25,689	5,047	8,10[illegible]	†3,063
	4 " " '04	139,926	90,289	49 637	33,19[illegible]	16,442
	4 " " '03	146,472	96,491	49,981	30,03	19,947
MILWAUKEE, WIS.						
Milwaukee El. Ry. & Lt. Co	1 m., Dec. '04	353,307	136,263	217,044	82,072	134,973
	1 " " '03	337,147	133,956	193,191	75.376	117,815
	12 " " '04	3 285,378	1,592,414	1,692,964	916,460	776,505
	12 " " '03	3,096,324	1,526,910	1,569,414	871,685	697,730
Milwaukee Lt., Ht. & Tr. Co	1 m., Dec. '04	68,242	17,102	51,140	17,949	33,191
	1 " " '03	62,584	18,099	44,485	14,734	29,751
	12 " " '04	492,228	216,964	275,264	203,731	71,533
	12 " " '03	452,931	213,020	239,911	168,990	70,921
MINNEAPOLIS, MINN						
Twin City R. T. Co	1 m , Dec. '04	377,650	170,194	207,456	104,446	103,010
	1 " " '03	359,184	157,655	201,528	78,521	123 007
	12 " " '04	4,308.081	2,163,304	2,144.776	1,116,195	1,028,581
	12 " " '03	4,063,938	1,878,051	2,185,888	989,578	1,196,310
MONTREAL, QUE.						
Moatreal St. Ry. Co	1 m., Dec. '04	211,283	146,821	64,463	18,475	45,988
	1 " " '03	189,266	128,032	61,234	17.273	43 961
	3 " " '04	638,114	402,307	235,808	56,293	179,515
	3 " " '03	585,428	355,350	230,078	52,367	177,711
OAKLAND, CAL.						
San Francisco, Oakland & San Jose Ry. Co	1 m., Dec. '04	41,840	16,786	25,053	11,560	13,493
	1 " " '03	27,463	13,994	13.469	5,723	7,746
	12 " " '04	419,350	180,409	238,941	111,000	127,940
Oakland Traction Consolidated	1 m., Dec. '04	111,154	60.441	50,713	------	------
	12 " " '04	1,258,136	659.261	598,875	------	------
	12 " " '03	1,137,041	582,065	554,976	------	------
OLEAN, N. Y.						
Olean St. Ry	1 m., Dec. '04	8,437	4,013	4,424	2,663	1,761
	1 " " '03	8,250	3,879	4,371	2,452	1,919
	6 " " '04	27,537	13.463	14,074	7,926	6,148
	6 " " '03	27,150	14,090	13,060	7,356	5,703
PEEKSKILL, N. Y.						
Peekskill Lighting & R. R. Co	1 m., Dec. '04	10,482	6,166	4.316	------	----
	1 " " '03	9,474	6,144	3,237	------	------
	6 " " '04	62,688	34,201	28,487	------	------
	6 " " '03	60,658	33,477	27,181	------	------
PHILADELPHIA, PA.						
American Rys. Co	1 m., Dec. '04	119,754	------	------	------	------
	1 " " '03	109,616	------	------	------	------
	6 " " '04	776,946	------	------	------	------
	6 " " '03	752,595	------	------	------	------
ROCHESTER, N. Y.						
Rochester Ry. Co	1 m., Dec. '04	142,224	75,535	66,689	26,834	39.855
	1 " " '03	119,949	63,462	56,487	25,117	31,370
	12 " " '04	1,496,593	824,489	672.104	------	------
	12 " " '03	1,280,373	656,071	624,303	------	------
SAN FRANCISCO, CAL.						
United Railroads of San Francisco	1 m., Dec. '04	572 500	------	------	------	------
	1 " " '03	560,384	------	------	------	------
SAVANNAH, GA.						
Savannah Electric Co.	1 m., Nov. '04	45,635	26,378	19,257	10,552	8,705
	1 " " '03	44.855	22,760	22,095	10 452	11,643
	12 " " '04	540,833	307,909	232,924	126,024	106,900
	12 " " '03	516,882	307,465	209,417	118,456	90,961
SEATTLE, WASH.						
Seattle Electric Co	1 m., Nov. '04	200,607	147,972	52,636	24,974	27,662
	1 " " '03	178,024	142,211	35,813	22,873	12,940
	12 " " '04	2,306,100	1,586,267	719,833	286,500	433,334
	12 " " '03	2,084,525	1,513,597	571,028	287,913	283,115
SYRACUSE, N. Y.						
Syracuse R. T. Co	1 m., Nov. '04	70.096	40,291	29 804	20,337	9,467
	1 " " '03	68,387	38,945	29,442	20,254	9,188
	5 " " '04	361,329	202,932	158,397	101,467	56,930
	5 " " '03	350,993	196,089	154,905	101,460	53,445
TERRE HAUTE, IND.						
Terre Haute Tr. & Lt. Co	1 m., Nov. '04	49,308	29,171	20,137	9,222	10,916
	1 " " '03	41.491	27,400	14.092	8,549	5,543
	12 " " '04	562 883	370,900	191,982	114,132	77,850
	12 " " '03	464 104	305,363	158,741	84,319	74,422
TOLEDO, O.						
Toledo Rys. & Lt. Co.	1 m., Dec. '04	165,929	*77,836	88.093	41,693	46 400
	1 " " '03	154,494	*75,336	79,158	39,292	39,866
	12 " " '04	1,752,833	*923,208	829.625	499,874	329,751
	12 " " '03	1,663,794	*856,526	807,268	488,200	319,068