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Worlds' Fair Street Railway Facilities

To the street railway man no small part of the interest in any great exposition lies in the provisions made by local street railway and other transportation companies for handling the great crowds. In the last issue considerable attention was given to St. Louis Exposition matters, and this information, interesting in itself, is now completed by the outline which is presented elsewhere of the plans of the local transportation companies for carrying people to and from the Exposition. Inasmuch as many laymen have asked frequently whether the street railway companies of St. Louis will be able to take care of the great Exposition crowds, it is in order to recall some statements made in an informal talk by C. A. Moreno, chief engineer of the St. Louis Transit Company, before the Engineers' Club of St. Louis a few weeks ago, in which he truthfully said that if the Louisiana Purchase Exposition had anywhere near as many visitors as the transportation companies would be prepared to land at its gates, it would be the greatest financial success as an exposition the world has ever known.

That the street railway companies will be able to easily deliver as many people to the Exposition gates as will wish to go can hardly be doubted when the extent of the preparations made by the local companies is known. The number of terminal loops and the number of routes reaching the Exposition grounds from all parts of the city assure abundant carrying capacity for any ordinary occasion. To be sure, there will always be at an exposition certain times when the entire crowd in the grounds will move toward the street railway terminals at once in an effort to get home. Against a certain amount of congestion at such times no power on earth can guard. Such congestion is more likely to occur during the first month or two of an exposition than toward the latter part of the exposition, even though the total number of admissions per day is much greater toward the close of the season.

For example, one of the most trying times for the transportation companies at the World's Columbian Exposition, at Chicago, was on the night of July 4, after the fireworks. The abundance of transportation facilities which had never before that been taxed, led the public to believe that every one could get home at any time desired on a moment's notice, and an immense crowd remained within the grounds until after the fireworks, and then moved en masse toward the transportation lines. The greatest difficulty occurred two or more hours after the rush began, when the crowd reached the down-town district, and desired to take cars for points on the North Side and West Side. The street railway managers had hardly expected a rush-hour demand for cars at 1 a. m., but they responded as promptly as was possible under the circumstances. Even the companies which directly reached the Fair Grounds did not anticipate any such long-continued rush. The public and the Exposition management learned its lesson thus early in the game, and later much greater crowds were handled per day with less friction, partly because the public knew that everybody could not start for home at once and hope to get there within reasonable time, and partly because the Exposition management did not again arrange matters so as to produce such congestion at one time. One other day during the Chicago Exposition, "Chicago Day," taxed the Exposition lines to their utmost from one end of the day to the other, but this was practically a single exception.

The terminals at St. Louis appear to have been arranged to admit of great flexibility, which is always desirable in handling exposition crowds. It is extremely difficult to tell before an exposition opens which entrance to the grounds will prove the most popular, and ability to operate cars from a given route to any one of several terminals, such as has been provided at St. Louis, is very desirable. Then, too, there are times when one exit will receive more than its ordinary share. If additional cars can be routed by that exit it is a great aid in handling the crowds. As regards a number of details the

plans of terminals seem to have wisely been left open to alteration and to any small changes that may seem desirable in the light of the experience of the first month. It would be contrary to all precedent if the first month's attendance was large enough to demand full completion of all details of the terminals, and there is certainly wisdom in going a little slow in completing final arrangements.

"Opening Day" Traffic in St. Louis

It is seldom that the companies handling traffic on any great day of an exposition receive such commendation as did the street railway companies of St. Louis upon the opening day of the Louisiana Purchase Exposition. Grave fears had been expressed by many people unacquainted with the extent of the preparations that had been made, lest the transportation facilities should be shown to be entirely inadequate. The judgment of the public was, perhaps, formed from experiences on Dedication Day a year ago, when so little provision had been made for handling large crowds to and from the grounds. Now that the construction period is over with and the companies have practically completed their plans for handling large traffic from all directions to and from the grounds, both the companies and the Exposition management, as well as the public, are very much gratified to find how easily such crowds as those of the opening day were handled. The companies were on trial, and withstood the test successfully. There appears to be nothing but praise from the press and the public for the way in which crowds were handled that day, which means that the service must have been most excellent, for it is seldom that either press or public goes out of its way to praise good service, however quick they may be to condemn poor service. Of course, much larger crowds than on opening day will be handled before the Exposition closes, but to withstand the first test so well before the machinery of transportation has had time to get thoroughly limbered up, is something regarding which the St. Louis companies are to be congratulated.

Traffic Peaks on Elevated and Surface Lines

The outline which is published elsewhere on the plans for increase in capacity on the Metropolitan West Side Elevated Railway system in Chicago, serve to bring to mind forcibly the fact that the elevated or underground road is pre-eminently the road for rush-hour traffic. An elevated system in a large city is sure to have a much greater rush-hour traffic in proportion to the mid-day traffic than the surface street railway lines operating through the same territory. The Metropolitan Elevated, of Chicago, figures, as given, show three times as many cars in operation during the evening rush than during the day, and even greater increase in train service is made by steam railroads giving suburban service. These facts simply mean that business people take the most rapid means of transportation, even if it involves considerable walking. Many people, shut up in offices all day, do not mind this extra walk, and the saving in time in the course of a year may be considerable by taking the fastest line. Rush-hour traffic is much of it likely to be long-haul traffic. The mid-day traffic, on the other hand, has a considerable number of short-distance riders. Shoppers, who take the cars during the middle of the day, care more for saving a walk of a few blocks and climbing elevated stairs than for any gain in time, hence they take the surface lines. The same is true of those traveling but a short distance along the street railway lines.

The tremendous increase in elevated traffic during the rush hours in some respects makes the load of an elevated railway power station like that on an electric lighting station, in that a large amount of machinery must be kept idle during the greater part of the twenty-four hours in order to take care of the peak loads. This high peak load is the cause of the recent decision of the Metropolitan management to install two storage batteries to help take care of the peak load. Other elevated roads have adopted the storage battery with the object of reducing the momentary fluctuations. These fluctuations on a system as large as the Metropolitan are not, however, great as compared to the total load, and the larger the system becomes the less marked are these momentary fluctuations. The function of the storage battery, therefore, in this case is primarily that of assisting at the peak load. Being located at points some distance from the car house, the line loss during the peak, when such loss can be least afforded, is much less than if the total load was being carried from one power station.

An Important Test of the Curtis Steam Turbine

The paper by W. L. R. Emmet before the Engineers' Club of Philadelphia upon recent developments of the steam turbine, of which a digest appears elsewhere in this issue, gives a report of one of the most important tests that has yet been made upon the steam turbine. The tests were conducted with great care by experts who were disinterested in the results, and it is probable that the results were secured with the greatest possible accuracy. The figures shown for the 500-kw turbine, operating with a steam consumption of only 22.38 lbs. per kilowatt-hour during a rapidly and widely fluctuating load, averaging at half its rated capacity are remarkable. The ability of the turbine to take care of such rapidly varying loads as those met in street railway service is very gratifying, as is also the ease with which close speed regulation is obtained; during the above mentioned test the turbine's speed did not vary more than 50 r. p. m., ranging from 1800 r. p. m. to 1850 r. p. m., while the load was varying all the way from 50 kw to 300 kw. As the diagrams which accompany the article show in an interesting way how the efficiency of the turbine is affected by superheat, by speed and how it varies with the load, they will not be referred to in detail here. In this connection, however, it is of interest to note that the result of the use of superheated steam is to increase the economy of the turbine's operation in direct proportion to the amount of superheat, a rise of superheat of 50 degs. F. effecting a saving of nearly 1½ lbs. of steam per kilowatt-hour at almost any point throughout the superheat range. On the other hand, equally as remarkable is the result of decreasing the speed, which causes a rapid decrease of economy.

An important advantage of power generation by the steam turbine which, while not new, was clearly brought out in Mr. Emmet's paper, is the possibility of returning the condensation directly from the condenser to the boiler and the consequent saving of the contained heat. It is rarely, if ever, possible in power plant practice to save the water discharged from the condenser for use over again in the boilers on account of the oil contained in it, which is taken from the engine cylinders. Many attempts have been made to solve this difficulty, as it would permit a large portion of the latent heat of the water otherwise wasted to be saved, and even of greater value, in many districts where bad feed waters are found, would be the benefits of returning the distilled water to the boilers; untold troubles with the boilers would thereby be avoided which in many places would effect great savings in repair bills. But only in rare cases can this be accomplished; indeed, so rarely is it done that it may rightly be called unusual practice.

In the use of the Curtis steam turbine at Newport, by the use of surface condensers, all of the water of condensation is saved and returned directly to the boilers entirely without the necessity of treatment for removal of the oil. The lubrication of the bearings of the moving parts of the turbines is effected in such a manner as not to bring the steam in contact with oil during its passage through the turbine, with the result that the condensation leaves the turbines absolutely pure. This makes ideal boiler feed for the boilers, as it may be used over and over again without danger of trouble in the boilers; this is of more than usual importance at Newport on account of the bad water conditions which are met at that city.

This is a feature of operation with the turbine which should receive the careful consideration of power plant engineers in future designs, as the result of this feasibility to return water of condensation directly to the boilers, and saving the large amount of heat which would otherwise be wasted, has the effect of increasing the efficiency of the turbines. This would, in fact, permit steam turbines to be used with economy if their efficiencies of operation were considerably less than that of the steam engine; the comparatively high efficiency of the steam turbine, however, makes its use of unusual advantage and importance when this favorable feature permitting continued use of the water of condensation and its beneficial effect upon the boilers is taken into consideration. Its many other advantages are, of course, well known, but this is one which will be liable to bring it into very general use where circulating water is available, permitting the use of condensers, so the full benefits of this feature may be obtained.

The New York Central Plan for Through Car Operation

Considerable discussion has taken place in engineering circles regarding the radical difference between the plans of the New York Central and Pennsylvania Railroads, so far as they have been announced, for the electrical equipment of their New York terminals. It will be remembered that while the Pennsylvania Railroad is planning to introduce electric locomotives for hauling its through trains into New York City the use of electricity by that company, for the present at least, will be restricted to a zone 4 miles or 5 miles adjacent to the New York station. The New York Central Railroad, on the other hand, is not only proposing to use electric locomotives for its New York City service proper but has decided upon the adoption of electricity as a motive power exclusively for the operation of both suburban and through passenger trains from New York City to Croton, on the Hudson River division, and to White Plains, on the Harlem division, located respectively about 34 miles and 22 miles from the New York terminal. While all traffic engineers who have given close attention to the relative advantages of steam and electricity for suburban service have recognized the desirability of operating the suburban service as far as these points by electric power, some of them have expressed surprise at the decision to extend the electric locomotive operation beyond some point at or near Mott Haven. A careful consideration, however, of the situation in which the railroad is placed will, we believe, be convincing that the decision was a wise one.

The problem before the engineers and directors of the New York Central Railroad naturally resolved itself into two questions, first, that relating to the suburban service, and, second, that in regard to the through train service. Considering the former first, the two limits selected include practically all of the territory along the lines available for the development of commuter traffic. As the use of electricity south of the Harlem River was obligatory, the loss of time and danger of congestion which would be caused by a change of motive power on suburban trains if the electric zone extended only to Mott Haven, constituted, we believe, the principal reasons for deciding upon a uniform system within the commuter territory. Again, the opportunities for increasing the traffic due to the recognized advantages of electricity, such as smaller units, frequent service, greater speed, and freedom from smoke, cinders, noise and gas, must have appealed with great force in view of the natural advantages for residential purposes which the territory directly north of New York City possesses. This district is the only one in the neighborhood of the metropolis which is as yet connected to it by an all-rail route; but, as yet, it has not been penetrated by competitive rapid transit lines. Viewing the situation broadly, therefore, it was a question, so far as this suburban business was concerned, whether the New York Central Railroad Company, in making a change, would make the strongest appeal to commuter traffic which the science of transportation can at present suggest, or whether it would continue its present steam service up to a point near the Harlem River, and thus largely nullify any advantages which might accrue from a change of motive power south of that point.

While these arguments apply to the suburban business of the company they do not necessarily concern the through train service, and while one change was contingent to a certain extent upon the other, yet the two services are by no means governed entirely by the same considerations. We must assume, however, that the directors of the company considered not only present but future conditions. For instance, the existing statute requires the change of motive power only for that section of the road south of the Harlem River. But with the installation of an electrical suburban service the force of public opinion might soon require the abolition of steam locomotives within the city limits, which would mean as far north on the two divisions as Yonkers and Mt. Vernon. But whether this should be so or not, a change from steam to electricity on the through trains at any point south of the suburban electrical terminal would involve the maintenance of three electrical and steam terminals with their extensive equipment and force of men as well as the undesirability of operating a steam passenger service with its attendant annoyances of steam, gas, cinders and noise alongside of the electrified suburban service. Again, the land required for a third terminal would be considerable, and its cost at a point such as Highbridge or Woodlawn, or even a short distance north of these points, would be large even if the topography of the land at these points was suitable for an adequate site for a terminal, which it is not. The logical solution, therefore, of the problem seemed to be a change for the through trains from steam to electricity at the edge of the suburban electrical zone, and while this change involves a large expense to the railroad company in the way of electrical apparatus, we believe it to be entirely warranted by the situation.

The Pennsylvania Railroad conditions are quite different, as the meadows in the neighborhood of Newark afford ample area for electrical and steam terminals, and as the commuter traffic on the Pennsylvania Railroad is comparatively small. We expect, however, before very long, to take up the consideration of the situation on this road. There is certainly no more interesting transportation problem in the world to-day and no more important work of this kind being carried out than that which involves the entrance into New York City of the two largest trunk lines in this country.

SOME FEATURES OF THE EAST ST. LOUIS & SUBURBAN RAILWAY

Many are not aware that there exists across the river from St. Louis, in East St. Louis and surrounding country, a large city and interurban electric railway system comprising over 120 miles of track. Besides the city lines in East St. Louis there is a line as far as Edwardsville by way of Collinsville, two lines to Belleville, a branch of the Belleville line to O'Fallon and Lebanon, and a cross-connecting line between Edgemont and Collinsville. Of the two lines from East St. Louis to Belleville, one is a double-track passenger line running over an old and well-settled turnpike. Paralleling it a short distance to the south is a line on a private right of way, which is now used entirely for freight. These two lines were originally built as competing lines, but consolidations have brought them under the control of one company. The freight business is carried on under the name of the East St. Louis & Belleville Electric Railway Company, and consists mainly of the hauling of coal from numerous coal mines along the way. The coal cars of the East St. Louis & Belleville Electric Railway Company, Fig. 2, are to be seen within parts of St. Louis delivering coal to manufacturers there. This freight business is hauled and delivered by steam roads by two electric locomotives, one of which is shown in Fig. 3. These locomotives weigh 50 tons each, and are equipped with four 160-hp motors. They will haul about twenty-five loaded coal cars.

FIG. 1.—EMBLEM OF SYSTEM

Unfortunately, part of the East St. Louis & Suburban Railway Company's system is 4-ft. 10-in. gage, and part standard gage. The freight line is, of course, standard gage. The balance of the system is 4-ft. 10-in. gage, except that from Edgemont to Lebanon. The latter is standard gage, and, consequently, a transfer of passengers is necessary at Edgemont. Besides the electric passenger service given between Edgemont and Lebanon, a steam locomotive is used for freight, steam being used in this case because it is not considered advisable to invest sufficient money in feeders to operate the freight traffic on this division of the system electrically.

FIG. 3.—ELECTRIC LOCOMOTIVE OF EAST ST. LOUIS & SUBURBAN RAILWAY COMPANY

ADVERTISING

This company gives a great deal of attention to advertising, as the management considers that it is in a position where advertising can be made to yield large returns. The system being located as it is, across the river from such a large city as St. Louis, can naturally look to St. Louis for a large amount of pleasure traffic, if proper steps are taken to secure it and take care of it. It is only by vigorous advertising that the many attractive pleasure trips which the East Side offers can be brought to the attention of many people in St. Louis. Pleasure riding on the "Great East Side System," as it is commonly advertised, must depend very largely upon the amount of traffic that can be obtained from St. Louis and the familiarity of the pleasure-riding public in St. Louis with the East Side system. A number of excellent ideas in advertising can be obtained from this company's work. The company has a regular passenger and excursion agent in the person of F. H. Thomas, who gives a great deal of attention to working up both regular pleasure traffic and special excursions. The company has a regular badge or trade mark which appears on all of its advertising, which is shown at the beginning of this article. This also is put on all the company's rolling stock, and serves to give an identity to the East Side system and to attract attention to it. Another excellent idea is the map, Fig. 4, which is published on some of the company's advertising matter, and which gives at a glance the fare between different points on the line. This general idea could be copied by many other interurban railway companies. The prospective passenger does not have to hunt through a long rate schedule to find out the fare between any two points. The map does not pretend to be geographically correct, but it shows the principal towns on the line and the general direction. Another map, Fig. 5, is to be used the coming summer extensively on advertising matter, with the idea of diverting some of the traffic which would otherwise cross the Eads Bridge on the steam railroads, and go into the Union Depot. All the steam trains which enter St. Louis by way of the Eads Bridge, which is also the bridge by which the East St. Louis & Suburban cars enter St. Louis, stop at what is known as the Relay Depot, in East St. Louis, where the locomotives belonging to the various steam roads are changed for the switching locomotives of the Merchants' Bridge & Terminal Association, which takes the trains across the bridge and into the St. Louis Union Station. As there is likely to be considerable delay in the Relay Depot and the Union Station in St. Louis this is some advantage to many passengers in leaving the steam trains at the Relay Depot at

East St. Louis, where they can take an electric car, which will carry them across the Eads Bridge, landing them at the foot of Washington Avenue, in St. Louis, at the end of the bridge. This is directly at an important terminal loop of the St. Louis Transit Company, where cars can be secured for the World's Fair Grounds or for any other point in the city. The passenger taking this route will have the advantage of boarding almost empty cars at the Washington Avenue loop in St. Louis. These facts are all being brought out in printed matter now being distributed by the company, and the accompanying map showing this is being used in this connection. There are also some other local depots of steam lines in St. Louis which are reached by this route, as seen.

There are ten steam roads converging at East St. Louis, and the company will bill all Illinois towns within 190 miles of East St. Louis on these ten roads with posters calling attention to the East Side electric railway system and the assistance it can be in reaching the Fair. It is also expected that since the Fair will be closed on Sundays, a great many visitors can be attracted to take interurban trips on Sundays during the Fair. The interurban lines of the company offer some very attractive trips. Belleville, Fig. 7, is one of the oldest settlements in the State, and the trip from St. Louis to Belleville is described by Charles Dickens in his "American Notes." Dickens made the trip in 1842, when the transportation facilities were hardly equal to those of the present day. One of the publications of the company is a handsomely illustrated pamphlet, entitled "Charles Dickens' Trip to Belleville in 1842, and How the Trip May Be Made To-day."

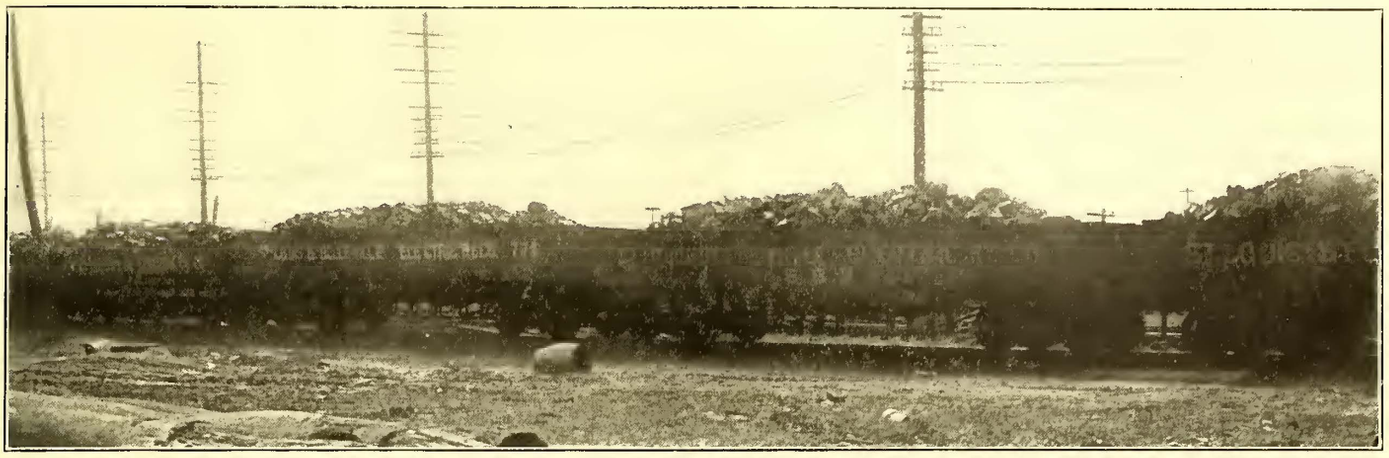


FIG. 2.—TRAIN OF COAL CARS BEING HAULED BY ELECTRIC LOCOMOTIVE

Another decided attraction on this company's lines is Monk's Mound, between East St. Louis and Collinsville. This mound is the largest one of a group of mounds thrown up in that vicinity by the mound builders of pre-historic times. These mounds are of much interest, not only to anthropologists and archæologists, but to the general public, and are well worth the trip from St. Louis. They are probably the best and most accessible examples of the mound builders' work to be found in

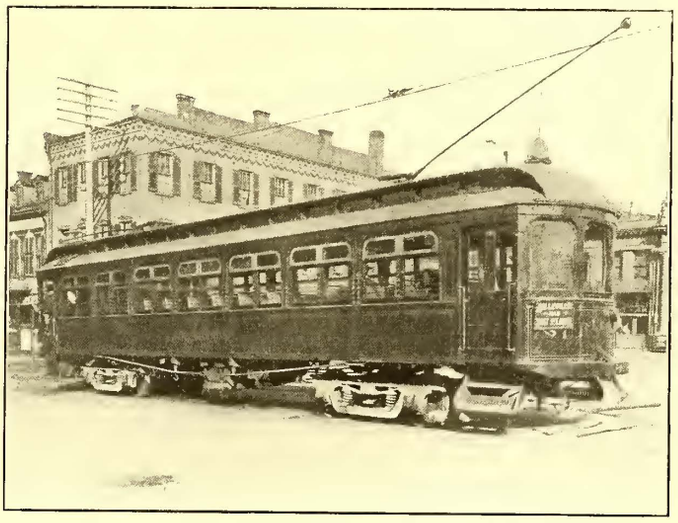


FIG. 6.—STANDARD CAR OF COMPANY

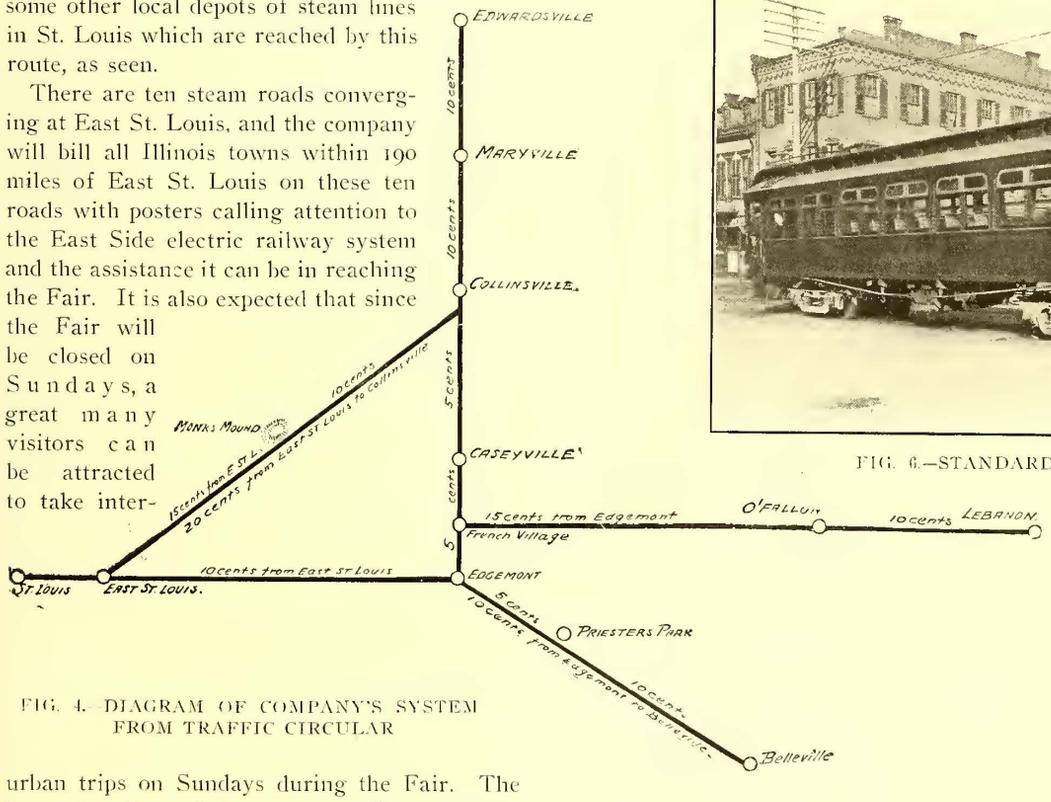


FIG. 4.—DIAGRAM OF COMPANY'S SYSTEM FROM TRAFFIC CIRCULAR

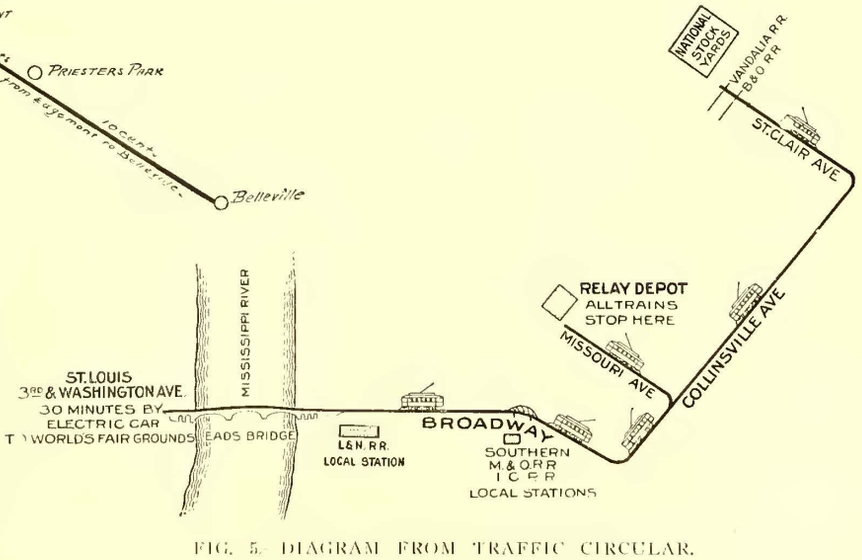


FIG. 5.—DIAGRAM FROM TRAFFIC CIRCULAR.

the United States. They rise up out of the level of the river bottom, appearing much as some glacier deposits or the remains of former river bluffs, but upon approaching nearer it is seen that there is a symmetry, both in the shape of the mound and

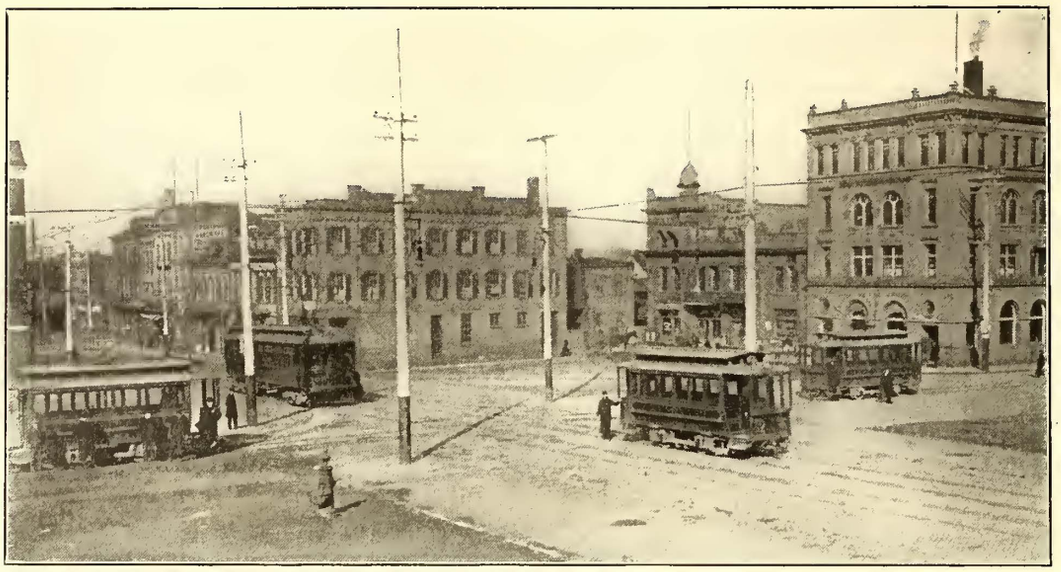


FIG. 7.—VIEW IN THE CITY OF BELLEVILLE

in the location of the mounds with reference to each other, showing, beyond doubt, that they were thrown up by man, even if further evidence were not available. The company distributes a vest pocket guide, 3 ins. x 4½ ins., containing, besides the covers and the map, twenty-four pages of reading matter and half-tone illustrations. The map used is that reproduced in Fig. 4. Some of the pages are given up entirely to illustrations of attractive scenes along the line. Other pages to particular points of interest and information as to the rates of fare. Much attention is given to working up private car parties. A reduction of one-third from the regular rates of fares from East St. Louis and points on the suburban lines is made to parties of ten or more traveling on one ticket on the regular cars. This enables private picnic parties to enjoy a day's outing at small cost. These special rates are not good on Sundays or holidays, as the regular traffic on these days is all the company can care

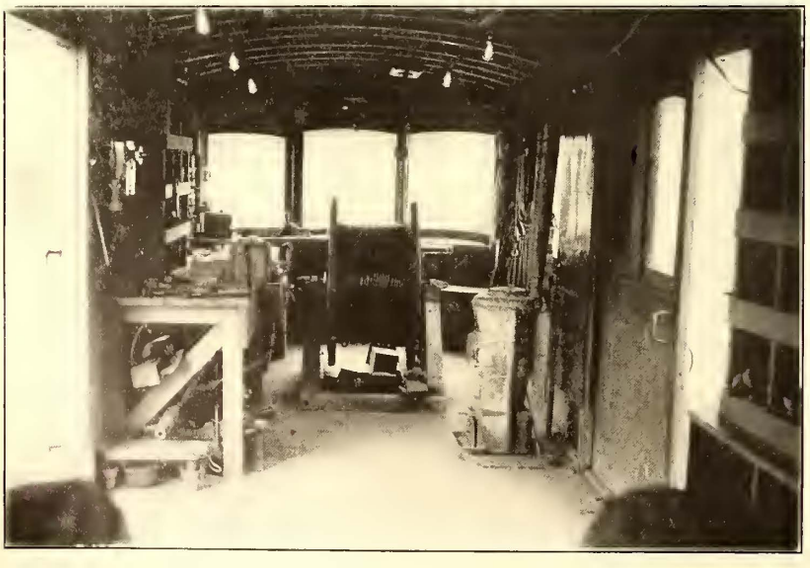


FIG. 8.—INTERIOR OF TOWER CAR

for without extra inducement in the way of low fares. The management is of the wide-awake kind, that realizes the possibilities of the property, and is taking energetic steps to live up to its opportunities.

ROAD AND EQUIPMENT

The company's equipment, including new cars purchased for World's Fair traffic, includes twenty interurban cars of the type shown in Fig. 6, which are 51 ft. over all, 4-ft. 10-in. gage, 33-in. wheels, St. Louis bodies and trucks and four G. E.-57 motors with K-14 controllers. One of these cars is shown herewith. Besides this there are seven other interurban cars with four G. E.-1000 motors; thirty city street cars with 26-ft. bodies, two Brill convertible cars, and ten twelve-bench open cars, built by the American Car Company, with Brill 27-G trucks and two G. E.-57 motors. There are also eight short single-truck cars for local service in Belleville and other short lines. The

FIG. 9.—TOWER CAR

company has 600 coal cars like those shown in Fig. 2. Power is all supplied from one main power station at Winstanley Park, at the edge of East St. Louis, near the end of the St. Louis & Belleville freight line. The current is transmitted at 13,000 volts to the substations on the interurban lines. Direct-current generators supply the East St. Louis local lines.

The power station is equipped with simple non-condensing engines, as Lichter & Jens, consulting engineers, figured that coal was so cheap that the saving by condensing would not pay interest and maintenance on the extra cost of a compound condensing station with the necessary cooling towers or ponds. The consulting engineers calculated that unless the cost of coal was above 85 cents there would be nothing gained by putting in condensing apparatus, and as the company operates a coal road, it was not thought likely that the cost of coal would ever exceed this figure. It has been found advisable, however, not to burn the cheapest grade of slack obtainable, on account of the large amount of slate dust in with the slack, which is likely to interfere with keeping up steam. Sub-stations, three in number, are located near Edgemont, at O'Fallon, and about one-third of the distance between Collinsville and Edwardsville. Aluminum high-tension transmission

line and direct-current feeders are employed. High-tension lines, Fig. 10, are mounted on Knowles type-G glass insulators. High-tension aluminum cables are partly 104,000 circ. mil and partly 66,000 circ. mil. The direct-current aluminum are 790,000 circ. mil. In maintaining the line and stringing new wire a very complete line car is used, exterior and interior views of which are shown herewith, Figs. 8 and 9. This line car has a reel in each end of the car, each reel has a brake within reach of the motorman, so the motorman can run the car and keep the tension on the wire as the car moves along. The car is arranged for stringing the wire live, so that the reel and brake handle are insulated, and current is taken by the trolley wheel from the wire as it is reeled over the ladder. One reel carries figure 8 No. 00, and the other figure 8 No. 000 wire. Along the sides of the car are bins for all of the different kinds of line material used, and there is also a work bench, as shown. The car is equipped with tools both for emergency and regular electric construction work, and has an equipment of four G. E.-1000 motors. The line construction and maintenance is under the charge of R. W. Bailey.

REPAIR SHOP KINKS

The shops and main car house are within the power house at

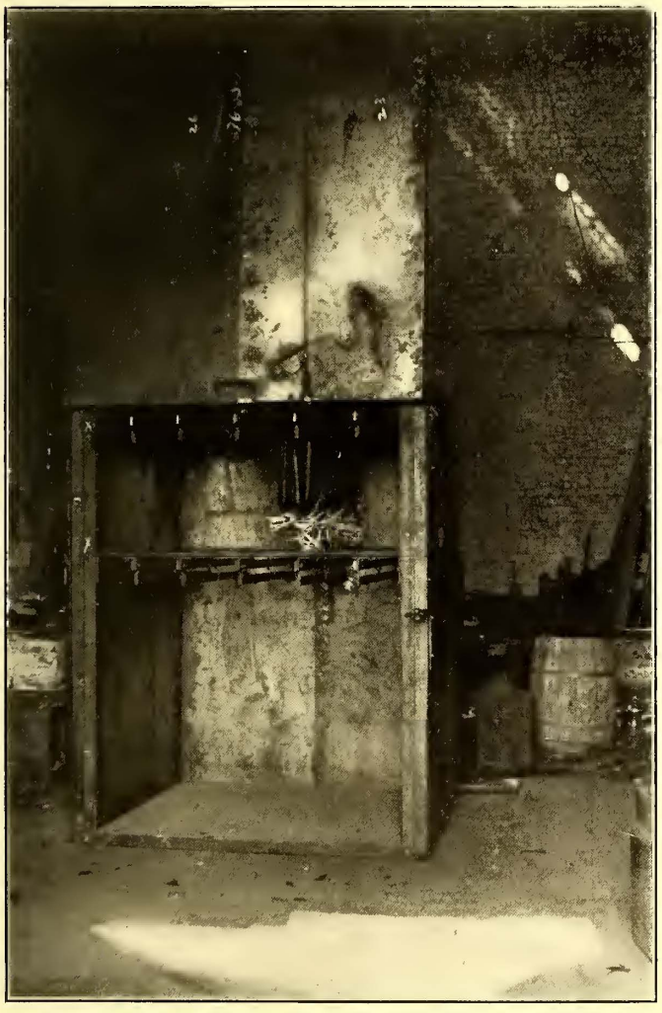


FIG. 11.—BAKING OVEN. COILS INSERTED

Winstanley Park. The master mechanic is Jos. Kuen. The general arrangement of this shop can be seen from the accompanying cut, Fig. 17. There are several tracks with brick-lined pits adjoining a machine shop. The whole shop has concrete floor. Back of the machine shop and separated by a brick wall are the blacksmith shop, store room and armature room. The paint and carpenter shops are in another adjoining portion of the building. For hoisting the motors out of the pits a compressed air hoist and swiveling crane, as seen in the engraving, is used. Compressed air is furnished by a motor-driven compressor of the type furnished by the General Electric Company for electric locomotives. The Monarch air drill is used for

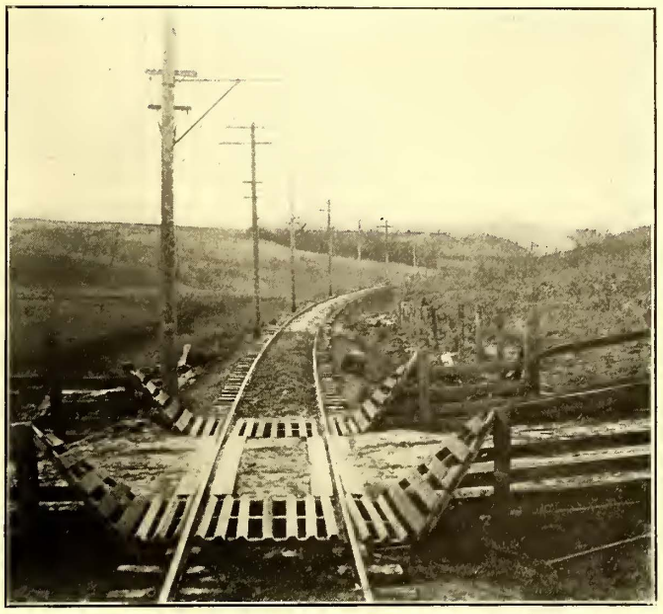


FIG. 10.—SECTION OF TRACK SHOWING HIGH TENSION LINES

drilling wherever the work cannot be brought to a drill press. Soldering irons are heated by gas. The machine tools are all modern, designed for heavy work. Among the larger tools is a wheel press, a boring mill for car wheels and a milling ma-

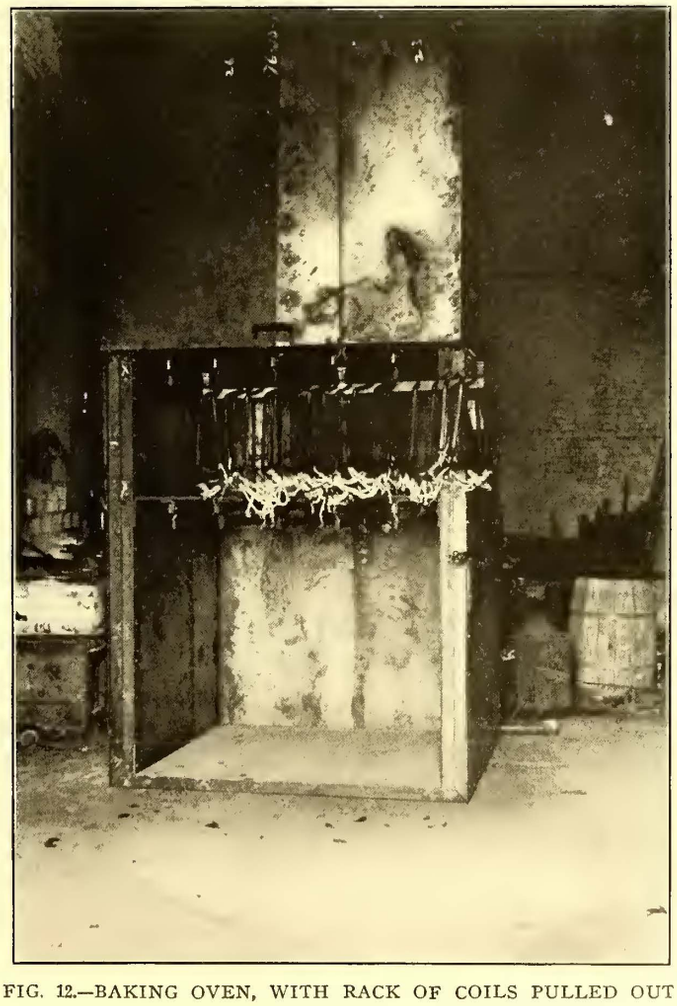


FIG. 12.—BAKING OVEN, WITH RACK OF COILS PULLED OUT

chine. A bolt cutter has been installed for working over old bolts. A Murphy wheel grinder has been put in for grinding wheels without taking them off the trucks. The company

winds its own armature coils, and has forms for each type of coil. The armature winding machine is arranged so that any one of the different forms can be placed on its spindle so that

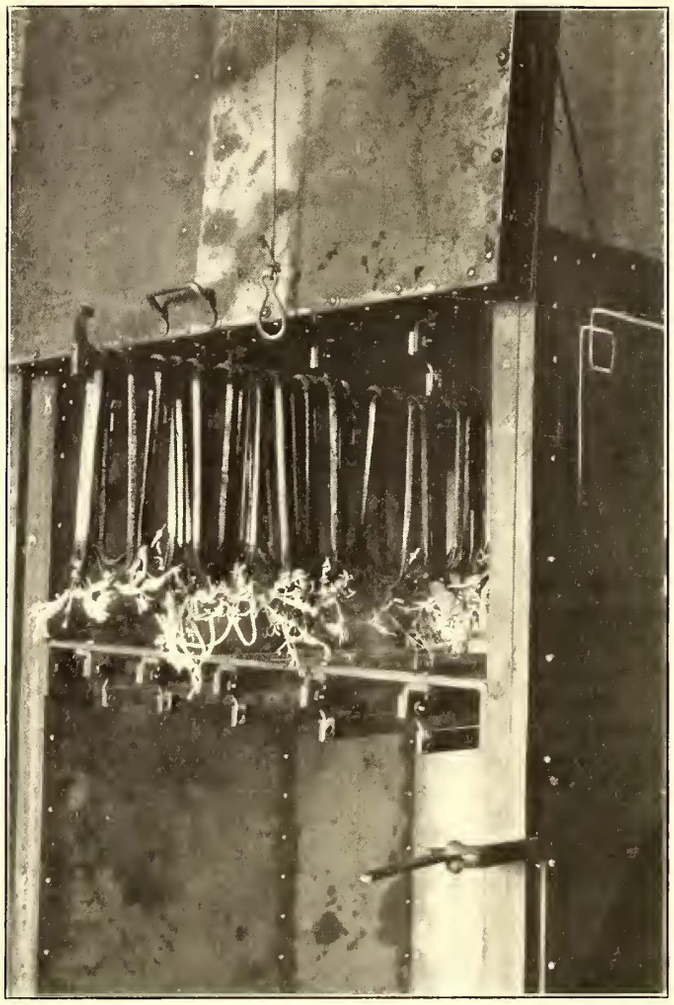


FIG. 13.—BAKING OVEN, WITH RACK PARTLY PULLED OUT

there need be only one stand and driving mechanism for winding any of the coils. In a small shop of this kind there is not enough work on any one coil to make it advisable to put in a complete winding machine for each type of coil. This coil-winding machine is driven by a small electric motor, the speed

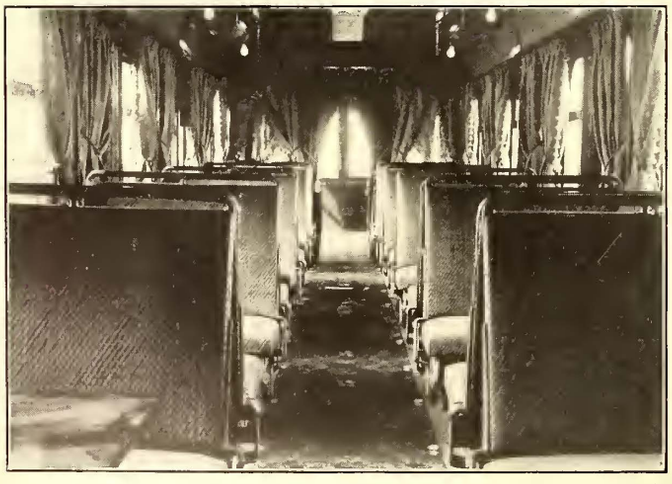


FIG. 14.—INTERIOR OF REGULAR CAR ARRANGED FOR PRIVATE PARTIES

of which can be varied and connection is made with the spindle on which the form is placed by means of a friction clutch. A baking oven for baking out armature coils is shown in three of the accompanying engravings, Figs. 11, 12 and 13. This oven is made of double thickness of sheet-iron. The novelty about it is the arrangement of racks for getting armature coils in and out of the oven. In Fig. 11 a rack full of coils is seen shoved back into the oven. In Fig. 12 the rack has been pulled entirely out and is hung from the ceiling on a ring provided for that purpose, which is in front of the oven. The rack has three hooks, which hook over the tracks in the oven, consequently it is easy to slide the rack in and out, and it can be handled easily with the assistance of the ring suspended from the ceiling. If desired, the rack can be carried to any other point in the shop for loading and unloading. In Fig. 13 the rack is half-out, almost ready to hook to a traveler or other hook.

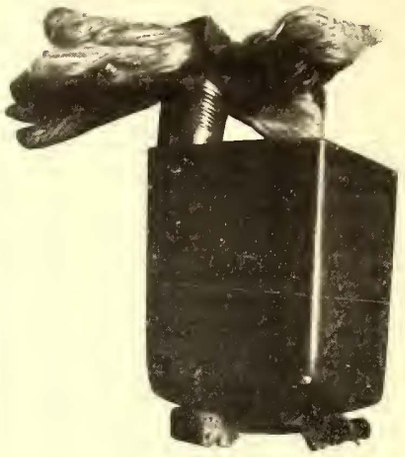


FIG. 15

Oil lubrication is being adopted for the motors as a substitute for grease formerly used. The lubricator is in a form designed by Chas. E. Hott, master mechanic of the Columbus Railway & Lighting Company, of Columbus, Ohio, and adopted by Mr. Kuen after a visit to those shops. The lubricator consists of a cast-iron box, Fig. 15, which fits into the grease box of the motor. In the bottom of this cast-iron box is a hole, which is tapped with threads so that the plug, Fig. 16, screws into it. The cross-section of the box is shown in Fig. 18, which gives the dimensions. The

FIG. 16

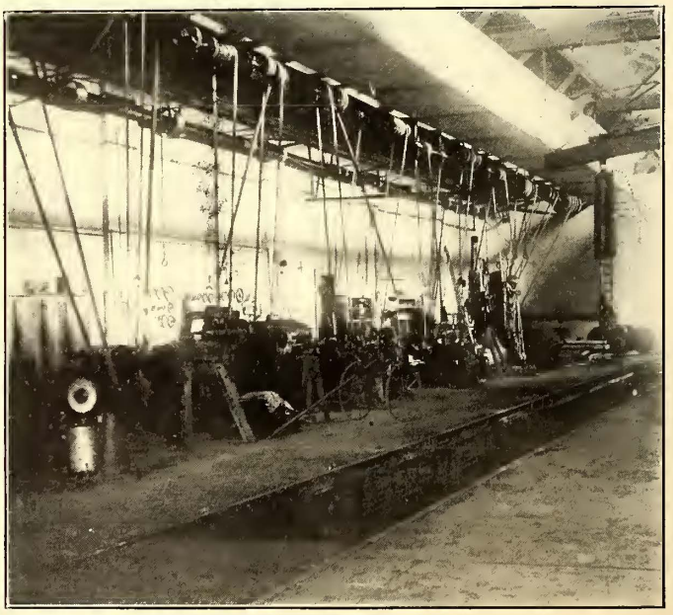


FIG. 17.—INTERIOR OF REPAIR SHOP

plug which screws into the bottom of the box has a hole drilled through it lengthwise and two holes drilled crosswise, through which latter wool waste is drawn, as seen in Fig. 16. This wool waste draws up the oil by capillary attraction, and it runs

down the hole through the center of the brass plug to lubricate the motor.

The shop number system is used in this shop, each piece of work being given a shop number, all men reporting the number of hours' work spent on different shop orders each day. Thus the labor cost of different operations can be readily determined.

OPERATION AND MANAGEMENT

The operation of the road is under the supervision of division superintendents, one for the city lines and one for the interurban lines. The operating headquarters in which men report for runs are at the large car houses at Winstanley Park. At this place the employees have comfortable rooms fitted up for their use, together with shower baths and lockers. The ordinary schedule calls for the operation of thirty-five city cars in East St. Louis, eight interurban cars between East St. Louis and Belleville (where a 15-minute service is given), four local cars in Belleville, three interurban cars between East St. Louis and Edwardsville, two operating to Collinsville by way of Edgemont, and two operating between Edgemont and Lebanon, making connection with the cars which operate between Collinsville and East St. Louis by way of Edgemont. The entire operation of the road is in charge of J. M. Bramlette, general superintendent.

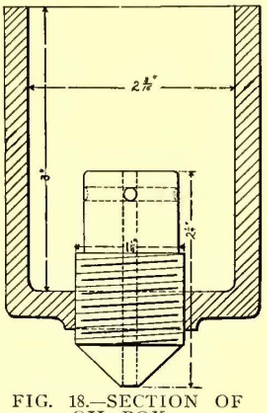


FIG. 18.—SECTION OF OIL BOX

TRACK IMPROVEMENTS IN BROOKLYN

The Brooklyn Rapid Transit Company has recently closed a contract with the Lorain Steel Company for the electric welding of track joints upon several sections of its lines. A large amount of their track is wearing into such bad condition at joints that an extensive relaying with new rail seemed absolutely necessary this spring, but electric welding is to be used in overhauling, and will, to a large extent, obviate the necessity of relaying. The Lorain Steel Company proposes to place almost all of this track in good condition by raising and electrically welding the joints, which it is claimed will more than double the life of the present rails—something that can, probably, be done in no other way.

The welding method that will be used is the improved system of the Lorain Steel Company, which was described fully in an article upon page 519 of our Sept. 12, 1903, issue. This method permits of raising the joints as much as desired, with the assurance of ample stiffness for strength. In this way it is possible to refit for service many stretches of track that are so badly worn at joints as to otherwise require relaying, although the rail itself is in such cases universally good for a large amount of additional wear. It is intended in this work to raise the receiving rail slightly higher than the other, and then, after welding, grind out the uneven surface resulting to a smooth surface; this tends to take out the battered condition and rounding end of the receiving rail resulting from the wear. Also, the Lorain Steel Company states that it is its practice not to grind the fin or projection on the face of the rail which is caused by the welding process entirely off as, if a slight portion of the projection is left and allowed to wear down by the wheel action of the passing cars, it soon smoothes out and makes a firmer and smoother surface in the end.

It will be remembered that in 1898, some 9 miles of track on the Fifth Avenue and Marcy Avenue lines of the Nassau Electric Railway Company, now a part of the Brooklyn Rapid Transit Company, was electrically welded by the Lorain Steel Company. The remarkably good results that were obtained from this work did much to induce the company to extend the welding work upon its present system. Of the entire 9 miles of track welded at that time only eight joints broke in the first year, and since that time there has been scarcely a break or any trouble whatever experienced with these electrically-welded sections of track. It is found that the track maintenance is very easy and attended by much less expense with the electrical welding, and the effect of the continuous smoothness of the rail upon the rolling stock is extremely favorable.

The Brooklyn Rapid Transit Company is also about to make a trial of the Nichols zinc-weld rail-joint on some new track which they are about to lay this spring. This joint, as here used, will be a duplicate of the zinc-weld joint which is in extensive use by the Philadelphia Rapid Transit Company, as described on page 523 of our issue of April 2. The installation of the zinc joints will also be made by the Lorain Steel Company, who will act as sub-contractor for H. B. Nichols, of the Philadelphia Rapid Transit Company, the inventor of this joint. It is not intended to use the zinc-weld joint upon any of the old track repair work, preference being given for it upon the new work. This will be an important and valuable test of the zinc-weld joint for continuous track work, and will be watched with interest by those interested in track maintenance.

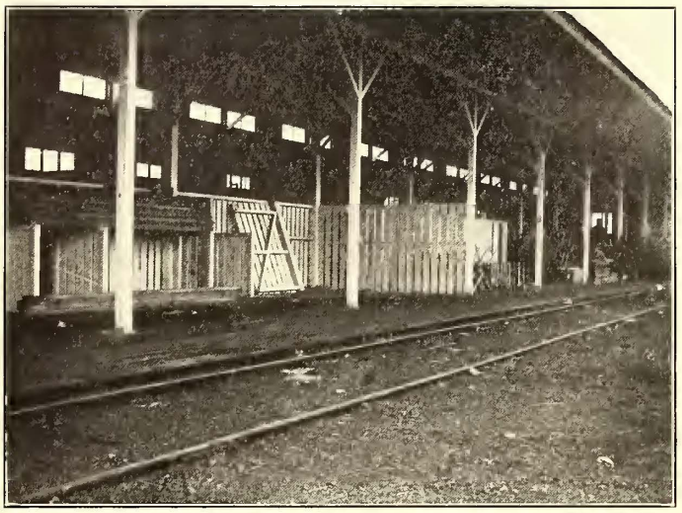
TRANSFERS IN EUROPE

The following table gives statistics of the fares charged on a number of the principal street railways in Europe, whether transfers are issued, and the charge for them, if any is made, the maximum fare charged, and whether the road is under municipal or private management. The table is made up from information supplied by the roads themselves to the secretary of the International Street Railway Association, and will form the basis of a paper to be presented to that association at the Vienna meeting, to be held Sept. 11-15, 1904:

	Fare per Zone	Minimum Fare	Charge for Transfers	Required by law	Maximum Fares	Private or Municipal Road
Aachen	5 pf.	10 pf.	free	no	50 pf.	Private
Berlin-Grosse	uniform	" "	no transfers	no	10 "	"
" Licht'f'de	5 pf.	10 "	free	no	20 "	"
Brussels	5 cent'm	10 cent'm	5 and 10 cent'm	yes	15 cent'm	"
Crefeld	5 pf.	10 pf.	free	yes	15 pf.	"
Dessau	5 pf.	10 "	free	no	----------	"
Dresden Tramways	5 pf.	10 "	free and 5 pf.	------	25 pf.	"
Dresden Company	uniform	10 "	5 pf.	yes	----------	"
Barmen-Elberfeld	uniform	10 "	free	no	10 pf.	"
Erfurt	uniform	10 "	free	no	10 "	"
Frankfurt	5 pf.	10 "	free	no	20 "	Municipal
Hamm	uniform	10 "	free and 5 pf.	no	10 "	Private
Hannover	uniform	10 "	5 pf.	no	10 "	"
Heidelberg	uniform	10 "	5 pf.	no	15 "	"
Helsingfors	uniform	15 pen.	free	no	15 penni	"
Konigsberg	5 pf.	10 pf.	free and 5 pf.	no	15 pf.	Municipal
Leipzig-Grosse	uniform	10 "	free	yes	10 "	Private
" Eleck	uniform	10 "	free	yes	10 "	"
Linz-Urfahr	from 4 to 10 heller	6 hel.	10 hel.	no	40 heller	"
Lyons	uniform	20 cent'm I 10 " II	free	yes	20 and 10 cent'm	"
Madgeburg	uniform	10 pf.	"	yes	10 pf.	"
Mannheim	5 pf.	10 "	"	no	20 "	Municipal
Nordhausen	uniform	10 "	"	yes	10 "	Private
Cie Gne Paris'ne (on principal lines)	uniform	30 cent'm I 15 " II	free or 15 cent'm	yes	----------	"
Prague	8 heller	12 hel.	free	yes	20 heller	Municipal
Rheims	uniform	15 cent'm I 10 " II	free	yes	15 and 10 cent'm	Private
Remsheid	5 pf.	10 pf.	free	yes	20 pf.	"
Strasburg	5 pf.	10 "	free	no	----------	"
Turin	5 cent'm	10 cent	free and 5 cent'm	no	20 cent'm	"
Vienna	2 to 16 heller	10 hel.	free	------	30 hel.	Municipal
Yaroslaw	uniform	5 copeks	free	yes	5 copeks	Private
Zurich	5 cent'm	10 cent'm	free	no	20 cent'm	Municipal
Zwickav	5 pf.	10 pf.	free	no	20 pf.	Private

WORLD'S FAIR TERMINALS OF TRACTION COMPANIES AT ST. LOUIS

At a meeting of the Engineers' Club of St. Louis, recently, C. A. Moreno, chief engineer of the St. Louis Transit Company, presented the first complete map to be compiled showing the location of all the street railway terminal loops for delivering passengers to the Exposition. This map is reproduced herewith. A map showing the St. Louis Transit Company's system alone and the location of the six loops of that company



THE MOVABLE FENCE AT THE DE BALIVIERE ENTRANCE

at the Exposition grounds was published in the March 5 issue of the Street Railway Journal. The present map shows the location, adjoining the Exposition gates, of the terminal loops of both the St. Louis Transit Company and the St. Louis & Suburban Railway Company, as well as the Wabash Railroad, which operates a steam suburban service. Both of the street railway companies will operate to the Exposition grounds over all of the routes that are anywhere near in that vicinity. There are six "Transit loops" and two "Suburban loops."

As regards the capacity of these loops and the lines leading to them, Mr. Moreno says:

"On the Olive Street loop we will operate cars on a half-minute space or better. Our cars seat forty-eight people, and adding those on the platforms and in the aisles, each car will hold easily 100 passengers. One hundred passengers every half-minute, provided the cars are not closer together than that, is 200 per minute, or 12,000 per hour. The Delmar loop will do as well, and I estimate that the remaining four loops between them will handle 26,000 per hour, making a total of 50,000 per hour for the St. Louis Transit Company. The St. Louis & Suburban Railway Company, I am advised, expects to be able to handle 7500 per hour on its Union Avenue loop, and 2500 per hour on the Skinker loop, and the Wabash, with its shuttle trains, 15,000 per hour, making the total of 75,000 per hour, which I mentioned in the beginning as the capacity of the three companies."

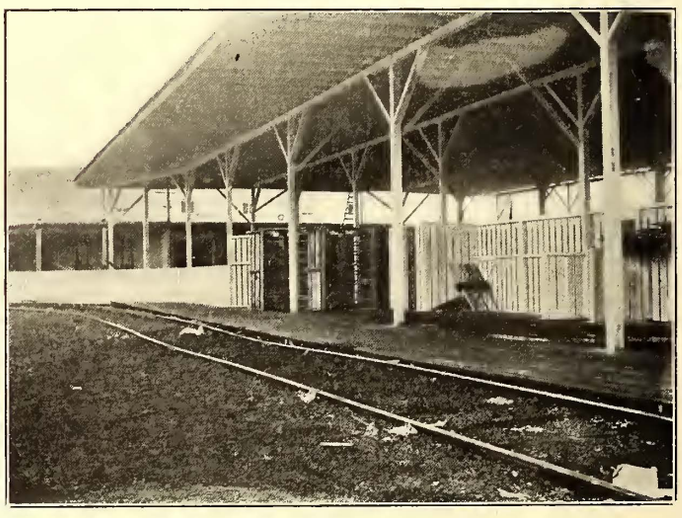
The St. Louis Transit Company's east loop at De Baliviere and De Giverville will be used by the Olive Street cars, and the west loop by the Delmar line. The Hamilton Avenue loop, which is opposite the Pike entrance to the grounds, will be used by the Easton and Taylor Avenue lines, the Skinker road loop by the Page Avenue cars, and those on the south side by the Market and Laclede lines. The Market cars now run to Tower Grove Park, while the Chouteau Avenue cars run out along the south side of the Fair Grounds to West End Heights. After the Fair opens, however, in order to avoid taking the Exposition crowds over the grade crossing of the Transit tracks with those of the Missouri Pacific on Chouteau Avenue, the Chouteau cars will turn out of Chouteau into Manchester, and thence to Tower Grove Park, thus taking care of the travel now handled by the Market Street line south of Chouteau, while the Market Street cars will turn into Chouteau at Manchester and follow the present route of the Chouteau cars.

This change will prove doubly advantageous to Fair patrons, inasmuch as it will enable them not only to escape the dangers of the grade crossing on Chouteau Avenue, but will provide a way for them to take a car at Union Station which will run directly to the grounds.

The loop at the southeast corner of the Fair Grounds is filled with storage tracks, which have a capacity of ninety cars, while in the loops on the north side no provision has been made for storage. The reason for this is that the main car yard, with a storage capacity of 500 cars, is located at Delmar and De Baliviere Avenues, which is only 1500 ft. from the two principal loops at De Giverville and De Baliviere Avenues, and when it is necessary to throw additional cars into service at these loops they can reach them in 2 minutes from the yard. Surplus cars for the loops at Hamilton and Skinker can also be stored at this yard, from which they can be put in service at the former in 4 minutes and at the latter in 6 minutes.

Another feature of this series of loops is that each one has a direct connection with all of the others, so that in the event of any special attraction at the Pike or Skinker entrances the Olive and Delmar cars can run directly there and return by their customary routes with no inconvenience and but little loss of time.

The ability of the local transportation companies to handle the crowds was demonstrated to the great satisfaction of both companies and public at the first real test, which was on opening day, April 30. The crowds were taken care of so well on that day as to excite much favorable editorial comment from the St. Louis daily papers. The statements of the street railway men, that upon the opening of the Exposition the companies would be prepared to handle with ease all the traffic offered,

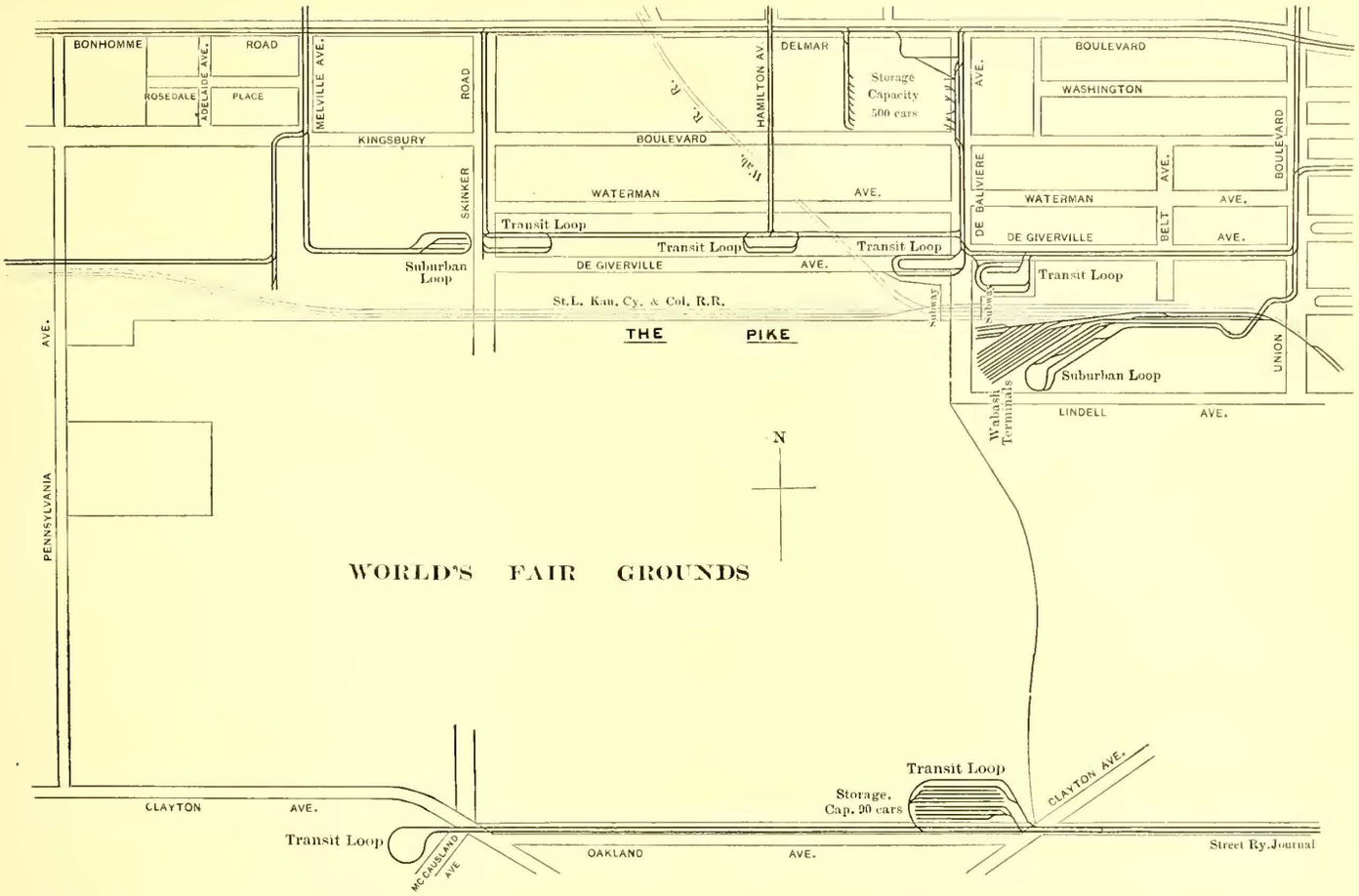


PART OF THE STILE AT DE BALVIERE LOOP

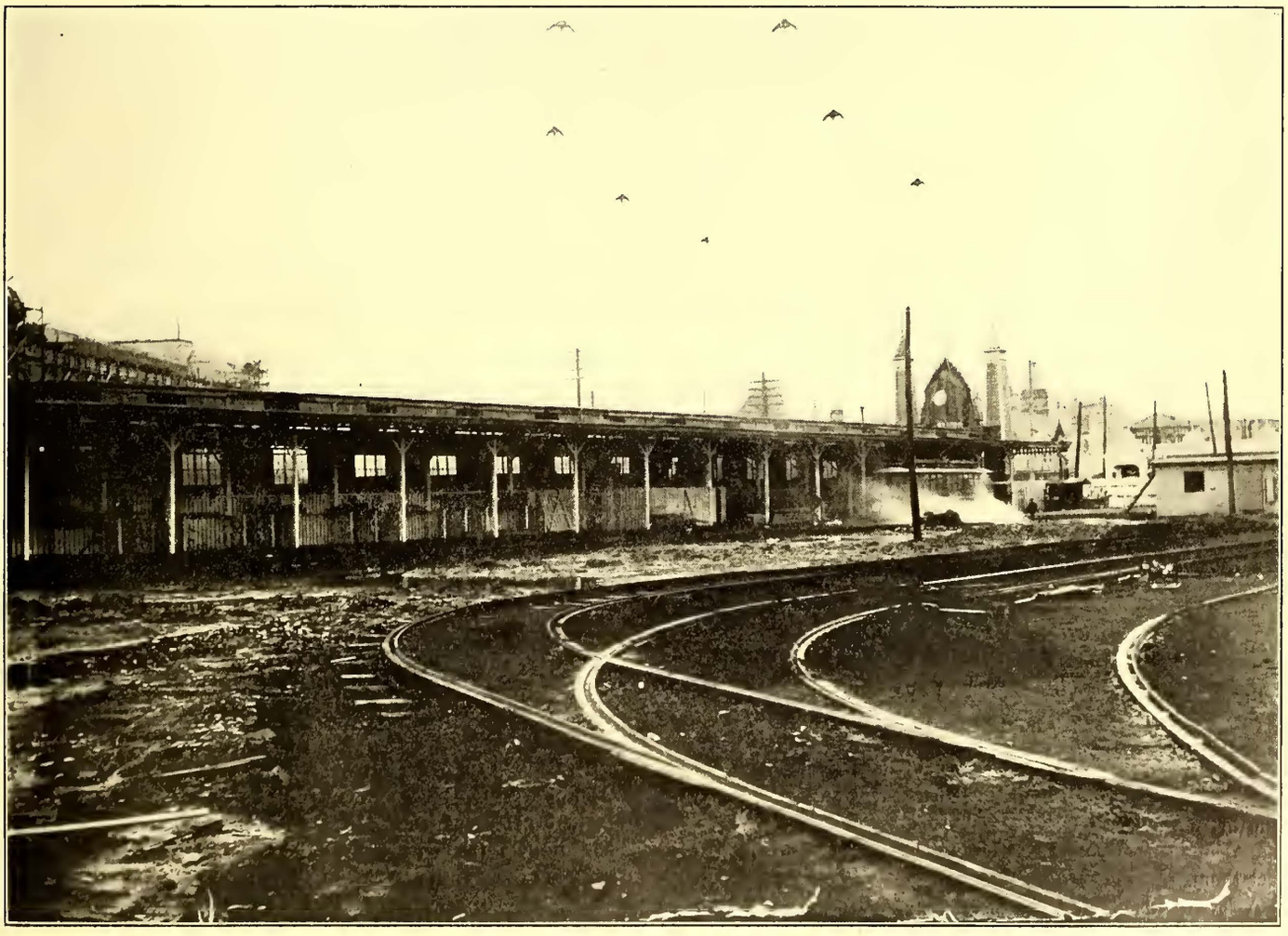
were amply borne out. The opening day crowds were carried comfortably and without crowding.

The St. Louis Transit Company on that day carried about 927,000 people with 1000 cars in operation; the St. Louis & Suburban about 94,000 with 110 cars, and the Wabash shuttle trains 16,514.

It is reported that the Columbus, London & Springfield Electric Railway Company, operating between Columbus, London and Springfield, Ohio, will put in operation regularly for one round trip each, morning and evening, the parlor cars heretofore reserved exclusively for private parties.



PLAN OF STREET RAILWAY TERMINALS AT THE WORLD'S FAIR GROUNDS



THE MAIN SHED AND LOOP AT DE BALIVIERE ENTRANCE

STREET RAILWAY ACCIDENTS—THEIR CAUSES, PREVENTION AND ADJUSTMENT.

BY HENRY W. BROOKS, JR.

While it is true that street railway accidents bear but a very small ratio to accidents of all kinds; that the proportion to total population is gradually lessening, and that the number of accidents to number of passengers carried is also steadily decreasing, yet their total cost in dollars to the companies has increased to such an extent as to compel very serious consideration by those financially interested in and those responsible for the management of street railway properties. It is a feature of railway operations of such manifest importance as to necessitate a careful investigation and study of the causes and situations under which accidents arise and what measures can be taken to prevent them; also to call for liberal cash outlays in investigating, experimenting with and adopting safety appliances.

To the sensitive, ambitious and conscientious manager, accidents are a sort of nightmare, for he never knows when they are going to happen nor the extent of their severity, and they seem to stand as a potent and unanswerable criticism of his personal efficiency and management. To the security holders they often appear like an avoidable cost, entailed by poor management, notwithstanding the fact that their cost is an item that every careful manager constantly endeavors to keep down to the lowest possible figure.

The sums paid in settlement of such claims and the expense attached thereto, reach surprisingly large amounts yearly, and constitute a large leak or heavy drain on the income and resources of nearly all companies. They make heavy inroads on the earnings of the large metropolitan railways, and the small interurban road is often forced to face serious financial exigencies by a single serious accident.

Not only are the opportunities for accidents increasing by reason of the more congested conditions of city streets, higher speeds and other causes, but also by reason of the heavier burdens that are being imposed upon the car companies by new acts of legislative bodies; the finding of new causes of legal liability by the courts, and the action of juries in increasing awards and establishing new and higher values for personal injuries. While we believe the majority of men are fair, honest and just, yet, we must confess, it sometimes seems as though juries took a personal pleasure in making excessively heavy awards against street railway companies. There is no doubt that the amounts awarded by the latter bodies are far greater when caused by surface railways than by factories and other lines of trade, agriculture or mining.

As nearly as ascertainable, the companies throughout the United States sustained a loss during 1902 from accidents of about $9,400,000, exclusive of the cost of repairs and renewals of equipment, this being about 1 per cent on the total capital stock issued, about 4 per cent of gross earnings and 0.9 cent per car mile.

To the above figures must be added a very large amount for the replacement and repairs of equipment and other property, charged to other accounts, but, nevertheless, a part of the accident cost. Also to this direct loss must be added that uncertain quantity, yet none the less real, loss of revenue by reason of the fear of accidents. A recklessly operated road, with a bad record for accidents, is bound to lose the confidence, and thereby patronage, of a certain proportion of the local traveling public. They will omit pleasure travel and select another line or method of transit for necessary trips, if they feel the management is careless of their safety or incompetent to protect them.

A few words about accident statistics: In dealing with them it must be borne in mind that the amounts paid for the year are not necessarily a fair charge against that year's operations, as many accidents occurring during that period may be unsettled at the end of the year, owing to the congested conditions of the courts, which prevents speedy trials, and payments may have been made for accidents of previous years. Also, in reference to comparisons of the number of accidents, it must be noted that many companies are now recording from year to year a larger number of slight accidents than formerly, which partly accounts for many apparent increases.

The management should make, from time to time, comparisons of the cost of accidents, watching the item closely and calling for explanations of marked fluctuations. In this respect the claim department can furnish the manager some valuable, current data, as mentioned later.

The two essential elements, to the practical manager, in a study of the accident problem, are the cause and the prevention, a knowledge of the former being the first step in effecting the latter. It has been found by practical experience that it is not at all easy to determine with accuracy the real cause of each accident occurring on the road. It may be due to a single cause or conjunction of a number of causes. Again, what at first may have been mistaken for the cause, may in reality be one of the results, as a part broken after the initial cause and not intensifying the trouble. It calls for discrimination—not only the knowledge of materials and equipment, but the weighing of the evidence of men, accurately and definitely to find the cause and fix the blame.

When do accidents happen? In general, we find a very direct connection between the safety of travel and the volume of traffic, the "pressure" under which it is conducted. When business is light or normal, there is, naturally, comparatively greater safety than during "rush hours," holiday travel or sudden unexpected increases in traffic. When the facilities and men are overtaxed, and the passengers crowded and excited, there is greater risk.

In tracing out the causes of accidents, we may classify them into the following five general groups, although a single accident may be the result of two or more causes, as first stated: First, those due to imperfect track and roadway; second, those due to defective equipment; third, due to negligence in operating on the part of employees; fourth, those brought about by contributory negligence on the part of passengers and the public; and, fifth, due to unseen causes.

Beginning with the first group, the history of the road may shed quite a little light on this point. As is too frequently the case, the road may have been built by a group of speculators, whose policy is plainly seen in poor location, bad roadbed, light track and cheap equipment.

Again, the cause may be traced to poor engineering in original location and design. The organizers may have been honest in their plans, but the size of the projected road, perhaps, seemingly may not have warranted high-priced engineering talent, or they may have regarded engineering services in the light of an "expense" capable of being cut to a low figure—even congratulating themselves on the economy effected, utterly unconscious of the added construction and operating cost. This is a false economy, and the writer has many times been surprised to see relatively enormous capital outlay entrusted to low-salaried engineers. Again, the organization of the engineering construction force may be such that important features are left to subordinates.

Among the detailed causes of accidents attributable to imperfect track and roadway in original construction or maintenance, or both, are the use of heavy cars on old, weak bridges, resulting in bridge and trestle failures; defective location, such as poor alignment, sharp curves on grades, foot of hills or brink of ravines, improper curve elevation, spreading of rails on curves, worn curve rails, lack of guard rails or timbers, poor surfacing, light rails, small ties, poor track fastenings, improper relation between the standard of track and weight of equipment, broken

rails, broken or defective switches, all resulting in derailments; failure of block signal system, lack of derailing switches, signal apparatus and other safety devices at dangerous points, by placing point switches on cross-overs, double-track roads, grade crossings, right angle crossings with roads where the view is obstructed, resulting in head-on and crossing collisions; also, falling wires, although these are decreasing in number owing to the use of better line material.

The second group of accident causes includes those due to defective equipment; improper car design, such as long cars with too short wheel base, defective trucks, broken wheel flanges, loose wheels, improperly gaged wheels, axles out of line, and defective braking apparatus, resulting in derailments; defective or improperly maintained electrical equipment, car wiring, etc., brakes and brake chain failures, vestibuling city cars, etc., resulting in head-on, crossing and other accidents; worn or poorly designed car steps, grab handles, etc., resulting in accidents to passengers.

Coupled with a dangerously located road, having sharp curves on heavy grades, steep embankments at foot of long hills, etc., poorly maintained, with poorly disciplined motormen and heavy traffic, the brake question is one of life or death, and any evasion of its financial folly, not to say criminal negligence.

The third group, or those accidents due to negligence in operating on the part of employees, is hard to regulate, prolific of trouble and requires eternal vigilance in watching. Speaking of this class in a general way, we head the list with the manager himself, because he heads the organization, and any lack of efficiency, knowledge of materials or equipment, or handling men, any lack of attention or forethought on his part may be the real cause of an accident happening to a car under the immediate control of his representative, the motorman. However, the writer believes the majority of managers are keenly alive to the accident question, yet they must bear in mind that eternal vigilance is the price of safety.

The human element in railroading is liable to err, and cannot be depended upon to operate with mechanical regularity or accuracy. For that reason it has been the constant endeavor of railway managers to reduce to a minimum the human element, and to regulate its action within certain bounds by a code of laws, and by discipline to compel the observance of such laws. The lack of prompt obedience to proper authority and the unhesitating and exact observance of the established rules of the company are fertile causes of trouble, in fact are the cause beyond all others of accidents.

We may trace many of this general class of accidents to the selection, in the first place, of poor human machinery. The man causing the trouble was not of the right material or constitution to begin with. He may be one of those careless men who treat lightly their own criminal negligence in risky operating. Lack of attention or forgetfulness is a frequent explanation of the cause. To go into this more fully would require a chapter on the selection of employees.

Then, again, while normally an able man, at the time of the accident he may have been sick, fatigued with over-long hours, in poor physical condition or intoxicated.

To repeat, the first cause of this kind of accident is the inefficient, unreliable human element; second cause, imperfect, inexplicit, incomplete and improperly drawn rules; third cause, lax discipline.

But to itemize those accidents which are due to discipline or negligence in operating: First, those which result in crossing collisions, and which occur at grade crossings with steam or electric railways, which accidents are almost wholly due to violation of rules, although some are caused by the trolley leaving the wire when crossing, derailment or otherwise breaking down on the track, as mentioned in a previous classification. Second, right-angle collisions between cars and vehicles, for which there is no reason on a broad street, or where the view is unobstructed. Under high speeds or certain circumstances, as, for instance, the Columbus Avenue line, New York City, running between the pillars of the elevated railway structure, these accidents are extremely serious, frequently jamming the wagon between the car and pillars, and causing heavy damage claims, as both have the same right of way. Third, with persons crossing the street at cross-walks, those occurring in the middle of the block being very infrequent. The former are a frequent and serious class of accidents in congested cities. Fourth, those which arise when a pedestrian or alighting passenger passes around rear of car and is struck by the car approaching on the other track, whose motorman failed to ring gong or slacken speed.

The principal accidents resulting in derailments due to employees' negligence, may be sub-divided as to cause as follows: Open and misplaced switches, excessive speed or losing control of cars on poor track, curves, grades, or descending grades at approaches to bridges, negligence on the part of trackmen, and open draw.

Crews attempting to "steal switches" where due to meet another car, form a large number of the causes; misunderstanding 'phone orders, misplaced signals, running work cars or specials without proper notice, are the causes of many "head-on" collisions, often of a serious and expensive nature.

Cars coming to stops at a point where the view of the following car is imperfect; cars standing on the track at night without lights, as "dead" cars with broken trolley wheels and no kerosene signal lights; running into work cars or specials standing on the track; running into cars or wagons on the track ahead; running rapidly with too close headway; running at high speed in foggy or snowy weather, where the view is obstructed and the rails slippery, etc.

Among the accidents to passengers caused by employees are those occasioned by the conductors discounting the time required for passengers to get on or off cars, or even get a firm foothold, before signaling to start; in not giving passengers time to get inside the car body of an open car; allowing pasgengers to crowd on running board, and in motormen not stopping or even slowing down for intending passengers, or in starting too soon.

The fourth general group of causes embraces those which arise with the passengers and public—contributory negligence: Crossing streets in front of approaching cars; upon leaving car at the rear platform crossing in front of the car approaching from the other direction; alighting before the car stops; mistaken efforts to board a moving car, falling off platform or running board. Many of these accidents arise at points where there is the greatest rush, hurry and excitement, as at terminals, transfer points and crowded crossings.

The fifth and last group are due to what may be termed "unforeseen causes," for instance, washouts and landslides, snow or ice, accidental obstructions and malicious obstructions.

Doubtless the reader's experience and observation will add many other causes too numerous to be included here.

It is generally stated that "it is always the unexpected that happens,"as if events happened "hit or miss," yet upon the discovery of the cause and upon reflection, we see there is no reason why the accident should not have happened. Not only that, but given the same combination of circumstances,a similar accident will occur. The law of cause and effect most certainly applies to accidents. If, by a little forethought, we could have seen the cause as clearly as we now see the result, or as we see the cause after the accident, the catastrophe might and would have been averted.

A careful scrutiny of the records of accidents should lead to the removal of those conditions that cause accidents. There is not the slightest doubt but that prudent, persistent, intelligent and businesslike methods can reduce accidents to a minimum.

It is surprising that many street railway companies seem indifferent to investigating the possibility of accidents on their roads, while others, fully cognizant of danger spots in their systems, apparently ignore the serious situation. In many instances the directors do not devote personal attention to the operating affairs of the road, and frequently the manager has not at his disposal sufficient funds for radical preventive methods.

We have previously considered the cost of accidents, but a few further remarks on the financial side of this subject as related to preventive methods are pertinent. Undoubtedly, this is a matter capable of being figured out mathematically. It will be found that the cost of eliminating these danger spots, or sources, will be far less than the expense entailed by accidents, and that it is a wiser policy to appropriate a certain outlay of funds for permanently bettering the roadway and equipment than disburse the same funds, and more too, from time to time, in accident expenses. Further, it will lessen the company's vexatious and costly legal affairs and act as a sort of insurance against sudden financial exigencies, arising through heavy, unexpected damage claims.

We know accidents occur. We know they cost money. What we want to get at is how to prevent them.

The first step is a study. If due to defective track construction the remedy is easily found, though, perhaps, not so easily applied. In his consideration of this question the manager should not confine his improvements to remedying conditions which have already caused accidents, but should be equally ready to correct other defects in the track construction which may provoke them in the future.

Having gone over the list of accidents chargeable to the physical condition of track and roadway, the manager should next turn to those caused by equipment.

This might call for a radical change in car design, as, for instance, the discarding of long car bodies with short wheel base. This, of course, can be most economically brought about gradually when purchasing new equipment or by rebuilding. On lines running through congested, narrow city streets, crowded by car, team and pedestrian travel, vestibules would be dangerous and should be avoided. Interurban cars, whose service calls for taking heavy grades and sharp curves at high speed, should be amply provided with the very best braking appliances, sand-boxes and signals obtainable.

A system of careful, practical inspection of all parts of the brake, rigging, running gear and electric equipment, to see that all vital parts are in perfect working order, will prevent serious trouble. See also to the perfect safety of what may be termed "little things." Select the best gates, headlights, gongs, car fenders and keep up the standard of maintenance of equipment. The electric equipment of cars, or motive power-producing machinery should be carefully maintained in the best condition.

From a transportation standpoint, the schedule or headway must be so arranged as to afford the maximum safety combined with the traffic needs. On single-track interurban lines a telephone, if not telegraphic, train despatching system should be instituted.

Proper provision for the sudden increases of traffic should be provided for, otherwise there will be the increased liability of accident by reason of the employment of new, untried men, the lack of careful examination and selection, the insufficient time allowed for breaking them in and training in their duties. A large proportion of new or green men may seriously interfere with the methodical working order of the organization.

From an operating standpoint, distribute the traffic, so far as possible, over those lines whose facilities afford the greatest safety, bearing in mind, also, those lines affording the greatest economy of operation, both of which are usually coexistent. Certain kinds of accidents, especially those to passengers, are more prevalent where the traffic is congested, therefore, distribution tends to minimize their occurrence. Another preventative method is to divert, so far as possible, travel from those lines under reconstruction or contiguous to construction work of any kind.

Last, but, perhaps, most vital, in the prevention of accidents we mention efficient discipline.

The first essential in this respect is an efficient manager, who has perfect control of a well-organized staff and force, guided by a serviceable code of rules and regulations, which are thoroughly enforced by strict discipline. The manager is the power or source that guides, directs, controls the large body of motormen, conductors and others in their various acts. This he does, largely, through a code of rules, which are the result or concensus of years of his own and others knowledge and experience in railway operations. These rules should be as few, simple and explicit as possible and well known by the men. They should be drawn up with special forethought for the prevention of accidents, and so worded as to be readily and fully understood from the standpoint of the men.

There are certain rules which might be a standard on any road, but to this list should be added such special rules as operating conditions on each individual road necessitates. Further, each road will have its rules as to the local points, such as reducing speed to a safe limit while passing over a certain dangerous bridge, around a certain sharp curve, and otherwise cautioning safety at all the dangerous points on the line.

The best code of rules ever drawn will not prevent accidents, unless reinforced by close inspection and strict enforcement of regulations. The system of inspection will depend on the size and conditions surrounding the road, but should always provide the proper check and instruction to the men. Stringent discipline keeps alert to prevent accidents. If the rule says the motorman is not to "steal" a switch, and he does so, he should be detected and punished for so doing, whether or not an accident ensues. Too often lax observance of rules is engendered because of the harmless violation of rules several times, until, finally, a violation results in a serious accident. It is only by strict surveilance that this carelessness, the forerunner of accidents, is prevented and held in check.

The proper selection of new men affords another opportunity for the prevention of accidents. Only those who are physically, mentally and morally competent should be admitted to the service. Employment should be based strictly on merit only.

Having good material to begin with this can be shaped up and improved by systematic, intelligent training. The manager can create a spirit of better service, a pride in their work, an ambition to become better motormen or conductors. The training in their duties afforded by the "schools of instruction" conducted by some of the larger roads, and continued through their system of inspection on the road, together with plain, practical talks in railway association meetings, lead to greater intelligence and efficiency on the part of employees, correspondingly reducing the "human element" causes of accidents.

Along these lines the writer has in mind the reduction of accidents on one road from a monthly average of about 325 to 200 in the course of a year, by reason of the system of promotion of intelligence among the men, and a practical, thorough instruction in their duties, followed up by helpful, watchful inspection by competent men.

Better instruction and training on the part of the motormen is called for on roads poorly constructed, equipped and maintained. They should be good enough railroaders to understand the road and equipment they have to work, and, therefore, not ignorantly speed a heavily laden, teetering car with short wheel base and weak brake power down steep grades, around sharp curves and over light track, hazarding the lives of many passengers and the company's property.

Lose no opportunity to call attention to and forcibly impress

upon the men the lesson of each accident, as brought out by the investigation. It will be an object lesson to the other employees not so easily forgotten, that will tend to prevent repetition of the same kind of accident.

One of the stimuli to attentive, careful conduct of their duties is the appreciation of the good work of the men. The manly, friendly recognition of careful service inspires loyalty and personal interest in their work. On a road the writer has in mind, a "Roll of Honor," or monthly list of motormen and conductors who have not had blamable accidents, is conspicuously posted, and has a good effect on the accident record.

More effective still is the "premium system," of financially rewarding conductors and motormen for the avoidance of accidents. In one instance an extra cent an hour is added to their wages. The system has proved practical and satisfactory, both to the men and to the company, resulting in a decrease of over 40 per cent in the number of accidents during the first few months it was put in operation. It has since maintained this good record, but considerable care is required to award the premiums justly and prevent feeling among disappointed men.

The work of prevention of accidents should not be a spasmodic, impulsive attempt, but a systematic, carefully planned effort to strengthen the whole operating structure. It requires both a comprehensive plan of reform and a daily campaign. Each accident must be followed by a well-directed effort to correct the weak point in the operating system, gradually building it up to higher degrees of safety. The manager must be alert to new mechanisms and safety appliances, new ways of doing things, that lead to greater safety. All this cannot be accomplished in a day, but only by courageous, determined and well-directed work.

Another very important feature of the accident problem, from the financial standpoint, is the handling or adjustment of accident claims with the increasing number of accidents; the large court awards, which are printed in the daily newspapers with all the allurements of "get-rich-quick" advertisements; the methods of appealing to human weakness and inciting to cupidity employed by many unscrupulous attorneys, whose fees are large and possibilities so great, together with the protection afforded them by statutes in the enforcement and collection of contingent fees and expenses; the investigation by doctors who are also avaricious for high fees as expert witnesses, and many other causes all contribute to add to the large number of claims made daily upon surface railway companies. More demands are made upon roads operating in large cities than country roads, and some particular cities like Brooklyn, New York and Chicago seem to be more afflicted with personal injury litigation than other cities.

About seventy-five to a hundred claims are made daily on the New York City lines, about 7 per cent or 8 per cent of which result in suits, the balance being dropped or adjusted. Comparatively few of those claims that are made are just or the claimant fair and reasonable in his demands. Even although the claim departments are better organized, yet there has been a steady increase in suits during the past decade.

To meet these incessant and vigorous attacks on the companies' revenues, well organized and skilful claim departments have become a necessity to the larger roads. Perhaps, even more than the merits of the case, the satisfactory adjustment of claims depends largely upon personality—both claimant and adjuster. The great essential of the successful adjuster, therefore, is the right personality and the ability to deal with the various characteristics of those making demands, together with the understanding of human nature. This requires a suave, pleasing address, firmness, honesty and a clear, hard head. Claim agents, I believe, are born, not made.

The province of the claim agent is not only in the disposition of claims for damages and injuries, after the accidents have arisen, but also in assisting in the prevention of accidents by serving as a check on the operating departments.

By co-operating, without friction, with the other department heads he can effectively aid in the elimination of the causes of accidents from year to year. His records, when properly tabulated, for a complete exposition of the causes and results of accidents, thereby pointing out to the superintendent, master mechanic or track master where the dangers lie. They can apply the remedy and prevent repetitions.

The first step in handling claims begins at the time of the accident, and should be in the form of an exact and comprehensive report by the conductor, who should be supplied with properly designed accident blanks, ready for filling in, together with brief-pointed directions regarding reports and the rules relating to accidents. It is essential that they promptly make accurate, truthful and complete reports, no matter how trifling the accident may apparently be. The statement of exact facts must be clearly separated from any opinions, suggestions or inferences of the conductor which he may volunteer. The circumstances surrounding an accident often make conductors fearful and personally prejudiced in reporting the true causes or affording them a motive for concealing facts to shield someone. Despatch in reporting accidents is essential, especially so in the event of a serious accident, when the claim agent should be notified by 'phone that the proper investigation may be immediately instituted. The rule not to discuss accidents or give information except to the one in proper authority is important, and generally well observed. By tactfully and effectively securing proper witnesses the conductor can display some useful ability.

From the inception of an accident, preparation for a law suit must be conducted simultaneously with negotiations for a settlement. Being prepared for litigation, and the knowledge by the claimant that the company is fully posted as to all details and ready with a strong defense, have considerable weight in modifying his demands.

The prompt investigation of all facts and circumstances by the claim department should be instituted. This necessitates a considerable amount of skilful and careful work. It is easy to say, "get facts," but much harder to sift out conflicting testimony and determine them. Conductors' reports must be scrutinized, witnesses visited and examined at their homes or places of business, and after these and other sources of information have been exhausted, facts must be ascertained and the question of legal liability determined.

The claimant must be met—in fact he usually is not bashful in making himself known, and his first demand, as may be anticipated, is a liberal "strike." Upon his first interview it is well to question the party closely and record the results. It is also well to deal with the claimant direct, simplifying matters and usually being cheaper and more satisfactory to all concerned.

No fixed rule of proceedings can be laid down, each case having to be handled differently, according to its individual circumstances.

Having determined whether or not the company is legally liable, the next step is the decision of what amount should be offered or paid in settlement, provided the company is liable. This involves a number of nice questions, for instance, the nature of the injury, the value set upon similar injuries, the personal characteristics of the claimant, and the general conditions surrounding this particular case. The claim agent must base his offer, to a large extent, on the average payments made in his locality for such accidents.

It sometimes occurs that even though there is no legal liability binding the company, it may be wise to make some gratuitous payment. The claim agent must decide this, and, if so, set the amount. In all this work, it is seen, there can be no fixed rule or mathematical calculation of amount, but each particular case must rest on the judgment of the adjuster.

But having determined these points the most difficult work comes next—in effecting an equable settlement. It is not always easy to satisfy the claimant and his attorney as to the amount of compensation. The injured party's ideas may be exorbitant; may be warped by his sufferings; he may not be just and reasonable enough to admit the amount offered to be a fair and adequate consideration, or he may not concede it to be as much as a jury would award.

In making offers it usually is unwise to offer a great deal less than what is a fair compensation for the particular case. Neither is it wise, once having set a figure, to raise the amount, unless, of course, some unexpected or unknown conditions come up and fully warrant such change.

In the adjustment of claims it is well to pursue a firm, just, conservative and comprehensive policy. The claim agent must be careful not to get a reputation for settling everything easily, neither should he go to the other extreme by unfairness or fighting everything. Unfairness and sharp practice may give a temporary advantage or saving to the company, but a broader experience has shown it to be a wiser and more economical policy in the end to deal promptly and justly with those really entitled to compensation for injuries sustained. Meet an honest man honestly. Settle promptly all serious cases that would eventually result in loss.

Owing to the public nature of its business, the necessity for further franchises, the danger of excessive awards by antagonistic juries, and other excessive burdens, it is reasonable for the company to avoid all causes, so far as possible, that engender public hostility.

On the other hand, street railway companies should strenuously resist all impositions. Run down all organized attempts to swindle the company by claims for physical disabilities of antecedent origin or otherwise. Fight vigorously all those cases that are fraudulent or possess little or no merit, and fight to win. I wish the victories for the companies were as well advertised in the daily papers as are the large verdicts of juries for plaintiffs.

In conclusion it may be stated that inasmuch as many accident causes arise on the part of the public and largely outside the control of the companies, also that the public has required the present faster car service, therefore, it behooves the public, as a body, to assist in the work of accident prevention, and individually to take greater precautions.

It is hoped that a careful, analytical study of the accident element in railroading by managers, and the practical, prompt execution of their findings, will result in a still better accident record and largely increased net earnings of their properties.

In order to have its employees better prepared to act in emergencies for the relief of persons who may be hurt on its lines, the Oakland Transit Consolidated, of Oakland, Cal., is considering a plan for the training of its motormen and conductors in the methods of first aid to the injured. Claim Adjuster John Ferrin, of the company, has been working for some time on a stretcher specially designed for use on street cars, and has just completed his models. The stretcher is so built that it folds quickly into a small package to be stowed under a car seat. When extended the device can be used to carry an injured person, or as a cot on which a person hurt may be laid in some comfort until aid can arrive. Mr. Ferrin has so arranged the stretcher that when an injured person must be transported some distance on the car for the purpose of securing medical relief, the litter can be hung between the seats back of the conductor's stand. The company is considering the installation of one of these stretchers on each car running on its system.

Mail service has begun on the Indianapolis & Northwestern Traction line between Lebanon and Frankfort.

NEW STEAM TURBINE DEVELOPMENT

In a paper under the above title recently read before the Engineers' Club of Philadelphia, W. L. R. Emmet, of the General Electric Company, presented the results of an interesting series of tests that have recently been made upon one of the first of the Curtis steam turbines that was put into practical operation. This first machine, which is of 500-kw capacity, operating a 2300-volt, 60-cycle generator, was installed in a power station of the Massachusetts Electric Companies, at Newport, R. I., where it has been in continuous service since July, 1903. It has carried the service load of this station entirely without interruption, and the results accomplished by it have proven very satisfactory. Two similar machines have lately been installed at this station also, but have been in service for only a few months; the operation of these machines is also proving very successful, and no trouble is being experienced.

In starting up the first turbine at Newport several troubles were met which required considerable experimenting to overcome, but after a considerable amount of experimental work, by permission of the owners, these have been successfully done away with and now the turbine is giving perfect satisfaction. The first serious trouble encountered was with the balance of the generator, which resulted in trouble with the bearings; this was overcome when the balance was improved by the attachment of suitable weights. Another trouble developed in the step-bearing which made possible a certain degree of instability of its action under certain conditions, but changes of design were adopted which have entirely overcome this trouble. The valves were also changed somewhat from their original design so as to embrace changes of proportions of parts, but without any change in general principle of action; this also resulted in improved action of the machine. Since these changes there has been absolutely no trouble in the operation of the turbines, and the labor of attendance and possibility of interruptions have been reduced to a minimum.

The following tests, which were recently conducted upon these machines, were made by George H. Barrus, of Boston, representing the owners, the Massachusetts Electric Companies, with a view of ascertaining whether they had met the guarantees of the contract. Associated with him in the work was R. H. Rice, recently of Rice & Sargeant, and A. R. Dodge, who represented the General Electric Company. The tests were made and water rates measured with various conditions of fixed load, both with and without superheat. Tests were also made with such variable commercial loads as are daily handled at this plant, and the steam consumption per kilowatt-hour under working conditions was ascertained by the most careful determination of the total water condensed, and the load as measured by many instruments and as recorded by carefully checked recording wattmeters.

Attention is specially called, in the paper, to the records of operation under commercial load, since they illustrate the great practical advantage afforded by apparatus of this kind. The character of the load during these tests involved incessant rapid fluctuations, with an average sudden variation of about 100 kw, and with an average load of only 253 kw in one case and 421 in another. In the former case the average steam consumption per kilowatt-hour was only 22.38 lbs. It is positively asserted by Mr. Emmet that the best steam engines now used for such purposes in this country would consume at least 28 lbs. of steam per kilowatt-hour under such load conditions, and in most cases the consumption would be considerably larger. The consumption of 20.73 lbs. per kilowatt-hour with an average of 421 kw of such variable load is a very fine performance.

In considering these results Mr. Emmet advises that it should also be borne in mind that the plant, which gives these results, possesses many other practical advantages which conduce to economy. All the condensed water in this plant, since it

originally started, has been returned directly to the boilers, and the boilers are, consequently, at the present time in a perfectly clean condition, although the natural water supply at Newport is bad. During all this time no oil has passed into the boilers nor been wasted; it is simply circulated and used over and over again. The absence of air leakage in the turbine, and the absence of air in the feed-water, greatly simplify the maintenance of a good vacuum, which, of course, contributes to these excellent practical results.

SUMMARY OF COMMERCIAL RUNS OF THE CURTIS STEAM TURBINE

Newport, R. I., Power Station of the Massachusetts Electric Company

	January 15, 1904	January 26, 1904
Duration	12 hours	15 hours
Total coal (wet)	13,517 pounds	10,205 pounds
Moisture in coal	3.1 per cent.	5.5 per cent.
Water evaporated	127,267 pounds	104,026 pounds
Drip withdrawn from steam pipe per hour	.....	46 pounds
Moisture by calorimeter	3.05 per cent.	2.1 per cent.
Total steam to turbine	108,100 pounds	86,833 pounds
Steam per hour to turbine	9008.5 pounds	5769 pounds
Dry steam per hour to turbine	8733.8 pounds	5667 pounds
Load by polyphase meter	406.4 kw	234.7 kw
Load on auxiliaries (average)	14.9 kw	18.5 kw
Total load (average)	421.3 kw	253.2 kw
Dry steam per kw hour	20.73 pounds	22.38 pounds
Dry coal per kw hour	2.67 pounds	2.54 pounds

In regard to the larger units of the Curtis turbines Mr. Emmet stated that in October last the first 5000-kw turbine was installed in the new plant of the Chicago Edison Company, and

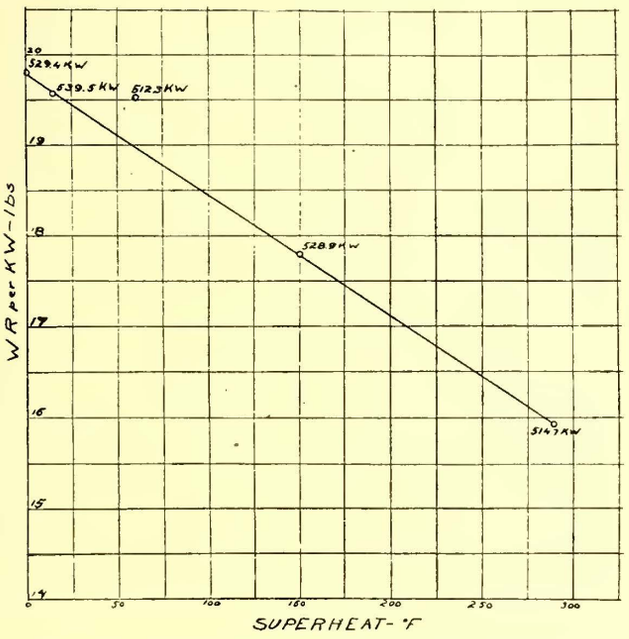


FIG. 1.—500-KW CURTIS TURBINE AT NEWPORT, R. I., CURVE SHOWING EFFECT OF SUPERHEAT ON STEAM CONSUMPTION (WATER RATE PER KW-HOUR)

since that time two others have been installed. This machine was put into commercial service soon after its installation, and has been in service daily since its original starting, and the second machine has been in service for several months past. Neither of them has been subject to any interruptions of service through its own defects, and for some time past they have both operated almost continuously, on some occasions having been kept under load for five days without stopping. In many cases they have operated with extreme overloads and have regularly been depended upon throughout the past winter.

Several unforeseen troubles have been experienced with these machines also; the valves, as originally designed, have been subject to the same difficulties experienced at Newport,

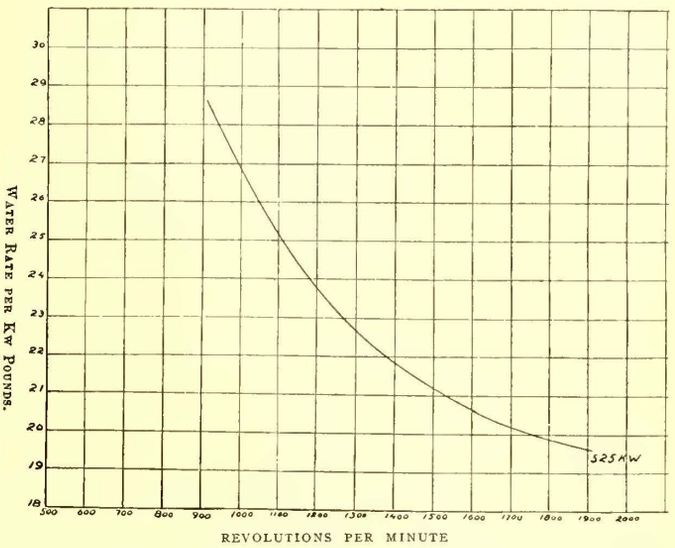


FIG. 2.—500-KW CURTIS TURBINE AT NEWPORT, R. I., CURVE SHOWING EFFECT OF SPEED ON STEAM CONSUMPTION (WATER RATE PER KW-HOUR)

and have been replaced by valves of such improved construction as could be applied without loss of time or interruption of service. This trouble with valves has, however, caused no stoppages, since the principle of governing is such that each valve operates independently, so that the failure of one simply serves to throw the work on to the next in order.

There have also been at Chicago certain unexpected movements of wheels, through variations of temperature, which

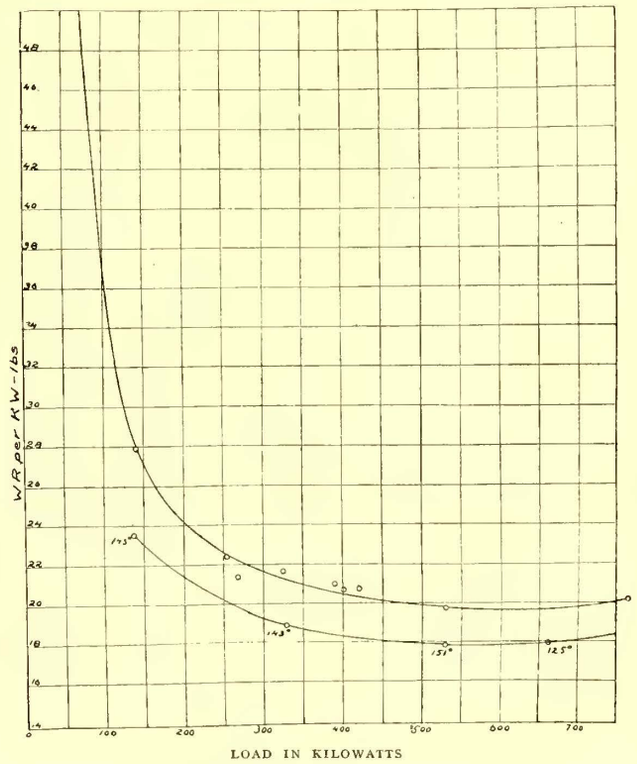


FIG. 3.—500-KW CURTIS TURBINE AT NEWPORT, R. I., CURVES SHOWING STEAM CONSUMPTION (WATER RATE PER KW-HOUR) AT DIFFERENT LOADS, WITH AND WITHOUT SUPERHEAT—INITIAL PRESSURE 145-LB. GAGE

have made necessary certain adjustments which were not originally intended. The fact that the machines have been required for daily service has made it impossible to correct the cause of these difficulties and has occasioned a little inconvenience in handling them. No trouble has arisen in connection with these,

or other machines, which is not readily curable and which cannot be avoided in all future machines, and none of the troubles has been of sufficient magnitude to interrupt the continuity of service or appreciably impair the efficiency of action.

The machines in Chicago operate with wonderful steadiness and freedom from vibration under all conditions of load. The generators are cool and have given no trouble whatever. The electrical regulation is good and the speed control has always been perfect, in spite of the difficulties with valves above mentioned. The machines have repeatedly been subjected to sudden accessions of heavy load, in cases of accidents with other apparatus, and have repeatedly been called upon to operate noncondensing without interruption of service, through some failure of the condensing facilities. In all such cases they have successfully performed the duty for which they were designed, the step-bearings never having given any trouble from the time the plant was started.

No official tests of the Chicago units have ever been made, and no accurate knowledge concerning their steam consumption is possessed. Tests were begun at one time, but a large and variable leakage in the condenser made it impossible to weigh water, and testing was postponed on account of the late season, which made it necessary to keep the machine in commercial service.

The facilities for shipment by rail limit the diameter of a 5000-kw machine of the Chicago type, and it is, therefore, designed for a lower peripheral velocity than other machines of the kind. It was guaranteed to give about the same steam economy as the machine at Newport, and it is probable that it gives a very similar result.

THE NEW TYPE OF CURTIS TURBINE

In regard to the most recent developments of the Curtis turbine, Mr. Emmet states that the early experience led to the adoption of new principles of turbine designs before the machines above mentioned were put into service, and very recently the first machine of this new type has been run and tested. These new condensing turbines are still of the vertical shaft type, but have four stages, while the earlier machines have only two. In each of these four stages there is a cast-steel wheel carrying at its outer edge two rows of buckets; the stages being separated by diaphragms which form separate compartments, and which are so shaped as to bear the pressure of steam to which they are subjected. In these diaphragms, or attached to them, are sets of nozzles which deliver the steam to the wheel of the succeeding stage, the number and size of these nozzles, and the portion of the circle which they cover, increasing from stage to stage as the steam expands. The wheels of these machines are of extremely simple construction and the attachment of buckets is simple and strong. They are operated with ample clearances and no adjustment whatever is required in their operation under any conditions. These machines can be started immediately without preliminary heating, and require no adjustments with changes of temperature, load or vacuum.

These new machines are also governed solely by the original admission of steam, the number of first stage nozzles in flow being controlled by the governor, and always kept proportional to the load. The stationary buckets in these machines project from heavy strips of metal fitted in slots and firmly held to the stationary part by heavy bolts from the outside. The construction is such that the injury through accidental interference between the moving and stationary parts is very small, no distortion or warping being possible, and is such as to make it easy to avoid such touching altogether, even where machines are started for the first time.

A 2000-kw machine of this new four-stage type was recently tested under the conditions of vacuum and superheat afforded by the Schenectady power station of the General Electric Company, although tests have not yet been carried far enough to fully analyze the possibilities of this machine with the best adjustment of shell pressures and all other conditions. The tests have, however, shown remarkably good steam economy, and it is probable that still better results will be produced within a short time.

The results and conditions of some of these tests are given in the following table:

	February		March					
	23d	25th	11th			12th		
	1	2	3	4	5	6	7	8
Load in kilowatts	1750	2400	1740	2210	2760	637	1000	2000
Revolutions per minute	760	760	750	750	750	750	750	750
Gage pressure	140.5	156.5	155	160	160	150	160	160
Superheat, F.	200	239	202	212	192	215	242	242
Inches of vacuum	28.5	28.5	28.73	28.50	28.35	28.2	28.9	28.78
Pounds of water per kilowatt hour	14.2	13.5	15.30	15.20	16.20	20.1	16.30	15.30

After the first two tests here reported a change in the arrangement of the machine was made, and this change produced an unforeseen condition, which was thought to be very disadvantageous to the machine. All the tests given were made with the best facilities for long periods with perfectly fixed conditions, and are believed to be nearly correct. The tests made under the second condition were witnessed by many prominent engineers, and all the conditions were accurately verified.

Satisfactory tests, without superheat, have not yet been made upon this machine. The indications of such tests as have been made are that the improvement with superheat is very large, and that in this respect the functioning of the machine is very similar to that of the Parsons turbines, which show more benefit from superheat than the earlier turbines of the Curtis type. The use of high degrees of superheat has been considered commercially desirable in connection with the Parsons turbines, and the indications are that the same reasoning applies to machines of this type.. These machines are designed to operate with superheat, without any mechanical difficulty, and it is probable that future steam plants designed for the use of such apparatus will use high steam temperatures.

NEW DETERMINATION OF THE SPECIFIC HEAT OF SUPERHEATED STEAM

Mr. Emmet states in this connection: "In the course of tests with experimental turbines, A. R. Dodge, of Schenectady, has observed certain conditions which indicate serious errors in the ideas previously accepted concerning the specific heat of superheated steam, and these observations have led us to make investigations of this matter. By delivering superheated steam to a turbine fitted with a water brake we can, at will, vary the amount of work extracted from the steam, until the exhaust is brought to a saturated condition. If we know accurately the temperature and weight of exhaust steam, and the temperature and pressure of the steam admitted, and have an exact measure of the work extracted from the steam, and of the heat radiated, we have in our possession all data necessary to calculate the total heat of steam admitted. This method of test is subject to certain difficulties and inaccuracies, but has the advantage that it can be carried on on a considerable scale with large flows and steadily maintained conditions. We have made such tests with different degrees of superheat, and have checked approximately some of our results by other methods of investigation. The result of these tests indicates that the specific heat of superheated steam under the conditions ordinarily used is much greater than has generally been supposed. The idea generally accepted, until quite recently, has been that the specific heat of superheated steam under all conditions was 0.48. Our investigations indicate the following figures:

VALUES OF Cp AT 155 LBS. ABSOLUTE

(Cp being the average of specific heat up to these temperatures; not the heat required for a rise of 1 deg. at these temperatures.)

Superheat	Cp.
0° F.	0.52
100° F.	0.65
150° F.	0.7
200° F.	0.74
250° F.	0.77

"It is probable that our investigations on this subject will be carried further, and that Mr. Dodge will publish fuller and more accurate figures. Since this work was done very similar figures have been arrived at independently and by different methods in England and in Germany."

DISCUSSION

In reply to questions from members and visitors at the meeting Mr. Emmet made some interesting explanations as follows:

"This type of turbine is adapted to operation between any pressure limits, and the work obtained will generally vary in approximate proportion to the variable energy in the steam.

"The wear of buckets, as determined by experience with existing machines and by experiment, is so small as to indicate inappreciable expense in maintenance. The appreciable wear is confined to parts which are in continuous contact with steam having a high density and high velocity, and these parts are small, inexpensive, and easily replaced. The first set of stationary buckets is subject to more wear than any other part. In a 500-kw machine this part should wear at least two years and should not cost more than $25.

"All of these turbines have been designed for electrical purposes and for operation at a fixed speed, the design being made with a view to accomplishing the highest attainable economy at this speed. The machines will, however, operate at other speeds higher or lower, and will give a fairly good economy through a considerable range of speed. I cannot, from memory, give specific data on this subject. Such machines give a large torque at low speeds, but there is, of course, a very rapid reduction of efficiency as the speed is reduced. The normal speeds of some of the machines which I have mentioned are as follows: 5000 kw, 500 r. p. m.; 2000 kw, 750 r. p. m.; 1500 kw, 900 r. p. m.; 500 kw, 1800 r. p. m. All of these speeds are fixed by the frequency of the alternators which they drive.

"All of the machines which have been described are designed for operation with condensers. They are all suitable for use non-condensing, and it may be roughly estimated that their steam consumption non-condensing would be about twice as great as it would be with a good vacuum. It is hoped that better non-condensing results can be obtained with designs made particularly for that purpose.

"When these machines are operated with superheat the bearings are in no way affected by the high temperature, the bearings being entirely external to the turbine.

"The relative economy of one of these turbines and a Corliss engine may be judged by the steam consumption figures which have been given. Much of the advantage of the turbine in this respect arises from the high degree of expansion which can be provided for in its design. Under conditions which are ordinarily practicable, I think that the turbines, even in their present state of development, are very decidedly superior to Corliss engines.

"There is no appreciable change in speed of the turbine when the machine passes from a condensing to a non-condensing condition. To operate with the same load non-condensing it must open more admission valves; consequently, the range of speed would be slightly greater. As our machines have generally been built, the maximum variation of speed non-condensing would not exceed 3 per cent.

"The pressure required in the step-bearing of the 5000-kw machine is about 1000 lbs. per square inch, and that in the 500-kw machine about 200 lbs. per square inch.

"The clearance between moving and stationary parts in the four-stage machine, which has been described, is about 0.05 of an inch. A less clearance would be practicable, but would be of very little advantage.

"The effect of wear upon the step-bearing is to gradually lower the revolving part. In the 500-kw machines with which we have experimented, the lowering, after the lubricant had been stopped, went on at the rate of about 0.01 of an inch per minute. In no case has any damage been done through the failure of the step-bearing except the wear on the blocks themselves, which involves inappreciable expense. As a rule, it is not necessary even to re-surface the step-bearing blocks after a stoppage has occurred. They tend to wear to a proper engagement, and if they do not they can generally be made to do so by successive short interruptions of the oil pressure. In properly arranged installations troubles of this kind can easily be avoided, and this should, of course, be done if possible. Weighted accumulators, as a reserve on the pumping system, are very desirable in this connection.

"The effect of rubbing, between the moving and stationary parts of these machines, causes surfaces to wear away gradually, but does not cause the rapid injury which might be expected. In many cases, through improper arrangements or inaccuracy of work, we have had serious and repeated rubbing, but in no case has this put a machine out of service or caused any serious injury to it.

"The smallest machine which we have built is of 1¼-kw capacity, designed to run an electric headlight on a locomotive. Its speed is 5000 r. p. m.

"The packing around the shaft, where it passes from one compartment into the next, in our existing turbines, simply consists of a loose sleeve which gives a considerable clearance around the shaft and is free to center itself. The pressure tends to hold this sleeve in any position to which the shaft may force it. Since the sleeves are inaccessible, considerable clearance is used, so that there will be no risk of cutting. There is, of course, a loss through the leakage of steam past these sleeves. This loss is, however, not very great. We have used successful packings which give much less leakage, and they may be regularly adopted in future.

"There is no lubricant of any kind used in connection with these packings, and since the bearings are external to the turbine base, there is no means by which oil can get into the steam. This is one of the greatest advantages of our turbine, and is an advantage which has not been fully realized in turbines of other makes. In most of the plants which we have installed, water is being returned directly from the hot well to the boilers, and there is no waste of water or accumulation of dirt or scale in the boilers.

"Mr. Curtis has made arrangements for reversing turbines of this type by using a separate set of buckets on the same wheel designed to receive steam from an opposite direction. These reversing buckets would ordinarily be applied to the wheels which operated in the vacuum space, so that in reversing the machine would operate as a single-stage condensing machine.

"The driving power of the turbine is confined to the buckets which come opposite to the nozzles which are in flow, and these nozzles occupy only a portion of the circumference, except in the last stage, where they generally occupy all or nearly all of the circumference. There is no unbalancing of the wheels caused by the delivery of steam to one segment at a time.

"The steam required to drive auxiliaries will depend upon local conditions. In the 5000-kw installation at Chicago, all of the auxiliaries are driven by a single-cylinder Corliss engine, and this engine delivers 70 ihp when the 5000-kw machine is running at full load.

"I cannot give any definite statement as to the degree of

superheat which may be economical. I am inclined to think that where superheat is provided by increased heating surface in the boiler, it will be found economical to use considerable degrees of superheat, possibly 150. I will have much more information on this subject within a short time, and would rather not express a positive opinion at present. Every turbine shows a different degree of improvement by superheat. In some machines the advantage is undoubtedly small, while in others it is certainly very great.

"We have built a very successful direct-current machine for our 500-kw turbine, which operates at 1800 r. p. m. This machine is of a very radical type, and its success shows the possibility of much other work in the same direction. I cannot say just what the possibilities are, but I am inclined to think that we can successfully apply direct-current machines to most of the turbines which we have built for alternating work, and that the results from these machines will be very satisfactory."

CORRESPONDENCE

DROP LETTER BOXES ON CARS

DULUTH STREET RAILWAY COMPANY
Duluth, April 25, 1904.

Editors Street Railway Journal:

In your issue of April 16 you refer to the use of drop letter boxes on cars. Letter boxes of this kind are carried on two of our lines in the city of Superior. On the line running to Billings' Park such a box is attached to a car at 3:47 p. m. in the center of the city, and makes a trip out and back, and is then taken to the postoffice. A mail carrier usually stops the car and puts what mail he has collected from the street boxes into this box. There is no postoffice or sub-station upon this line. The box is taken from the postoffice and is returned to the postoffice by one of our employees. On the line running to the East End a similar box is put on a car in the afternoon and taken off at the East End postoffice. Later in the afternoon the postmaster at the East End sends the box back upon another car, and it is taken to the central postoffice by one of our employees.

Persons sometimes stop cars en route to mail letters in these boxes, but not very frequently—if they did it would become a nuisance. The carrying of these boxes is something that was started before the present company had anything to do with the operation of the lines in Superior. The Government does not pay the company anything whatever for handling these boxes, although we handle closed pouches also upon the East End line and are paid for that service at the regular rate. We have recently had some correspondence with the Postoffice Department with regard to this service, and have had some thought of discontinuing it, but will probably not do so as it is more or less of an accommodation to the public, and we do not want to take any action that would inconvenience those accommodated by it unless it should become a nuisance.

Herbert Warren.

SAND TUBES FOR SANDING

Rochester, N. Y., April 30, 1904.

Editors Street Railway Journal:

It is well known that most sand boxes will not sand the rail properly when the car is passing around a curve. The reason for this is that as the box is carried on the car floor or platform and is placed directly over the rail when the car is on straight track, it will throw the sand to one side of the rail when on a curve. There are one or two methods for correcting this trouble, but as a rule when a car gets stalled on a curve the motorman or conductor gets a handful of sand out of the sand box and throws it under the wheel. To do this he usually has to ask the passengers who are sitting over the sand hopper to move so that he can get at the sand. Another serious objection to this primitive method of sanding the track is that the conductor's hands become soiled by contact with the sand, and this is not a desirable thing for a man who has to hand out and make change all day.

It has always seemed to me that it would be a very easy thing to provide two or three paper or tin tubes filled with sand and hung up some place in the car. These tubes should be about the same size as those used for dry fire extinguishing powders; that is, they should be 2 ft. or so long, perhaps 2 ins. in diameter and capable of holding a quart or so of sand, and might be hung up by a hook inside the car. When the car wheels commence to slip on a curve, it would then be a very easy thing for the conductor to grasp one of these tubes, pull it down so as to pull off the cover, step out of the car and throw under the wheels all or part of the sand contained in the tube. The tube could then be hung up again and refilled at any time. The tubes would also be useful in putting out flaming fuse boxes, and also for cleaning up the car floor from any cases of car-sickness.

R. P. Gorman.

ELECTRIC VERSUS STEAM LOCOMOTIVES

New York, May 9, 1904.

Editors Street Railway Journal:

In the issue of April 30 the editorial comments on the high-speed tests of German steam locomotives and on speeds attained in this country were interesting. The writer, who has some knowledge of both sides of the question—that of the contest for supremacy between the steam and electric locomotive—is of the opinion that the fight has only begun. Certainly most steam engineers are to-day as confident of victory as ever, and do not consider the contest at all one-sided, as our electrical friends seem to think it.

The strongest argument of the steam engineer is their contention that they will never be beaten in the long-distance haul. They do not necessarily mean high speed or great mileage per locomotive day, but length of track. They believe that there is a limit to the distance which it would pay to equip with electric traction a railway doing a general freight and passenger business, and in the present state of the electrical art they are right. They are not yet ready to admit defeat even in short-haul suburban passenger traffic, and will await the result of those, to them, experiments which are about to be tried at enormous expense by several railways.

To one who has watched the improvements in both kinds of locomotives during the past five or six years, it is difficult to decide whether the steam or electric locomotive has improved the faster. The steam locomotive of to-day presents about the same comparison to that of the earlier date as does the modern interurban car to that of six years ago.

The improvements in the steam locomotive, as exemplified in the "Atlantic" and "Lake Shore" types have been many. They include the wide fire-box, with its immense grate surface, and the increase in size and capacity of the boiler. The boiler pressure has been carried up to 250 lbs. per square inch, and the steaming capacity of the boiler, even with poor fuel, has been made sufficient to supply the largest cylinders which could be used with the tractive weight of the engine. The use of the piston value and the various types of compound cylinders has added greatly to the general efficiency.

It must not be supposed that this increase in efficiency means higher speed with a decrease in consumption of fuel, water and oil. The steam engineer was not trying to do that, but to reduce the cost per ton-mile hauled, and he has succeeded. He hauls freight and passenger trains of far greater weight than before, and at higher speed at less cost.

A somewhat mistaken idea has been held by many that the

steam locomotive designer is trying to save weight. This is not always so, but frequently railways ordering new power specify the maximum weight, generally on account of the strength of their bridges, and sometimes the weight of their rails.

They also carefully specify the minimum clearances of their railway, and locomotive design has now reached the point of producing the most powerful engine that can be built within given dimensions of height and width. The result of the increase in the size of boiler, diameter of wheels, etc., has all tended to raise the center of gravity so that if clearances were somewhat increased it would hardly be safe to raise it further on our now narrow standard gage.

Referring to speed contests, especially long steam locomotive runs, is there any evidence to support the theory that the locomotive failed to maintain the speed acquired in a spurt because of lack of steam?

The man at the throttle of a modern locomotive running at a speed of 100 m. p. h. over the best American railway, would have to be made of steel if he was to maintain that speed between water stations, even if they were 200 miles apart. Assuming that the grades are negligible, the alignments, strength and rigidity of the track determine the speed of either the steam or electric locomotive, although it must be true that the electric locomotive can be safely driven much faster over the same track than the other, owing to the absence of the terrific vibration produced by the reciprocating parts.

If, on the other hand, a straight rigid track of any length be built for the purpose of holding competitive speed tests between the steam and electric locomotive, the "power station on wheels" will surely be beaten as long as reciprocating engines are employed. The speed of the steam locomotive is limited by the speed of the steam in passing in and out of the ports, and by the effect upon the engine itself and upon the track, of the vibration caused by the great piston speed and the weight of the driving rods.

In discussing extremely high speeds in the future the "personal equation" of the engine driver must inevitably come into the question. Probably not one man in a thousand is able, however well trained, to drive a steam locomotive at a fairly continuous speed of 80 m. p. h. to 100 m. p. h., and do it day after day, without breaking down. The same conditions do not apply to an electric locomotive running at the same speeds. The sensation is different, and the strain is not so great, except that of watching signals. The electric motor seems to float and hardly touch the track, the motion is perfectly smooth, and one is apt to feel a sense of gratification that the car is heavy enough to hold itself down to the track, and that the steel-tired wheels have the M. C. B. standard tread and flange.

It is a little strange that many writers seem to put so much stress on the necessity of economizing weight in the design of a high-speed electric locomotive or car. Of course, a car can be made too heavy, but the trucks must be made heavy enough and strong enough to carry the powerful motors, and the car body of sufficient strength to withstand the strains incident to extreme high speed.

Perhaps those who are devoting their attention to increasing the speed of the steam locomotive do not realize that it is possible to design and equip an electric locomotive with motive power far greater than they can ever hope to achieve with the reciprocating steam engine within the limits of space required. It may be difficult to realize that it is not at all impossible to provide motors powerful enough to drive an electric locomotive or car up to a speed of, perhaps, 200 m. p. h. if all other conditions were favorable. In other words, the electrical designer is not troubled by the question of power, but only need concern himself with the resistance of the air as the ultimate limit beyond which he cannot go.

EDWARD C. BOYNTON.

MOVING THE PUBLIC FORWARD

Newark, N. J., May 5, 1904.

EDITORS STREET RAILWAY JOURNAL:

A careful perusal of the criticism in your issue of April 30 of the article entitled "Moving the Public Forward," convinces me that the gentleman who wrote it conducted his persistent studies from elsewhere than the rear platform of a street railway car. He speaks three times of the will of the conductor and the conductor's wishes in the matter. In regard to moving with a hydraulic rammer, I will say that I certainly would like to move out of the way those passengers who make themselves a nuisance on the rear platform, with a hydraulic rammer or anything else which would be effective. Where passengers are allowed to leave the car by the front platform, as in this city, the argument that it is necessary to stand on or near the rear platform in order to leave the car without crowding or pushing, disappears. A street railway company very properly can, and should, formulate rules which will save those passengers who occupy seats within the car from the necessity of pushing their way out through a crowd of men standing on the rear platform. Women passengers, especially, need this protection when these passengers include, as they often do, one or more of the rowdy class. Any legitimate means of forcing these persons to "move forward" would be welcome.

WILLIAM BROWN.

REMARKABLE EARNINGS OF THE DES MOINES-COLFAX LINE

In an interview with a representative of the STREET RAILWAY JOURNAL recently, President H. H. Polk, of the Interurban Railway Company, stated that the gross earnings of that company's line, between Des Moines and Colfax, were nearly $5,000 per mile of single track for the first year of operation. This record is remarkable, because of the low population tributary to this line.

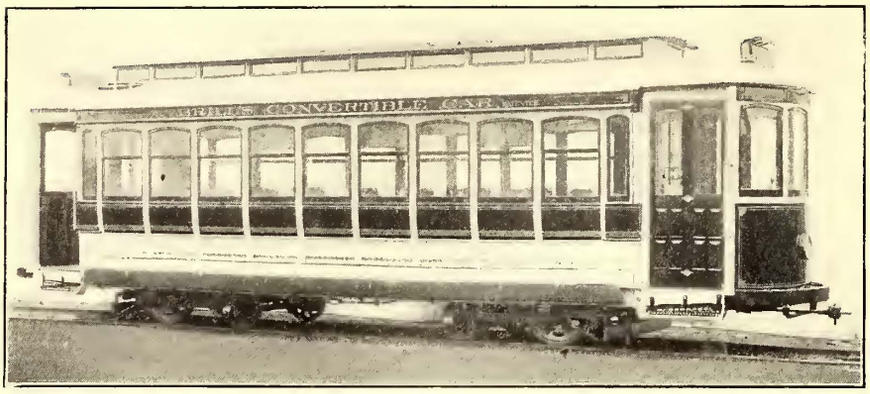
In the STREET RAILWAY JOURNAL of June 20, 1903, an article was published regarding this company's lines, and comment was made on the high earning capacity of the Colfax line up to that time, which was before the summer business opened up. At that time it was stated that the earnings would be at least $3,200 per mile, but that they would reach close to the $5,000 mark, and rival the earnings of many interurban properties running through much more thickly populated districts in Ohio, Michigan and Indiana, few would have dared to predict at that time.

The population tributary to the Des Moines-Colfax line, outside of the city of Des Moines, is not over 286 per mile, counting in everything that can be counted on a most liberal estimate. The actual population in 1900 of the towns and villages along the line was about 100 per mile.

When asked to explain the reason for such unusual earnings with such a small population, Mr. Polk says that it is probably due to the prosperous condition of Iowa farmers. The farms in Iowa are not as large as in some of the States where interurban building has been more extensive, hence the rural population per mile is not large, but what population there is has money to spend. The company sells mileage tickets, containing 500 miles, for $6.25. These mileage tickets are good for three persons. The mileage is on a strip, and the general form of the ticket is similar to the strip mileage used extensively by steam railroads. The three holders of a ticket must sign it when it is issued, and identification is by signature. It is believed that the selling mileage tickets to farmers encourages riding very much, as when once a ticket is purchased the inclination is to make use of it sometimes when cash fare would not be paid.

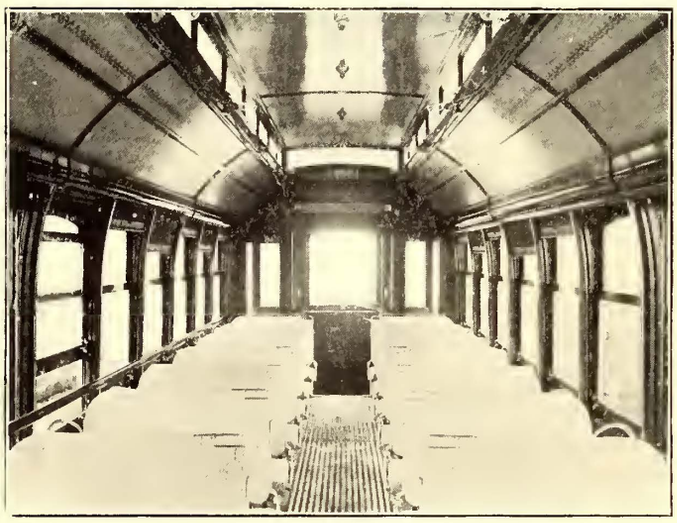
CONVERTIBLE CAR AT ST LOUIS EXPOSITION

The car shown in the accompanying illustrations is one of the three patented types exhibited by the J. G. Brill Company at the St. Louis Exposition. It is a significant fact that the



EXPOSITION CAR READY FOR WINTER SERVICE

main features of this car are the same as the first car of its type exhibited in 1898. In that car the window sashes were hinged together, while in the present arrangement the lower



INTERIOR OF CONVERTIBLE CAR AT ST. LOUIS EXPOSITION

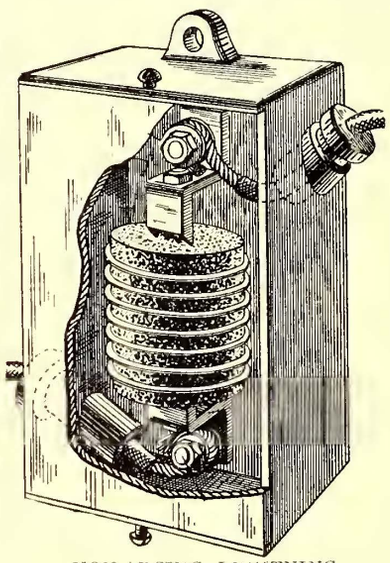
sash is raised alone until the tops of both sashes are abreast when they automatically engage, and the smaller sash is carried on the larger into the pocket. This lessens the depth of the pocket, and is an exceedingly simple and satisfactory method. The former type of revolving seat has been replaced with a step-over seat with a wider and more comfortable cushion. Brackets close the space between the seat back and the post, and are made to serve as grab handles, doing away with the usual grab handle on the outside of the post. Entrance guards slide inside the posts, and when not in use are held by patent gravity catches under the curtain guards. For cars longer than the one shown, longitudinal corner seats for three passengers are used, and solid panels extend from the double corner post to the first side post.

This car for the Exposition is finished in solid mahogany, of natural color, rubbed to an egg-shell gloss and richly inlaid with holly and ebony. The ceilings are of bird's-eye maple, with graceful decorations. Length over end panels, 25 ft. 9 ins., and over vestibules, 35 ft. 2 ins.; from end panels over vestibules, 4 ft. 8½ ins.; width over sills and panels, 7 ft. 6¼ ins., and over posts at belt, 8 ft. 1 in.; sweep of posts, 3½ ins.; from center to center of side posts, 2 ft. 7 ins.; thickness of side posts, 3⅜ ins., and of corner posts, 3¾ ins. The side sills are 4¾ ins. x 7 ins., with 7-in. x ⅝-in. plates on the outside; end sills, 4¾ ins. x 7 ins. Among other patented specialties of the builder's make with which the car is equipped are angle-iron bumpers, radial draw-bars, "Dedenda" gongs, "Dumpit" sand-boxes, ratchet brake handles, and round-corner seat-end panels. The cars are mounted on Brill "Eureka" maximum traction trucks with 4-ft. wheel base, 33-in. driving wheels and 20-in. pony wheels.

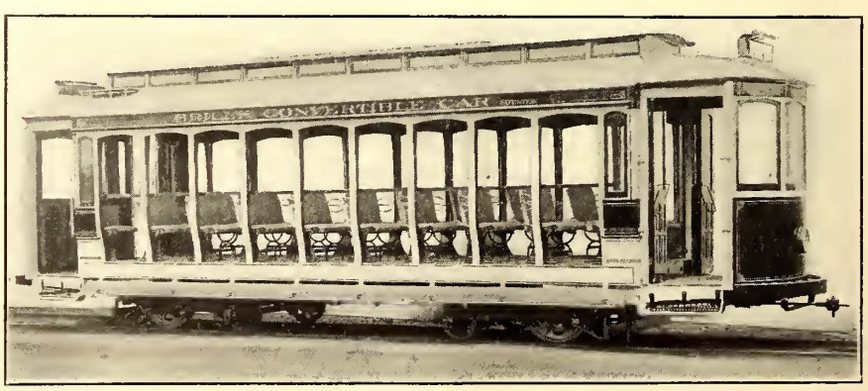
NON-ARCING LIGHTNING ARRESTER

The Franklin Institute, Philadelphia, Pa., has recently awarded the Edward Longstreth medal of merit to H. M. Shaw, of Newark, N. J., for the invention of the non-arcing lightning arrester shown in the accompanying cut. The simplicity of this device will be apparent from the following description:

The arrester is furnished with a plate of insulating material to which flat metal ribbons are secured by screws, the latter serving also as binding posts for one stranded wire and one grounded wire. These ribbons project from the plate for a certain distance, and are then bent parallel to the plate so as to have their serrated edges directly opposite. Between these serrated edges is placed a composite cylinder made up of alternating plates of non-arcing material, such as carbon and thin mica sheets. The carbon plates are mounted on insulating washers, and the mica plates extend down between these washers to a bolt made of some non-conducting material. The ends of this bolt are attached to the metal ribbons, as shown in the illustration.



NON-ARCING LIGHTNING ARRESTER



EXPOSITION CAR READY FOR SUMMER SERVICE

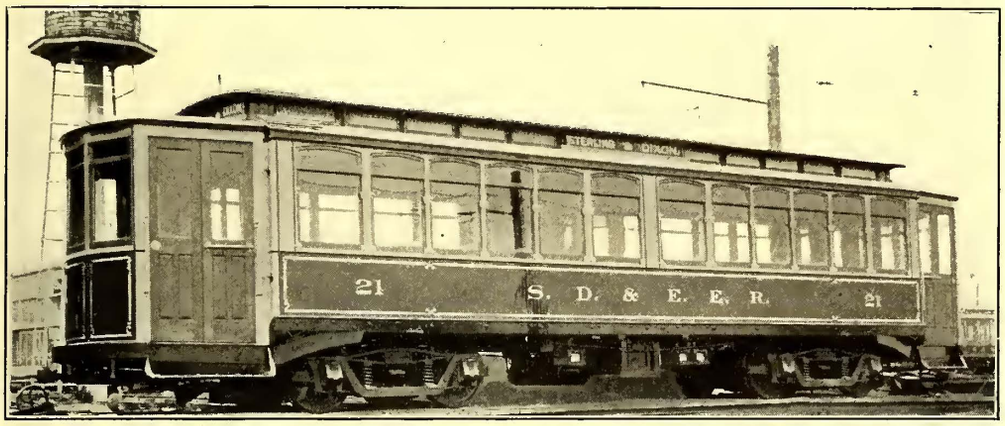
The lightning discharge enters the instrument by way of the stranded wire, passes through the first ribbon, and on reaching the serrated edge of this ribbon is broken up into small arcs and diverted to the flat carbon discs, which in turn break up the discharge into infinitesimal sparks. The latter are received at

the serrated edge of the second ribbon and conducted to the ground. By thus sub-dividing the discharge its destructive effect is reduced to a minimum, while the resistance of the composite cylinder is so great that the line current cannot follow the static discharge. The complete instrument consists of the foregoing parts mounted in a substantial case having a removable front.

STERLING AND DIXON INTERURBAN CARS

The cars for the Sterling, Dixon & Eastern Electric Railway, illustrated herewith, have a length of body of 34 ft. and a length over all of 46 ft. The width over all is 9 ft. These cars seat forty-four people. The platforms have double folding doors on each side. There are two compartments, one for smoking. Between the compartments is a heater on one side and closet on the other. The cars have the St. Louis reversible seats, covered with canvas-lined rattan. At each end of the car and next to the partition are longitudinal seats. The doors in the partition are double-sliding automatic as well as in the vestibule. The sash is arranged to drop as on a city car.

The trucks are the St. Louis Car Company, 23-AE, which is built on the same general lines as the other No. 23 trucks of this company, the main difference being in the arrangement of the end frames. G. E.-70 motors are used under this car. The sand-box and draw-bars are also of St. Louis manufacture.



EXTERIOR AND INTERIOR VIEWS OF INTERURBAN CAR FOR STERLING, DIXON & EASTERN ELECTRIC RAILWAY

IMPROVEMENTS ON THE METROPOLITAN ELEVATED, CHICAGO

The Metropolitan Elevated Railway Company, of Chicago, has recently ordered sixty-eight new motor cars, in anticipation of an increase of its train service next fall, when its new stub terminal at Fifth Avenue, near Jackson Boulevard, is completed. The plan is to run a large number of trains into this stub terminal during the morning and evening rush hours instead of operating them around the loop, as the maximum possible number of trains is now being operated around the loop. These sixty-eight new motor cars will be equipped with the Westinghouse electro-pneumatic turret train control system. The adoption of a train control system is essential to the rapid handling of trains in a stub terminal of this kind. The new motor cars, twenty-four of which will be built by the Jewett Car Company and forty-four by the American Car & Foundry Company, are to have sheet-steel floors underneath the wooden floors for preventing the spread of fires due to electrical causes underneath the car. The car wiring will be run in iron pipe conduit. The company has under construction an all-steel car, as an experiment, but owing to the importance of early delivery (as the present order of sixty-eight motor cars must be ready for service next fall), and because of the many details calling for special parts in an all-steel car, it was decided not to adopt the all-steel construction for this order. It is believed that the steel sub-floor will prevent the spread of the majority of fires, as the greater part of them originate under the car floor. The motor cars will have two motors each. Fifty-six G. E.-55 motors have been ordered and fifty Westinghouse 150-hp motors. One motor car will be used per train for this stub terminal service, and trains of not over four cars will be run. For some of the new motor cars motors will be taken from present four-motor equipments which the company has.

It is interesting to note in this connection that for the past three years the company has been operating a service terminating at Canal Street during the rush hours, and in this service twenty three-car trains have been used. These trains have consisted of a motor car with two trailers. In order that the train can be operated from either end without switching at the terminals, the motor car is placed at one end of the train with a type-L controller, and in the rear of the trailer at the other end is a modified type-L controller. By running three wires the length of the train from the motor car to the rear controller, the rear controller can be used to operate the motors either in series or parallel. The reversing is accomplished by electro-pneumatic control of the reverse cylinder on the motor car controller. An air cylinder, controlled by electro-pneumatic valves, throws the reverse switch of the motor car controller one way or the other. The circuit controlling these valves is connected to the reverse switch of the trailer controller.

The company has ordered two batteries, one to be placed at Forty-Sixth Avenue, on the Garfield Park line, and the other at Robey Avenue and North Avenue, on the Logan Square line. Both these batteries are the chloride type, with a capacity of 1200 amps., discharging at the 1-hour rate. Boosters will be installed in connection with these battery plants, and the object of the battery is to aid in carrying the morning and evening peak loads, which are very high compared to the midday load. The company has three-times the number of cars in service during the rush hours that it has during the middle of the day, and this difference is likely, if anything, to be increased when the new Fifth Avenue terminal is established.

Representatives of the Pavers' Union called on General Manager Stanley, of the Cleveland Electric Railway Company, a few days ago, to remonstrate with him for employing Italians, who work for $1.65 to $2 a day on paving work, as compared with the union scale of 50 cents an hour. The union leaders claimed the Italians were poor workmen, slow and wasteful, and that it would be cheaper in the long run to employ union men at the wage mentioned. Mr. Stanley stated that his company was looking for results, and that he would try a gang of union men with a union foreman, and that if they could show that union labor was cheaper the company would employ union pavers in the future. The proposition was accepted.

THE MANUFACTURE OF OVERHEAD APPLIANCES AT MANSFIELD, OHIO

The importance to successful railway operation of high standards of overhead insulation, and the probability of the use, through the development of the alternating current railway motor, of still higher voltages than those now employed, make a study of the methods of

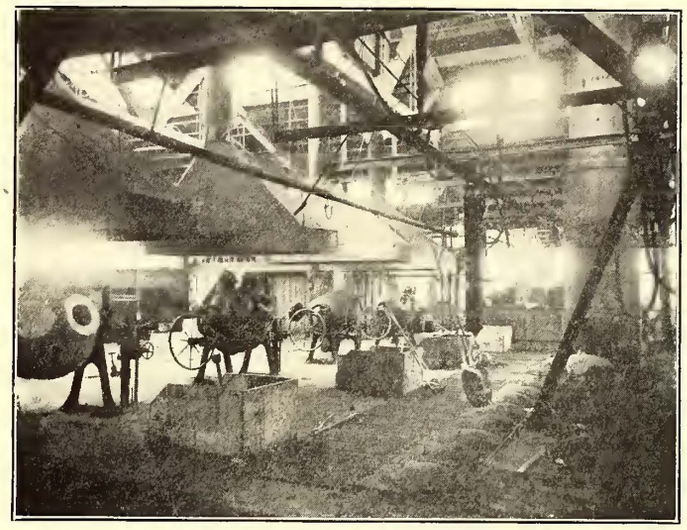


FIG. 1.—PART OF BRASS FOUNDRY, SHOWING GAS FURNACES

insulation for overhead conductors of more than ordinary interest at the present time. It is proposed in the accompanying article, therefore, to outline the practice in this respect of the Ohio Brass Company, as well as to describe briefly certain of the main features of the company's present works.

The plant of the Ohio Brass Company covers about 5 acres, with a floor space of buildings of about 200,000 sq. ft., and possesses the unique distinction of occupying a triangle made by three of the great trunk lines of the country, the Pennsylvania, the Erie and the Baltimore & Ohio Railroad. As switches connecting with each of these lines extend into the company's grounds its shipping facilities are of the best.

The power for the entire plant, as well as the heating of the several buildings, is furnished by a power plant, which occupies a separate building. The equipment consists of two tandem com-

FIG. 2.—BRASS FINISHING MACHINE SHOP

pound Buckeye engines, one being 300 hp, and the other 200 hp. Each of these engines is direct connected to a two-phase alternating-current Westinghouse generator of 180-kw and 120-kw capacity, respectively. These generators are arranged to run in parallel. The machinery throughout the plant is driven by fourteen induction motors of various sizes, each manufacturing department being operated by an individual motor. The boiler equipment consists of five Cahall water-tube boilers, aggregating 800 hp. The exhaust steam from the engines is piped through the various buildings for heating. A large air compressor is also provided for operating the pneumatic carriers in the foundry, and several other devices.

As the greater portion of the products of the company is produced from castings, the foundry and coremaking departments are very extensive. In the brass foundry the company melts up an average of from 8 tons to 10 tons of metal per day. A view of the brass foundry is presented in Fig. 1. Until recently, all metal was melted in crucibles in brass furnaces, and twenty-eight of these furnaces are still in regular use. In addition to these, four large gas furnaces to use natural gas have recently been installed. By this method the metal is melted much more quickly, so that the output of material is much greater than by the old method. Installed in the foundry is a pneumatic carrier system for conveying retorts of molten metal to and from the furnaces. As both wood and metal patterns constitute one of the most valuable assets of a firm in this line of business, it is essential that they be fully protected against danger of loss by fire, and for this purpose a large three-story fire-proof brick vault has been built in connection with the foundry where all patterns are stored except when in use. Each of these patterns is numbered and indexed by a card index system, so that any one of the many thousands of patterns can be located in a moment. A large pattern shop is operated in connection with the plant for the manufacture of both wood and metal patterns.

The brass finishing machine shop, in which all brass parts are finished, occupies the second floor of the larger building. A corner of this shop is shown in Fig. 2. The equipment embraces the latest types of engine lathes, turret lathes, planers, milling machines, etc. A number of special turret lathes are employed which have been designed especially for the particular work which they

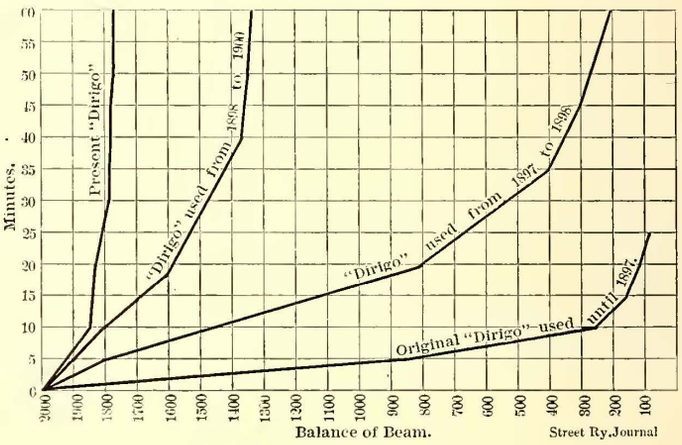


FIG. 3.—DIAGRAM SHOWING IMPROVEMENT IN DIRIGO

produce. Among the products of this department might be mention a large variety of trolley ears, clamps, etc., as well as motor bearings. Of the latter, over 150 varieties are made, all of which are accurately machined to gage. A large and well ventilated polishing department adjoins the brass finishing shop.

The general machine shop occupies the first floor of this building. Here is performed all the general machine work aside from the brass finishing. The equipment is very complete, including a number of very heavy tools. Aside from its railway material, the Ohio Brass Company is a large manufacturer of brass, bronze and copper goods of all kinds, and at present is doing considerable heavy work for the government war and navy departments. A part of the general machine shop is divided off for a tool room, where nearly all the special tools, dies, etc., used in the various departments are manufactured. A corps of tool makers is regularly employed at this work.

Probably the most interesting part of the establishment is the insulation department, which occupies a fine, new building 165 ft. long x 75 ft. wide, constructed entirely of brick and having a structural steel roof frame. The company has made a careful study of insulating material, and its present insulation, which is known to the trade as "Dirigo," is the result of experiments covering a number of years, with a great variety of substances, careful observations of the practical uses and results of these substances, together with the installation of a number of special machines for working the material. The requirements of a successful insulation for overhead line material are numerous. It must have extraordinary tensile strength, and great resistance to crushing strain. It must be absolutely uninflammable and moisture-proof, and must be able to withstand extremes of temperature, and above all, must be highly non-conductive. An interesting little book recently issued by the company on the sub-

ject of insulation shows, in the form of a curve sheet Fig. 3, the progress made in developing Dirigo insulation along the lines indicated above. The insulation is made directly from materials in the raw or crude shape. Fibres and gums of several kinds form the basis of the composition, and with these are mixed numerous other ingredients for obtaining the desired results. The composition, after being thoroughly mixed in special mixing machines, is ready for moulding, and is delivered to the pressmen operating hydraulic presses, where it is placed in dies and subjected to hydraulic pressure, which in some cases is as high as 80 tons. The hydraulic presses are operated by means of high and low-pressure pumps and a steam accumulator. Evidence of the extreme care used in maintaining the quality of Dirigo insulation, is shown by the fact that any waste composition remaining after each piece has been formed and smoothed off, is thrown into the scrap heap and afterward destroyed. It is never worked over again, as it is claimed that the wear from the dies and presses, together with dust collected, might impart to the composition particles of metal and other foreign substances which would tend to depreciate its insulating qualities.

Before leaving the insulation room, each piece of insulation is given a careful test, both electrically and mechanically. After the various parts have been assembled, and just before the complete article is shipped, each insulated piece is given another, and more thorough test. The testing devices used in this final test are located in the shipping department, and are shown in Fig. 4. In the mechanical test, each insulator is subjected to a severe tensile strain, which tests not only the strength of the insulation, but also the malleable iron or bronze castings which constitute part of the article. In the electrical test, insulators which are

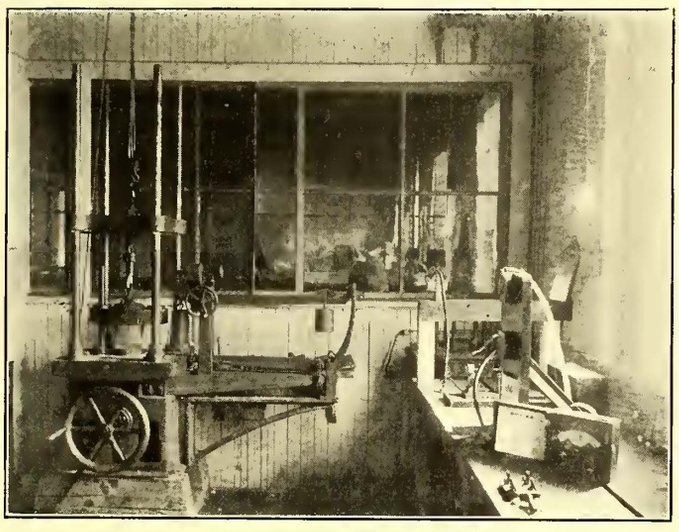


FIG. 4.—APPARATUS FOR APPLYING STRAIN TESTS TO INSULATING DEVICES

designed for 500 to 600 volts are tested to from 7000 to 10,000 volts. Any material which proves defective in the slightest degree in any of these tests is immediately destroyed, so that there is no possibility of any being shipped which is not up to standard.

All overhead material in which malleable iron is used is given either a japanned or galvanized finish. The japan finish used is what is known as the "baked finish," and not air dried, as the baked finish will stand rough usage in the weather much better than the air dried. The galvanizing department is a large one, and contains seven galvanizing tanks.

The production of rail-bonds is a large and important part of the company's business, and a specialty is made of the well-known "all wire" bond, which, as its name implies, is constructed wholly of wire. The wire is received on reels as continuous copper cable and is first cut to length. The pieces are passed to a special press, which bends them at right angles, and then doubles them. From there they pass to an upsetting machine, which forms the ends into the terminals, the strands of wire being compressed cold into the shape of the terminals, although the size of the latter is considerably larger than in the finished bond. Bonds in this stage are shown on the truck in the foreground of the view of the rail-bonding department (Fig. 5). The ends of the bond are then heated, one at a time, to the welding point in a special furnace, and in this condition are placed in a special press designed by the Ohio Brass Company. The dies in this press compress the terminals to approximately the required size and shape, and the wires composing the terminals are perfectly welded together into a homogeneous mass of solid copper. The terminal is finally placed in a trimming die and finished accurately to size. Bonds of this type are made in twelve varieties.

A new soldered bond, known as the Type G, which has lately

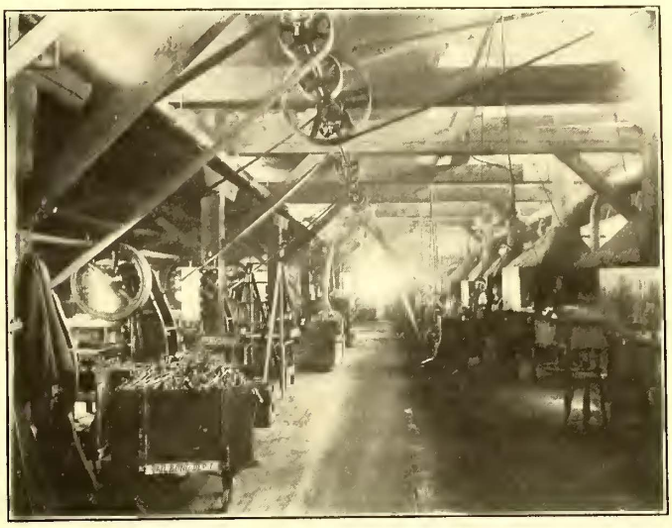


FIG. 5.—RAIL BOND DEPARTMENT

become very popular, is made in a manner similar to the process described above. The bond consists of a number of strips of soft cold rolled copper, the ends of which are welded, forming solid copper terminals. They are secured by soldering them to the ends of the rails, and for this purpose a special soldering torch and the requisite tools are supplied. The soldered bonds are made in two standard forms, one for attaching below the rail, and the other for attaching at the side of the ball of the rail.

As a large part of the product is shipped in barrels and boxes, an extensive carpenter and cooperage shop is required for the making of barrels, boxes, etc.

Although the company has been a strong advocate of, and has accomplished a great deal in the standardization of track and line material, it can fairly be said that the company has ever been ready to develop and bring out material to conform to the ideas of railway engineers who desired special goods, and a large part of its success has undoubtedly been due to this fact. A good idea of the number of articles manufactured by the company is best discernible by a walk through the storerooms. For example, in the line of pole brackets are over sixty types, the number of pieces in each ranging from fifteen to thirty, and each arm is made in four different lengths, and also several sizes of pipe. In the standard forms of line material manufactured, provision must be made for four sizes of round trolley wire four of figure 8 wire and three of grooved wire; in addition to this, a number of ears are made in a variety of different lengths and trolley wire hangers are made in bronze metal and malleable iron, both galvanized and japanned. From this the large variety which must be carried in

FIG. 6.—FIRST FLOOR OF WAREHOUSE NO. 12, SHOWING ARRANGEMENT OF SECTIONAL BINS

stock will be readily realized. In addition to overhead materials the company makes, or handles, an extensive line of motor and car supplies, general electrical supplies, third-rail insulators, construction tools, track-bonding tools, etc.

FINANCIAL INTELLIGENCE

Wall Street, May 11, 1904.

The Money Market

Rates for money have made the low records of the season in the course of the last fortnight. A million or two was actually offered and loaned on the Stock Exchange last week at ½ of 1 per cent. For sixty day accommodations on good collateral as low as 2 per cent was quoted, 2½ was paid for ninety days and 4 per cent for loans extending over the first of the year. The same conditions of extreme ease are revealed in the market for commercial paper. Here they take the form of an urgent demand on the part of bankers having money to lend, for all paper of the better grades that is offered for discount. Rates are quoted on the business at 4 to 4¼ per cent. Until Monday of this week, the supply of funds in all branches of the market ran far ahead of the requirements. A change toward a nearer balance between supply and demand has been noted, however, within the last day or two. The cause of this lies plainly enough in last Saturday's remarkable bank statement, which showed a decrease of $10,400,000 in the surplus reserve. This somewhat startling shrinkage is ascribed to the operations connected with the New York City bond issue of $37,000,000 announced a week ago. The City Treasury has evidently been borrowing heavily in anticipation of the proceeds of the sale, and this accounts for most of Saturday's $21,000,000 loan expansion. When the subscription money is all in, these loans will doubtless be paid off promptly and surplus reserve will regain most of what it lost in consequence of the operation. The effect on the money market has, on this version of the case, been more moderate than would ordinarily have been expected. The surplus even as it is, reduced below $23,000,000, compares with a total of only $10,000,000 for the corresponding date last year. While we are witnessing precisely what these articles foreshadowed several weeks ago—a rapid decline in bank reserves, the movement is not likely to go far enough to change the present easy situation very seriously. As soon as there is any hardening at all in money rates, the export of gold will cease, and with it the only important source of depletion for local bank resources.

The Stock Market

Extreme dullness has been the only feature in the week's stock market. Considering the stagnation in every quarter, prices have held very well, only a few of the regularly active issues having changed as much as a point. New York Central has been conspicuously weak on the report that the management are about to come out with a note issue. The Erie stocks have also shown some special selling pressure due partly to the poor earnings of the company and partly to their comparatively unprotected position in the market, now that the voting trust has been dissolved. Consolidated Gas has declined sharply on the expectation that the Governor will veto the so-called Remsen Bill, and Metropolitan Street Railway has slumped again for reasons which will be discussed presently. With these exceptions the market has held up very firmly. In spite of the unusually low condition —76 per cent—revealed in yesterday's monthly report on winter wheat, and in spite of the rather gloomy advices concerning the railway traffic outlook which have recently been received, holders of the granger railroad stocks seem to be confident of their position, and bearish operations directed against this group have so far failed to make headway. The view taken in banking circles is that the present dullness is a reflection of the lull which is everywhere being observed in the country's industries. Uncertainty as to the presidential nominations and elections, and as to the harvest future is largely but not entirely responsible for this lapse in activity. Beyond and above these more obvious influences is the fact that investment confidence, so rudely shaken in the upheaval of a year ago, needs a longer interval before it is completely restored. It is showing itself to a gratifying degree in the higher branches of the bond market, but there are no signs of it reaching yet awhile to the stock market. The men who manage the great Stock Exchange campaigns are undoubtedly waiting for the time when they can appeal to investment capital with more hope of success than they can just now. In this lies the real secret of the market's inactivity.

Metropolitan has been the center of interest in the local traction group this week. The theory now held by professional Wall Street, is that there must be something wrong with a 7 per cent guaranteed stock for it to sell so low. The argument is that either the price ought to be considerably higher or that it ought to be considerably lower, that the stock would be worth a good deal more if the dividend were regarded as absolutely safe, consequently it must be assumed that those who are in a position to know do not feel entirely secure that the 7 per cent can be maintained. These are the current Wall Street opinions given for what they are worth. They have been strengthened by the recent figures of the State Railway Commission, showing that Metropolitan has borne only an inconsiderable share in the general increase of the city's traffic during the past year, and by the further reflection that the opening of the subway is bound to cut heavily for a time at least into the company's business. On the other hand Manhattan stock has been bought by investors who have been impressed by the excellent showing of traffic disclosed in the State Commissioners report.

Philadelphia

The only features in the recent Philadelphia trading have been the strength of Union Traction stock and the weakness of Philadelphia Electric. The latter has again been heavily sold on the talk of an impending assessment, and it has shown itself more sensitive than any of the other traction properties to the collapse in certain other and more notorious quarters of the Philadelphia market. At 5¼—the low price of the week—Electric shares showed a loss of a full point from the high a month ago, which is considerable of a drop for a stock with a $10 par value. The advance in Union Traction to 50⅛—the highest price in a long time—is explained simply on the ground of an active inquiry from investors. Philadelphia Traction rose sympathetically a half point to 96. Philadelphia Company common was fairly actively traded in, but within a narrow range between 38½ and 39. The preferred sold at 44½. American Railways gained a half point, from 44 up to 44½. Only one sale of Rapid Transit was reported at 13. Consolidated Traction, of New Jersey, was notably strong, 150 shares changing hands between 64¾ and 65. Fairmount Park Transportation rose from 25 to 26 on transactions of 200 shares. One hundred Reading Traction went at 30½, 10 shares of Indianapolis Street Railway at 85¼ and 160 Rochester Passenger at 103. Three hundred United Railways, of San Francisco, common, sold at 10½ and 10¼ and the same amount of the preferred from 45¾ to 46¼.

Chicago

It is the opinion in speculative circles that the recent decline in the shares of the Union Traction and affiliated securities was greatly aggravated by bearish operations. In part proof of this West Chicago stock was offered down to 38, then when a genuine order to buy 100 shares came into the market it could not be executed better than 40¼. Union Traction has been active and stronger during the past week, selling at 5⅜ and 5½. According to present expectations, the decision in the ninety-nine-year franchise case will be handed down about May 25. Recent purchases of Union Traction shares have been based partly on the idea that this decision will be in the company's favor, and partly on the improving earnings of the lines, which, during April, were fully 15 per cent larger than a year ago. According to Exchange gossip the Metropolitan Elevated also had an excellent month last month, its earnings figuring out at the rate of 4½ per cent on the preferred stock. The market for the shares has shown no enthusiasm, however, over these computations. Scattering sales have occurred between 46 and 46¾. Lake Street Elevated receipts sold at 3¼ and 3⅜. Fifty shares of Nothwestern common went at 16, and South Side was strong at an advance of half a point, from from 91 to 91½.

Other Traction Securities,

Boston traction specialties have generally gone backward in the market of the last two weeks. Elevated, after selling as high as 142, sagged off to 140⅛ and then rallied to 141. Massachusetts Electric common dropped from 20 to 19¼ recovering only to 19½, while the preferred was decidedly weak at a decline from 73¾ to 72¾. West End common receded from its top figure—92⅝—to 90, but only odd lots sold at the lower level. West End preferred, on the other hand, rose a point from 111 to 112. Georgia Railway & Electric issues—newly traded in on the Boston Exchange—

were active, the common advancing from 38½ to 40, and holding most of its gain, the preferred rising from 79½ to 80. In Baltimore weakness has continued in United Railways securities; it is apparently part of a general downward movement among all the Baltimore home properties, which has been in progress intermittently since the fire. One hundred shares of the stock sold last week at 6¾—the low of the season. The income bonds, which have recently been quoted as high as 53, touched 49½ and rallied only to 49¾. The 4 per cent bonds meanwhile fell a point from 91¼ to 90¼ and later rallied to 90¾. Trading elsewhere in the Baltimore traction department was less active than usual. Anacostia & Potomac 5s lost 2 points from their late high figure, selling down to 98. Other sales comprised Lexington Street Railway 5s at 99½ to 100, Augusta Street Railway 5s at 101, and Norfolk Railway & Lighting 5s at 80. On the New York curb Interborough Rapid Transit has been decidedly strong, selling up to 110¼, as against 107 two weeks ago. Trading on the advance has been light. One hundred and fifty St. Louis Transit sold last week at 13 and 12½. A small lot of American Light & Traction preferred went at 92. Nassau Electric 4s have again been actively bought between 80 and 80½. New Orleans Street Railway 4½s sold between 75½ and 76.

Tractions were inactive at Cincinnati last week. Cincinnati Street Railway sold for about 330 shares with a range of from 137½ to 138. Detroit United dropped to 61½ and Toledo Railways & Light declined to 20¼ on small sales. Cincinnati, Newport & Covington preferred sold at 85½ to 86 on three small sales and the common sold at 30, a decided decline from recent prices. Cincinnati, Dayton & Toledo 5s sold at 78, also a decline. Five hundred shares of Miami & Erie Canal sold at 50 cents a share, which shows that holders are willing to take anything they can get to relieve themselves of the responsibility.

At Cleveland, Cleveland Electric advanced to 72¾ on sales of 175 shares. Nothern Ohio Traction & Light came into the trading at irregular prices from 13½ to 14, all small lots. A small lot of Elgin, Aurora & Southern sold at 28, two points off from last sales. Northern Texas sold ex-dividend at 35½, a fraction above the last previous sale. Aurora, Elgin & Chicago 5s sold at 77½, a decline of two points from last sale. Demand for Northern Ohio Traction & Light 5s was active, and the price advanced from 70 to 72¾ on sales of $15,000 worth. The 4s sold at 57½ for $5,000 worth. It is stated that negotiations are pending with Eastern bond buyers for taking up the $3,000,000 first mortgage issue of the Aurora, Elgin & Chicago Railway, and the $2,000,000 of Northern Texas Traction Company's 5s which are held under pool agreements until July 1.

Security Quotations

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

	Closing Bid April 26	May 10
American Railways	44	44½
Aurora, Elgin & Chicago	a14..	a14
Boston Elevated	142	140
Brooklyn Rapid Transit	46½	45¾
Chicago City	155	158
Chicago Union Traction (common)	5½	5½
Chicago Union Traction (preferred)	30¼	30½
Cleveland Electric	72½	72½
Consolidated Traction of New Jersey	64	64¾
Consolidated Traction of New Jersey 5s	106½	106⅝
Detroit United	61⅜	61½
Interborough Rapid Transit	107⅝	110
Lake Shore Electric (preferred)	—	a30
Lake Street Elevated	3⅜	3¼
Manhattan Railway	142⅛	143
Massachusetts Electric Cos. (common)	20	18½
Massachusetts Electric Cos. (preferred)	73	72
Metropolitan Elevated, Chicago (common)	15	15
Metropolitan Elevated, Chicago (preferred)	46	46
Metropolitan Street	113	108¾
Metropolitan Securities	79½	75
New Orleans Railways (common)	8	8¼
New Orleans Railways (preferred)	28	25
New Orleans Railways 4½s	75	76
North American	82½	84
Northern Ohio Traction & Light	13	13
Philadelphia Company (common)	39	38⅞
Philadelphia Rapid Transit	13½	13¼
Philadelphia Traction	96	95⅞
St. Louis (common)	11¾	13
South Side Elevated (Chicago)	91	91
Third Avenue	120	116
Twin City, Minneapolis (common)	92¾	94½
Union Traction (Philadelphia)	49⅝	50
United Railways, St. Louis (preferred)	53	57½
West End (common)	92	91
West End (preferred)	112	111¾

a Asked.

Iron and Steel

The break-up of the Lake Ore Iron pool has been the absorbing topic of interest in the iron trade. Although the dissolution had been long expected, it came as a good deal of a shock. A long period of unsettlement is now apprehended during which consumers in all departments will buy as little as they can consistent with their immediate wants. Prices have not as yet reflected the change, but owing to the recent great expansion in output it is thought that the sudden let-down in the consumptive demands will necessarily cause some weakening. Quotations are as follows: Bessemer pig iron $13.85, Besemer steel $23, steel rails $28.

Metals.

Quotations for the leading metals are as follows: Copper 13⅜ cents, tin 27¾ cents, lead 4½ cents, and spelter 5¼ cents.

CONSOLIDATION OF ROCHESTER COMPANIES

A plan has been outlined for the consolidation of the Rochester Gas & Electric Company and the Rochester Light & Power Company, of Rochester, N. Y., and the acquisition by the consolidated company of a controlling interest in the stock of the Rochester Railway Company.

The capital and funded debt accounts of these companies are as follows:

ROCHESTER GAS & ELECTRIC COMPANY	
Bonds and water power and real estate mortgages..	$6,230,000
Preferred stock, 6 per cent cumulative	2,360,000
Common stock	2,150,000
Total	$10,740,000
ROCHESTER LIGHT & POWER COMPANY	
Bonds	$125,000
Stock	500,000
Total	$625,000
ROCHESTER RAILWAY COMPANY	
Funded debt	$4,593,000
Preferred stock, 5 per cent cumulative	2,500,000
Common stock	2,500,000
Total	$9,593,000

The name of the consolidated company is to be Rochester Railway & Light Company. Its capital stock will be $3,000,000 of preferred stock and $6,500,000 of common stock. An issue of first consolidated mortgage 5 per cent bonds to an amount not exceeding $16,000,000 will be authorized. These bonds will be used to retire the present funded debt of the Rochester Gas & Electric Company, to take up the preferred stock of that company at 120 and its common stock at 110. Provision has been made for the sale of $500,000 of these bonds at par and accrued interest, and the balance will be reserved for future requirements of the consolidated company.

The bonds of the Rochester Railway & Light Company will be appropriated as follows:

To take up the Gas & Electric preferred stock at 120.	$2,832,000
To take up the Gas & Electric common stock at 110.	2,365,000
To be sold for cash	500,000
Trusteed against funded debt of Gas & Electric Co..	6,230,000
Trusteed for future requirements	4,073,000
Total authorized to issue	$16,000,000

The bonds are to be secured by a first consolidated mortgage upon all the franchises, real estate, plants, etc., of the consolidated company, and by a deposit as additional security, with the trustee, in pledge, of a majority of all present and future issues of Rochester Railway stock. The bonds will mature in fifty years, but will be redeemable on any interest day and on ninety days' notice at 110.

Stockholders of the Gas & Electric Company who so desire may receive the preferred stock of the consolidated company instead of bonds on the basis of 120 per cent for both preferred and common stock of the Rochester Gas & Electric Company. The amount of the preferred stock of the consolidated company will be increased to such an extent as shall be necessary to provide preferred stock for the Gas & Electric stockholders who shall elect to take it instead of bonds, and the amount of bonds set aside for them shall be added to the amount trusteed for future requirements.

Three million dollars of the preferred stock of the consolidated company is to be set aside to be used together with part of its common stock in the purchase of the common stock of the Rochester Railway Company. The common stock of the consolidated company received by the holders of railway common stock will be issued 50 per cent paid and liable to assessments of 50 per cent. The bondholders and stockholders of the Rochester Light & Power Company are to receive common stock of the consolidated company for their bonds and stocks.

No bonds will be used to acquire the bonds or stock of the Rochester Light & Power Company or the majority of the present issued stock of the Railway Company. By reason of the ownership of a majority of the stock, the consolidated company will control the Rochester Railway Company and the mortgage will contain a guarantee on the part of the Rochester Railway & Light Company that the Rochester Railway Company shall not incur any indebtedness of any kind except for current expenses and such as may be temporarily incidental to the ordinary course of its business, but this shall not prevent the refunding of existing liens or the sale by the Railway Company of its bonds already authorized but not issued, provided that its present bonded debt is not thereby increased to a greater extent than $125,000.

The three companies to be consolidated control the entire gas, electric light, power and railway facilities of the city.

Under the provisions of the plan about $1,250,000 in cash will be immediately available for the company's purposes; and from further assessments on the common stock and from surplus earnings it is estimated that another $1,000,000 will be forthcoming for betterments, extensions and improvements during the years 1904, 1905 and 1906, making a total of about $2,250,000 provided for use in that period, of which but $500,000 will come from the sale of bonds. In addition to this estimated amount of $2,250,000 there will be in the hands of the trustee $4,073,000 of bonds reserved for future requirements, and the common stock will be liable to further assessment of $1,300,000.

The plan for the combination of these companies has been formulated by Frederick Cook, Albert H. Harris and Granger A. Hollister, as representatives of the Rochester Gas & Electric Company, and E. W. Clark, Jr., C. M. Clark and A. G. Hodenpyl, as representatives of the Rochester Railway Company. These gentlemen, as a joint committee, will have charge of carrying out the details of the plan.

JOHN SCOTT MEDAL FOR MR. BRILL

The John Scott Legacy Premium and Medal issued by the Franklin Institute, of Philadelphia, for meritorious inventions has just been awarded to John A. Brill, of Philadelphia, for his invention of the Brill convertible and semi-convertible car. This award is based upon Mr. Brill's patents Nos. 623,724 and 691,351, also upon an investigation of the practical merits of the two types of car which was undertaken without the knowledge of any of the officers of the Brill Company. In its report, which is quite a lengthy one, referring to the method of construction and the desirability of these cars, the committee of the Franklin Institute says:

"The semi-convertible is unquestionably the safest and most comfortable car that we have yet seen, and as constructed by the J. G. Brill Company is the nearest approach to the ideal car that has come to our notice. The few advantages of wide openness and rapid filling and emptying capabilities of the open-side car are only gained at the expense of the safety of the passengers and the discomfort of getting into and out of them past an already occupied end seat. They have been tried thoroughly and are disappearing because these defects and discomforts are greater than their advantages, while the center aisle cross-seats and easily managed windows of the semi-convertible type of car is rapidly gaining popularity on its real merits.

"The ingenious and practical devices which have been developed and applied by the J. G. Brill Company in the production of their improved cars merit the unqualified approval and commendation of the Franklin Institute, and in testimony of this appreciation we recommend the award of the John Scott Legacy Premium and Medal to Mr. John A. Brill."

SAN FRANCISCO ANNUAL REPORT

The second annual report of the United Railways Investment Company, of San Francisco, and of the United Railroads of San Francisco, was made public May 2.

UNITED RAILWAYS INVESTMENT COMPANY, OF SAN FRANCISCO

GENERAL BALANCE SHEET AND COMPARISON, DEC. 31, 1903

ASSETS

Investments—	
United Railroads of San Francisco capital stock: 200,000 shares preferred, $100 par value each, 199,991 shares common, $100 par value each, valued at.	$24,799,784.00
Organization expenses	294,055.71
Cash on deposit	226,064.96
Total assets	$25,319,904.67

LIABILITIES

Preferred capital stock: 150,000 shares, $100 par value each	$15,000,000.00
Common capital stock: 100,000 shares, $100 par value each	10,000,000.00
Bills payable	64,582.66
Dividend on preferred capital stock—declared and payable	225,000.00
Profit and loss—surplus	30,322.01
Total liabilities	$25,319,904.67

STATEMENT OF INCOME AND PROFIT AND LOSS FOR THE YEAR ENDED DEC. 31, 1903

Gross Income—		
Dividends of 2 4-10 per cent on 200,000 shares, par value $100 each, of the preferred capital stock of the United Railroads of San Francisco		$480,000.00
Total expenses		13,109.66
Net income for the year		$466,890.34
Profit and loss—surplus at beginning of the year		13,431.67
Profit and loss—gross surplus		$480,322.01
Profit and loss charges—dividends on preferred capital stock—declared June 9, 1903; payable July 3, 1903; 1½ per cent on $15,000,000	$225,000.00	
Declared Dec. 9, 1903; payable Jan. 2, 1904; 1½ per cent on $15,000,000	225,000.00	
Total		450,000.00
Profit and loss—Surplus, Dec. 31, 1903		$30,322.01

UNITED RAILROADS OF SAN FRANCISCO

The business of the road for the year ending Dec. 31, 1903, resulted as follows:

Earnings—		
Passenger receipts	$6,189,898.01	
Other sources	53,320.96	
Total gross earnings		$6,243,218.97
Expenses—		
Operation (including $96,545.66 charged in monthly instalments for renewals).	$3,350,862.25	
Renewals (balance)	37,500.00	
Depreciation	113,272.81	
Taxes	409,200.00	
Total		$3,910,835.06
Net earnings		$2,332,383.91
Other income		24,754.00
Total Income		$2,357,137.91
Deductions from income		12,388.09
		$2,344,749.82
Fixed charges—		
Interest on bonded debt	$1,524,050.10	
Sinking funds	123,999.67	$1,648,049.77
Balance		$696,700.05
Two dividends paid		480,000.00
Surplus for the year		$216,700.05

Charged for renewals and depreciation for the year 1902, no charge having been made during that year.		157,500.00
Leaving a balance carried to surplus account of....		$59,200.05

The gross earnings are in excess of those of the year previous, a portion of which, however, is due to the strike of 1902, lessening the receipts of that year. The operating expenses and taxes for the year amount to 60.22 per cent of the gross earnings—an increase over the year previous, due to renewals of track, overhead line and equipment, increased wages of earmen and other employees, and extra expenses attending arbitration and other labor troubles. During the present calendar year additional provision must be made of over $11,000 per month for the first annual sinking funding requirement of the 4 per cent sinking fund gold bonds of this corporation.

While the amount expended for construction work has been in excess of the cash fund of $1,600,000 provided for that purpose by about $1,000,000 (provided from surplus, depreciation, and other funds) further amounts will still be required in the near future to meet the expense of additional car equipment ordered, reconstruction of the Cliff House steam line, additional power station equipment; as also for the erection of shops upon the site purchased for that purpose during the past year. The Sutter and Polk Street cable lines are inadequate to meet the present requirements of the traveling public and provision must also be made for their reconstruction within the not distant future. In view of these requirements your directors consider it advisable to make provision for them as rapidly as the opportunities present and thereby establish the permaneney of the company's dividends.

UNITED RAILROADS OF SAN FRANCISCO GENERAL BALANCE SHEET

ASSETS

Railroads, properties and franchises		$71,479,664.90
Additions and betterments to property		2,556,741.94
Market St. Railway Company bonds in treasury..		1,500,000.00
Mortgage sinking funds invested		878,665.87
Four per cent sinking fund gold bonds reserved—		
For underlying liens assumed.....	$9,866,000.00	
For future betterments, acquisitions, etc.	5,409,000.00	
Total bonds reserved		15,275,000.00
Fund for acquirement of outstanding stocks of—		
Market Street Railway Company.....	$25,400.66	
Sutter Street Railway Company	15,120.00	
Sutro Railroad Company	2,020.00	
Total fund for acquirement of stocks.....		42,540.66
Constituent companies—pro rata stock purchase consideration		23,145,539.34
Betterment fund from property sales		40,020.31
So. S. F. R. R. & P. Co. Stock.....		1,350.00
Material and supplies		352,880.99
Current assets—		
Cash with treasurer	$331,698.80	
Bills receivable	5,250.00	
Accounts receivable	39,603.39	
Cash on deposit to pay interest	145,327.00	
Cash on deposit to pay interest coupons in New York	20,380.00	
Change and bail funds	2,250.00	
Unadjusted accounts	1,230.00	
So. S. F. R. R. & P. Company	43,335.35	
Total current assets		589,074.54
Payments in advance—		
Insurance	$8,466.35	
Taxes	47,739.39	
Interest	365.40	
Total payments in advance		56,571.14
Total		$115,918,049.69

LIABILITIES

Capital stock—		
Common	$20,000,000.00	
Preferred	20,000,000.00	
Total capital stock		$40,000,000.00
Bonded debt—		
Four per cent sinking fund gold bonds.....		$35,275,000.00
Total underlying bonds assumed.....		14,591,000.00
Total bonded debt		$49,866,000.00
Reserve for mortgage sinking funds.....		$932,838.28
Reserve for insuranee		200,000.00
Reserve for renewals		133,022.35
Reserve for depreciations		19,339.93
Constituent companies—obligations		23,188,080.00
Current liabilities—		
Accounts payable	$372,462.84	
Pay rolls	143,928.07	
Unclaimed wages	1,382.64	
Employees' deposits	24,042.50	
Employees' hospital fund	2,526.14	
Tickets sold—unredeemed	2,392.51	
Bond interest due and unpaid.....	20,670.00	
Bond interest due Jan. 1, 1904.....	108,000.00	
Total current liabilities		675,404.70
Accrued, not due—		
Bond interest	351,016.66	
Sinking funds	60,000.00	
Miscellaneous interest	3,999.30	
Total accruals, not due		415,015.96
Profit and loss		488,348.47
Total		$115,918,049.69

THE OPENING OF ASSOCIATION ROOMS IN HARTFORD

On May 3 the new rooms of the Hartford Street Railway Employees' Voluntary Mutual Aid Association were opened in the new Wethersfield Avenue car house of the company. This organization is a mutual aid association existing among the employees of the Hartford Street Railway Company, with weekly dues of 50 cents per member, and with the usual sick and death benefits. The association is entirely self-supporting, and has been most successful. The new association rooms at the Wethersfield Avenue car house were provided by the eompany, and are probably as well equipped and as convenient as any meeting rooms of the kind that can be found. The furniture, which includes a new billiard table, was also the gift of the company, and was presented to the members of the association on the occasion of the opening, May 3.

Exercises of a special dedicatory nature were held on the evening of May 3, at which the keys of the rooms were presented to the officials of the association by B. R. Howe, secretary and treasurer of the company, and at which there were other special features in commemoration of the event. In recognition of the liberality of the company to the association on this and past occasions the members of the association presented E. S. Goodrich, president of the company, with a masonic jewel, emblematic of his thirty-second degree of masonry.

AN ELECTRIC RAILWAY PROJECTED BETWEEN INDIANAPOLIS AND CHICAGO

The Chicago & Northern Indiana Railroad Company, which proposes to build an electric railway from Indianapolis to Chicago, passing through Lake, Porter, Jasper, Pulaski, White Cass Howard, Clinton, Tipton, Hamilton and Marion counties, has been incorporated, with a capital stock of $25,000. The directors of the company are: Lester Soule, A. L. Wheeler and Charles N. Thompson, all of Indianapolis; Henderson E. Davenport, Sheridan; James G. Kemp, Kempton; Martin W. Eikenbury, Russiaville, and Luther McDowell, of Young America. Of the capital stock Mr. Soule holds $15,000. He is president of the Globe Construction Company, of Des Moines, Ia., which has the contract for building the Indianapolis, Logansport & Chicago railroad, which received a franchise the last administration to enter Indianapolis.

The new road will operate in competition with the steam roads running between Indianapolis and Chicago, carrying both freight and passengers. The line will be equipped with cars of the latest eonstruction and sleeping cars will be run between Indianapolis and Chicago.

Work on the new road will begin without delay. It is announced that a corps of civil engineers will start at once to survey the route. It is the intention to have the surveys made between Indianapolis and Logansport so that the work of construction may be begun June 1. This division of the road will be finished first, and will run through Sheridan, Russiaville, Kempton and New America, all without adequate transit facilities.

The new line will enter Indianapolis on the basis of other interurban railroads. By the consent of the board of works and by an agreement with the Indianapolis Traction & Terminal Com-

pany, the terminal station, at Market and Illinois Streets, will be used for the passengers, while the freight cars will be transferred to the other railroads at the Belt and taken to the freight depots.

Mr. Soule says that it will take between $1,500,000 and $2,000,000 to construct the road between Indianapolis and Logansport. The officers of the company are: Lester Soule, president and general manager; Henderson E. Davenport, vice-president; A. L. Wheeler, secretary and treasurer.

CONVENTION OF SOUTHERN STREET RAILWAY AND ELECTRIC ASSOCIATIONS

The Southwestern Gas, Electric & Street Railway Association and the Southwestern Electrical Association held a joint annual convention at Dallas April 25, 26 and 27, at which it was decided to unite the two organizations under the name of Southwestern Electrical & Gas Association. Those eligible for active membership in the new association are companies, firms or individuals engaged in the manufacture of gas, generation of electricity, operation of electric railways, telephone exchanges and telegraph lines. The officers elect of the new association are as follows: President, J. F. Strickland, of Waxahachie; secretary, F. E. Scovill, of Austin, and treasurer, A. E. Judge, of Tyler, Tex.

Most of the first day's session was occupied with discussions as to the benefits and evils of telephone competition. This discussion grew out of a paper read by Mr. J. E. Farnsworth, general manager of the Southwestern Telegraph & Telephone Company. At the conclusion of the afternoon session the members were tendered a trolley excursion around the city. In the evening various entertainments were provided for the visitors.

Among the papers announced on the programme were "Municipal Franchises," by John W. Shartell, president of the Metropolitan Railway Company, of Oklahoma City, and "Advantages of Combination of Gas and Electric Plants," by R. R. Stitcher, of the Cleburne Gas & Electric Company, of Cleburne, Texas. Mr. H. F. MacGregor, vice-president of the Houston Electric Company, read a paper entitled "Accidents and the Damage Suit Industry." Mr. MacGregor referred to the growing evil of damage claims based on the slightest pretext and frequently on fraud, and gave some advice as to the management of this department of companies. He stated that the increase in the amount of damages recovered from public service companies had recently become so large as to attract the attention of the Railroad Commission of the State of Texas to the injustice. Every member of the association, he said, should enlist in the campaign of exposure of fraudulent claims. Corporations have suffered from the administration of justice in Texas, not so much from the intent of juries not to reach the justice of the case, but from perjured testimony that creates conflict and confusion in juries and the failure of the trial court to assume the responsibility of setting aside a verdict that it conscientiously knows to be unjust. He urged upon the members of the association to give publicity to existing conditions in order to bring about a reform.

THE ST. LOUIS TRANSIT COMPANY'S FAIR EARNINGS

According to the statement issued by the St. Louis Transit Company May 6, the gross earnings for the month of April, 1904, were the largest in the history of the company. The best previous record was in October, 1903, but it is stated that the gross earnings of last month exceeded the earnings of last October by about $65,000. In April, 1903, the gross earnings of the company were $607,031, which was the high record up to May, 1904, but the earnings of last month were more than 17 per cent greater, being $710,338. Out of a total of 20,225,000 passengers carried last month, it is estimated that 14,206,760 were revenue passengers. In April, 1903, the total number of passengers carried was about 17,460,000. Based upon the gross earnings of last month, it is estimated that the daily receipts during April gained nearly 2500.

The statement of May 6 included the gross earnings for the four months up to April 30, 1904, which approximate $2,484,176. Contrasted with the same four months in 1903, this statement shows a gain of $303,882, or an average monthly betterment of $75,970. The net earnings of the company will be given out only in the yearly statement of operations, it being stated that it is practically impossible to determine the operating costs from month to month.

The company has fixed charges amounting in round numbers to $3,000,000, and it is believed that the surplus over the cost of operation will be more than sufficient to pay these charges, especially under the measures for retrenchment instituted by Vice-President and General Manager McCulloch.

Letters were sent to the managers of the street car companies by the World's Fair Manager, C. L. Hilleary, congratulating the company on the excellent results obtained. In his letter sent to Mr. McCulloch Mr. Hilleary says: "I feel it a pleasure as well as my duty to write to you and say how much pleased the World's Fair is with the excellent transportation facilities furnished by your company April 30. You and all your men are certainly to be congratulated. The transportation has been just as good since the opening, and we highly appreciate the work of the three companies. Chicago, with her elevated railway, her train and street car service, was far behind the work of the St. Louis companies. The crowd April 30 was the largest on the opening day of any exposition and the best handled."

TRAFFIC FIGURES OF NEW YORK COMPANIES FOR YEAR ENDING MARCH 28, 1904

At the meeting of the New York State Railroad Commission in New York City last week a statement of the traffic business of the surface and elevated railroads of the city, brought down to Feb. 29 of this year, was made public. The report for the year ending on that day shows that 670,000,000 passengers were carried in the Borough of Manhattan alone, not including transfers, which were 166,000,000. Some of the figures in detail are:

In Manhattan on the Interborough Rapid Transit (the elevated system) the total number carried in 1903-4 was 273,133,242 exclusive of transfers. This is an increase of 37,318,852 over 1902-3, which was 235,814,390. The total car mileage was 60,730,337, an increase of 12,870,859 over the previous year.

The New York City Railway Company, formerly the Interurban, carried a total of 397,644,829, an increase of 144,311. There was an increase of 5,129,287 in the first three-quarters of 1903-4, but the last quarter there was a large decrease of 4,984,976, making a small net increase. This did not include transfers. On transfer there were 166,310,453 passengers carried, an increase of 11,435,049. The car mileage showed a total of 62,412,527, a net increase of 954,666. The increase for the first three quarters was 1,661,666, but the large decrease of 706,900 for the last quarter reduced this considerably.

The Union Railway Company carried in the year 21,273,870 passengers, an increase of 1,998,543 over the year 1902-3, which was 19,275,327. With transfers the total number carried was 21,698,501. In the Bronx, all railroads, the total number carried for the year was 22,147,077, an increase of 1,988,636.

In a recapitulation for the Borough of Manhattan the enormous total of 670,778,071 passengers carried in the twelve months is shown, which is an increase of 37,463,163 over the previous twelve months. On transfers all lines carried 166,310,453 passengers, an increase of 11,435,049. There were no transfers listed from the Interborough. The total car mileage was 123,142,864, an increase of 13,825,625.

In the Borough of Brooklyn the Brooklyn Heights Railroad Company, which is operating the Brooklyn Rapid Transit system, carried 285,725,986 passengers, an increase of 23,280,423 over the previous year, which was 262,445,563. On transfers the road carried 55,146,001 passengers, a total net increase of 3,772,959. There was an increase in the number of transfers of 5,407,647 for the first three quarters, but the last quarter had a decrease of 1,634,688, reducing the net. The car mileage of this railroad was 54,394,315, an increase of 3,025,769.

The Coney Island & Brooklyn Railroad Company carried 33,129,812 passengers; an increase, net, of 967,765. There was an appreciable decrease in the second quarter on this road of 605,021, reducing the increase total of 1,572,786 quite considerably. This road carried 6,016,455 passengers on transfer, an increase, net, of 88,063. The total car mileage was 6,212,762, a net increase of 43,854.

The total number of passengers carried in Brooklyn on all lines was 320,107,163; an increase of 24,363,201 over the previous twelve months, which was 295,743,962. The passengers carried on transfers number 61,281,419; an increase of 3,864,782. The total car mileage was 60,733,233, a total net increase of 3,069,386.

In Queens and Richmond Boroughs the totals were, of course, much smaller. The total number of passengers carried in Queens without transfers was 16,058,207; an increase of 762,354. On transfers 2,080,913 passengers were carried, an increase of 52,777. The total car mileage was 3,875,573; an increase of 155,454.

In Richmond, on all roads, 7,744,255 passengers were carried without transfers. This is an increase of 498,610 over the previous year's total of 7,245,645. On transfers the various roads carried 746,468 passengers, an increase of 72,721. The car mileage was 2,259,520; an increase of 138,580.

The greater city, on all railroads, surface and elevated, carried 1,036,834,773 passengers. This is an increase of 65,075,964 passengers. The total in all boroughs for the previous year was 971,758,809. On transfers the total carried was 252,853,130, an increase of 18,015,410 net. There was a decrease in Richmond of 72,721. Last year the total number carried on transfer was 234,837,720. The total car mileage in the greater city was 197,826,719, an increase of 18,220,741.

UNIFORM SYSTEM RECOMMENDED FOR INDIANAPOLIS

City Engineer Jeup, of Indianapolis, has recommended to the Board of Public Works the adoption of a general plan for the extension of the street railway lines in the city, and to this end advises that a conference be held some time in the near future by the Board of Works and the Indianapolis Traction & Terminal company. As has been demonstrated by the number of requests for street car extensions along certain streets, serious complications are met by the board in fixing the routes, since there is no general system of car lines to be followed. At the present time there are ten requests before the board for extensions. Some of the routes asked conflict with the general system, and should many such extensions be constructed the system would become complicated and inconsistent.

THE TERMS OF THE SAN FRANCISCO SETTLEMENT

Last week the bald statement was made in the STREET RAILWAY JOURNAL that an agreement had been reached between the United Railroad of San Francisco and its employees, and that the threatened strike had thus been averted. Since then details have come to hand of the various overtures made by both sides, of the anxiety of the city during the hours of suspense, and of the good offices of Mayor Schmitz, which were in the main responsible for the settlement. A few hours before the expiration of the old agreement, and when it was generally thought that a strike soon would be on, the Mayor went before the men in meeting, and in the face of opposition from President Mahon, of the Amalgamated Association, and Mr. Cornelius, of the local association, secured the declaration of a truce for three days. This proved sufficient to effect a compromise. It was on May 3 that the union voted to accept the very agreement which on April 25 it had rejected. The terms finally accepted were practically the same as those noted in the STREET RAILWAY JOURNAL of April 23. The one point of difference was the question of the employment of union labor and the final stand of company in this matter as accepted by the men is best given in the letter of the company to the Mayor, which follows:

May 3, 1904.

To the Mayor of San Francisco.

Sir: We were notified by the Carmen's Union early on the morning of May 1 that action had been deferred by them, at your request, for three days. We were requested, thereafter, by your Honor, to meet you in the matter.

We feel it incumbent upon us, under these circumstances, not only to comply with your request, but to extend our proposal to the men till 3 a. m. on next Wednesday morning, in the meantime the status quo to be maintained; and, further, to emphasize our attitude toward our employees, we gladly accept your suggestion that the following words be embodied in our proposal, constituting the fortieth and final clause thereof.

"Section 40. The company fully recognizes the union as provided in this contract, and will not, directly or indirectly, interfere with or prevent the joining of the union by any man employed by the company after the date of this agreement, and it will be entirely satisfactory to the company if he should join. The company will neither discharge nor discriminate against any employee because of his connection with the union nor for any participation in any of the discussions or differences arising out of the present or any past controversy between the company and the union to the date of adjustment.

"When any member of the union shall have been discharged (except for failure to register fares) the president of the union shall be notified, and if in the opinion of the union the discharge is unjust, the matter shall be taken up with him and the member in question by the officers of the company having in charge the employment and discharge of men."

It is understood that one of the terms of this extension and addition is that the contract be for one, two or three years, as the union may elect, within the time above limited.

THE UNITED RAILROADS OF SAN FRANCISCO,
By Its Executive Committee.

Attest: GEORGE B. WILLCUTT, Secretary.

The agreement, by the way, is to stand for one year, or till May 1, 1905, and has been signed on behalf of the company and the men.

The Public Service Corporation of New Jersey has placed on sale at its trolley terminals, gas offices, etc., commutation tickets good over any division. Transfers will be issued for tickets for any 5-cent distance. Tickets will be sold in strips at the rate of twenty-one for a dollar, and books of 106 for $5.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED APRIL 25, 1904

758,131. Emergency Brake for Street Railway Cars; Patrick Flood, Albany, N. Y. App. filed Aug. 27, 1903. Details of mechanism whereby the brake-shoe may be thrown to a position between the track and the periphery of one of the wheels.

758,140. Magnetic Brake; John D. Ihlder, Yonkers, N. Y. App. filed Sept. 2, 1903. An electro-magnetic brake having means operated by the magnetic flux for effecting a slow action of the brake.

758,141. Track-Sanding Device; Washington H. Kilbourn, Greenfield, Mass. App. filed Aug. 13, 1903. Details of construction.

758,153 Ice Cutter for Third Rail Electric Railways; Samuel B. Stewart, Jr., Schenectady, N. Y. App. filed Sept. 20, 1901 Two pressure rollers traveling on the third rail, having corrugations on their peripheries at an angle to said periphery and scrapers adjacent to the rollers.

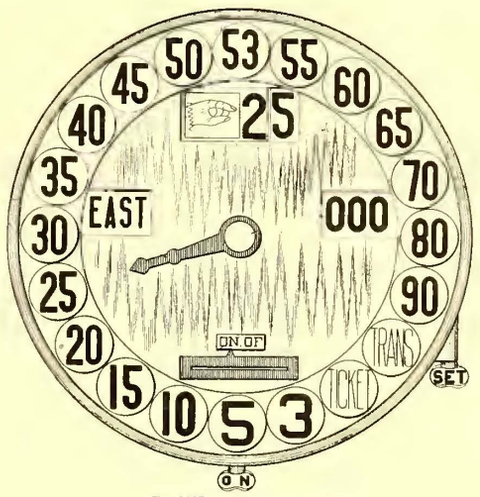
758,320. Train Control System; Harold E. White, Schenectady, N. Y. App. filed Nov. 20, 1902. The motors throughout the train are connected in pairs in such a manner that the armature of each motor of a pair is in series with the field of the other motor of the pair; the armature and field combinations are then treated as if they were series motors by connecting them in series and parallel in the customary manner.

758,355. Trolley Wheel; James S. Fletcher and Donald H. Waters, Chicago, Ill. App. filed Sept. 3, 1903. Details of the mounting and contact devices of the wheel.

758,398. Signal Operated by Car Brake Beams; Samuel N. Wilcoxson, Collingwood, Ohio. App. filed Jan. 13, 1904 The circuit to a signal lamp at the rear of the car is closed when the brake is applied, to notify a following car that the car ahead is being stopped.

758,445. Trolley Head; Peter D. Hean and John J. Egan, Media, Pa. App. filed Dec. 26, 1903. Details of a construction for maintaining the wheel in contact with the wire.

758,488. Fare Register: Hiram Tyler, Dayton, Ohio. App. filed Jan. 13, 1903. The fare register keeps a total record of the



PATENT NO. 758,488

cash fares separately, a total record of transfers and tickets separately, and a grand total of all the fares registered and indicated irrespective of their denominations of classes.

758,528. Current Collector; John E. Greenwood, Utica, N. Y. App. filed May 16, 1903. Consists of a double wheel trolley.

758,538. Rail Cleaner; Homer C. King, Elgin, Ill. App. filed June 30, 1903. A corrugated wheel adapted to be lowered against the third rail in oblique relation thereto.

758,552. Switch Operating Mechanism; John H. Miller, Christiana, Tenn. App. filed Sept. 24, 1903. Details of mechanism for throwing the switch from a moving car or train.

758,592. Safety Trolley; William M. Gruner and William C. Fink, Springdale, Pa. App. filed No. 5, 1903. Details.

UNITES STATES PATENTS ISSUED MAY 3, 1904

758,722. Controller Regulator; Vandiver J. Van Horn, Keokeu, Iowa. App. filed Sept. 10, 1900. Details of a motor controlling device which will enforce gradual movement of the controller handle in starting.

758,846. Auxiliary Fare Indicator and Protector for Street Car Registers; Felix Paduveri, San Francisco, Cal. App. filed Feb.

24, 1903. In a combination open and closed car, a bell is placed in the open part of the car and adapted to operate in conjunction with the fare register bell in the closed part of the car.

758,977. Guard Covering for Third Rails of Electric Railways; John Kress, New Rochelle, N. Y. App. filed Dec. 30, 1903 The roof of a third rail covering is divided into two laterally sliding parts, adapted to be moved aside by the plow as it progresses and afterwards to automatically close.

758,990. Railway Truck; William E. Ludlow, Cleveland, Ohio. App. filed Feb. 15, 1904. Details of construction of a light truck upon which a drill is mounted for operation upon the rail.

759,060. Electric Railway Switch-Point and Operating Means Therfor; Arthur J. Backer, Syracuse, N. Y. App. filed July 8, 1903. A magnet for throwing the switch tongue is located in the switch itself.

PERSONAL MENTION

MR. WILLIAM S. ROCK, who has been superintendent of the Raritan Traction Company, of Perth Amboy, N. J., for the past four years, has resigned and will handle masons' building supplies, etc.

MR. JOSEPH M. WALKER has been appointed chief engineer of the Pennsylvania & Mahoning Railway Company of Youngstown, Ohio, succeeding Mr. John N. Wolff, who recently resigned. Mr. Walker had charge of the construction work on the new Struthers line built by the company.

MR. JOHN GRANT, the retiring general superintendent of the St. Louis Transit Company, was agreeably surprised at his residence Friday evening, April 29, when a delegation of gentlemen connected with the Transit Company under his management presented him with a magnificent solid silver tea service appropriately engraved. The presentation was made by Mr. John L. Miers, division superintendent of the Olive Street line.

MR. ARTHUR E. APPLEYARD, of Boston, has been elected president of the Columbus, London & Springfield Railway, the Dayton, Springfield & Urbana Railway, and other properties in Ohio controlled by the Appleyard syndicate, succeeding Mr. John S. Harshman, of Springfield, Ohio, whose affairs were recently placed in the hands of the bankruptcy court, due largely to the failure of the Victor Rubber Tire Company, in which he was interested.

MR. GEORGE R. SCRUGHAM, president and manager of the Interurban Railway & Terminal Company, of Cincinnati, Ohio, recently contributed to the Cincinnati Enquirer an interesting illustrated article on the growth of the electric railway in the Ohio Valley. In this day, when so much is being said in the magazines and newspapers about scientific and other special subjects, it is indeed a pleasure occasionally to run across an article bearing on its face the stamp of authority and authenticity.

MR. RICHARD McCULLOCH, son of General Manager Robert McCulloch, of the St. Louis Transit Company, has accepted a position which will practically make him assistant to his father, giving particular attention to the mechanical and engineering departments. Mr. McCulloch is at present acting general manager of the Chicago City Railway. He is thirty-two years old, unmarried and was educated in St. Louis, finishing his studies with two years' work with a street railway company in Geneva, Switzerland. Returning to this country, he became his father's assistant in Chicago.

MR. H. I. BETTIS, who was formerly general manager of the Atlanta Consolidated Street Railway, and later auditor of the Paterson, Passaic & Rutherford Railway, and who left street railway service to become associate general auditor of the Union Pacific Railway Company, at Omaha, Neb., was recently appointed auditor of the San Pedro, Los Angeles & Salt Lake Railway Company. This corporation is one in which Senator Clark is largely interested, and is building a steam railroad line between Salt Lake City and Southern California.

MR. BENJAMIN S. HANCHETT, secretary and treasurer of the Grand Rapids Railway Company, of Grand Rapids, Mich., has in addition to his present duties been elected to the position of general manager, held by the late Mr. G. Stewart Johnson. Mr. Hanchett has been connected with the Grand Rapids Company and its predecessors continuously for twenty-one years. In 1883, when fourteen years old, he left the Grand Rapids High School to take a position in the office of the company. Soon afterward he was promoted to the position of assistant bookkeeper and then to bookkeeper. In 1888, under General Superintendent Bevier, he was made chief clerk. His next promotion was to the position of paymaster, and then he was chosen secretary of the old horse car system. When the Valley City Street & Cable Company purchased the car lines of Grand Rapids Mr. Hanchett became secretary and assistant treasurer of the consolidated systems. This company immediately began the conversion of the cable and horse car lines to an electric system. Mr. Hanchett continued as secretary of the Consolidated Railway Company until 1900, when the system was sold to its present owner, the Grand Rapids Railway Company, and he became secretary and treasurer of that corporation.

MR. C. P. WEAVER, special agent of the Philadelphia Rapid Transit Company and manager of Willow Grove, died a few days ago at his home in Philadelphia, after a brief illness. Mr. Weaver was born in Philadelphia Sept. 24, 1859, and was educated in the public schools and at Lafayette College. About twenty-six years ago he began his railroad career with one of the old horse-car companies. In a short time he was made an auditor in West Philadelphia and won steady promotion, until he became special agent and superintendent of Willow Grove Park.

MR. W. H. PAPE has recently become connected with the Galena Signal Oil Company, of Franklin, Pa., as salesman and mechanical expert. Mr. Pape has had quite a long street railway experience, and is well known in that field. In 1892 he was appointed superintendent of the light and power department of the Salem Consolidated Street Railway Company, of Salem, Ore., but resigned from that company in 1894 to become manager of the Franklin Street Railway Company, of Franklin, Pa., with which he was connected for six years. In 1900 he was appointed manager and consulting engineer of the Butler Street Railway Company, of Butler, Pa., and had entire charge of the construction and operation of this line until his resignation to become connected with the Galena Signal Oil Company.

MR. WARREN S. HALL, who has resigned as superintendent of the second district of the electric railway division of the Public Service Corporation of New Jersey, to become general manager of the Lehigh Valley Traction Company at Allentown, Pa., was tendered a farewell dinner on May 5. President Thomas N. McCarter and other officers of the Public Service Corporation were present, and after some very complimentary speeches in his honor, Mr. Hall was presented with a large traveling bag filled with a great variety of silver-mounted articles suitably engraved. Mr. Hall's successor in charge of district No. 2 is Mr. Arthur W. Pratt, formerly the Essex Division road master, and latterly superintendent of the Roseville, South Orange and Maplewood divisions of the corporation's lines. Mr. O. P. Coe has been named as successor to Mr. Pratt. Mr. Coe was formerly air brake instructor of the company.

FOLLOWING THE PURCHASE of the Camden & Suburban Railway, of Camden, N. J., by the Public Service Corporation of New Jersey, noted in the Street Railway Journal a few weeks ago, comes the announcement by President McCarter, of the latter company, of the appointment of Mr. William E. Harrington as general manager of the Camden & Suburban Company to succeed himself, and of Mr. Samuel H. Corliss as secretary of the company. Mr. Harrington has acted as general manager of the Camden & Suburban Railway since 1896. Under him the entire system has been almost entirely rebuilt, and a most efficient operating force has been organized. Mr. Harrington was born in Wilkesbarre, Pa., June 3, 1866, and graduated from the University of Pennsylvania, with the degree of B. S. in 1887. He is a member of the American Institute of Electrical Engineers, and of the Franklin Institute of Philadelphia, and has presented papers on engineering subjects before various technical bodies, including the American Street Railway Association, in which his interest is keen.

WILLIAM E. HARRINGTON

MR. HERMAN A. STRAUSS was appointed general manager of the Sheboygan Light, Power & Railway Company, of Sheboygan, Wis., early this year. The appointment came after about one year's service as engineer of the Construction Company of America, in the design and construction of 10 miles of interurban railway, and a large, modern, fireproof power station for the Sheboygan Light, Power & Railway Company. Mr. Strauss has had a large and varied experience. He was attached to the engineering staff of the Westinghouse Electric & Manufacturing Company for several years. He acted for two years as the assistant electrical engineer for the Manhattan Elevated Railway Company, of New York City, throughout the period of electrification of that system, and has done considerable independent consulting engineering work. The Sheboygan Company operates about 30 miles of city and interurban trackage and the lighting systems of Sheboygan.