Street Railway Journal

VOL. XXIV. NEW YORK, SATURDAY, JULY 16, 1904. No. 3

PUBLISHED EVERY SATURDAY BY THE

McGRAW PUBLISHING COMPANY

MAIN OFFICE:

NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:

Chicago. Monadnock Block.

Philadelphia: 929 Chestnut Street.

Cleveland: Cuyahoga Building.

London: Hastings House, Norfolk Street, Strand.

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

ST. LOUIS HEADQUARTERS:

Section 1, Electricity Building, Louisiana Purchase Exposition.

TERMS OF SUBSCRIPTION

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

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

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

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

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

To All Countries Other Than Those Mentioned Above:

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

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

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

EDITORIAL NOTICE

Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

All matter intended for publication must be received at our office not later than Tuesday morning of each week, in order to secure insertion in the current issue.

Address all communications to

STREET RAILWAY JOURNAL,
114 Liberty Street, New York.

Car-Wiring Rules

We take pleasure in presenting in this issue the proposed rules for car-wiring, drawn up by the committees appointed by the American Street Railway Association and the Underwriters' National Electrical Association, and which have been under close consideration for a year or more. There was a time, not so very long ago, when the insurance interests and the street railway interests, if not exactly hostile, were acting to a certain extent at cross purposes, with the result that the position of each was considered arbitrary by the other. This feeling is disappearing, however, and both sides are now largely united in the sentiment that progress can only be made through harmonious action. The importance of the subject of proper car-wiring is constantly growing with the additional capital continually being invested in rolling stock. A street car complete represented several years ago often not more than $2,500, whereas many cars now cost three or four times that figure. The amount of money at risk when one hundred or more of these cars are stored in one car house is enormous, and if this capital can be safeguarded by a set of reasonable precautions, it is for the interest of all parties concerned to take such action as they can.

To give an idea of the losses from destruction of car houses, the "Journal of Commerce," of this city, recently published a list of reported losses from car-house fires since Jan. 1, 1899. This list covered seventy-one losses, aggregating $4,737,000, or an average loss on these buildings of nearly $1,000,000 a year. Two of these fires cost $300,000 each, and one other $230,000, while a number of others involved a loss in each case of over $100,000. As the readers of this paper know, a great deal more attention has been devoted by both the insurance interests and the street railway companies to precautions against losses of this kind during the last year than ever before, and several recent articles in this paper indicate that a conscientious effort is being made to reduce the danger from conflagration to a minimum, both in the construction of car houses and precautions against fire in those which have been built. We understand that the proposed set of rules published elsewhere is the first only of a series which it is planned to draw up to protect against fires of this kind.

Economy in the Repair Shop

In common with all manufacturing establishments, the street railway repair shop offers a good field for the practice of economy. These are the days when the "production expert" walks abroad with a sharp eye open for leaks of every kind in industrial processes, in the praiseworthy effort to cut down all needless operating expenses. Believing that the best modern methods of eliminating losses are demanded by good repair shop practice, we have, of late, frequently called the attention of our readers to various labor-saving devices which have been adopted by progressive roads.

Unfortunately, with some officials, economy means getting along in the same old way without any change in apparatus from wasteful to efficient types—a policy which often produces but little effect when the balance sheets are made up. We recognize, of course, that there are times in the life of many roads when it is difficult to secure money for extensive improvements on account of the apathy of stockholders and the investing public, but there are often betterments which can be made without great expense, and which are most effective in ridding roads of preventable wastes. As an instance of this may be cited the case of a large repair shop's handling of motors. The shop in question is well equipped with compressed air hoists, which operate rapidly and freely over the car pits and upon the floor of the motor and truck repair room, but the motors themselves, after being taken from the trucks, are cleaned by compressed air in the repair shop yard. Two men are required to push each motor upon a small wooden flat car from the repair

room to the yard—a distance of over 100 ft. The time required to do this, including the return, is a minute and a half, against but 2 minutes to blow out the motor itself. Besides this 75 per cent increase in the time used up in cleaning motors, there is a further loss caused by the lack of a controlling valve near the nozzle of the air hose, as this deficiency requires the services of the second man at the wall valve, some 30 ft. away. There is no reason why one man could not do the whole of this work if the company would fit up an inexpensive runway for the pneumatic hoist to travel over between the yard and the repair shop; the time saving would be considerable through the doing away with the present slow-moving and back-breaking platform car, and this, with the placing of a valve at the operator's hands, would enable the second man to be used elsewhere in the shop. Allowing a salary of $50 per month to this man, it would pay to install a traveler, costing nearly $4,000, figuring interest at 6 per cent and all operating charges at 10 per cent. It is scarcely necessary to add that any such expense as this would be uncalled for, as the hoists are already at hand—the running track and its supporting brackets—constituting the missing link between inefficiency and economy.

In the same shops a list of instructions to employees was conspicuously posted, stating the duty of each department in case of fire. Unfortunately, the rules were printed as an almost illegible carbon copy of the original set of regulations, illustrating a species of false economy deserving much criticism. If there is any one requisite of such instructions that stands head and shoulders above their other characteristics, it is plainness. The complication of these particular regulations warrants their being read with absolute ease and extreme speed in times of emergency. Still another evidence of loose judgment was found in the whitewashing of hand grenades, so that they were inconspicuous when hung in place upon the walls.

We have instanced these two examples of cases where economy may be practiced because similar opportunities to save money await seizure upon many other operating roads. The fire risk always invites examination, and for a rainy day's work there are innumerable problems waiting to be solved in the direction of completing repair shop operations as quickly and conveniently as a minimum of expense will allow. It is by no means entirely settled yet as to when a single motor should drive all the machine tools in the repair shop. This, and other questions of power cost and consumption in the work of repairs, await the anaylsis and thought of those responsible for the maintenance factor in operating expense.

A Sensible Charity

One of the Metropolitan daily papers, which conducts each summer fresh-air excursions for the benefit and relief of the sick children in the tenement districts of New York, has taken a very sensible step. Instead of hiring steamboats and barges for a trip on the water or making an attempt to transport the little patients and their mothers 100 miles from home by steam train, the excursions this year have taken the form of a series of trolley trips. Arrangements have been made with the New York City Railway Company for frequent trips by chartered trolley cars into the suburban districts of the Bronx and Westchester County, and the results so far achieved amply justify the policy pursued. Outside the question of safety, which recent events indicate is a very important one, the trolley-car excursion possesses many advantages over that by steamboat, even for a city entirely surrounded by water, as is New York. The length of trip can be made as short or as long as may be required, and the mothers and their charges can be picked up and can leave the car at as many different points as may seem desirable. While a trolley-car outing may not be as permanently beneficial to the tenement dweller as a stay of a week or two in the country, it can be extended to one hundred persons where the fresh-air excursion by steam railroad would have to be confined to one. Altogether, the plan is one well worthy of consideration during the heated term by the philanthropical organizations and agencies in our different cities.

The Ethics of the End Seat Question

The conflict now being waged in the public press on the rights and duties of the occupant of an end seat in an open car continues unabated, and probably will survive so long as human nature is what it is, and there is a choice in seats in a public conveyance. We have already referred to this question in our columns, and revert to it in this issue only because the warm weather seems to have intensified public interest in the subject. The solution would be a simple one if the entire riding populace was as altruistic as those individuals who are demanding municipal legislation on the subject, and writing letters to the papers denouncing the "end-seat hog." Many stories related of the sufferings of these individuals in not being able to obtain the coveted position in the car are pathetic. But what is to be done about it? The Golden Rule has not yet been adopted by any municipal body as its general code, and while street railway companies may try to live up to it as regards their relations with the public, they cannot readily enforce it upon their passengers. Unquestionably the end-seat hog is more or less of a nuisance in loading and unloading cars. It would be much more convenient if all passengers could be stowed away in inverse order of their destinations and could thus slip quietly out seriatim, but no such arrangement being possible, the street railway man must simply meet conditions as he finds them. We do not see how it is incumbent upon him to make and enforce regulations upon the order in which passengers shall seat themselves, particularly when he is not prepared to furnish end seats to all comers. In the leisurely conduct of tramways on the continental system, it might perhaps be possible to legislate on the end-seat question with some degree of success. This situation is not in accordance with American conditions, and so long as passengers insist on piling upon the cars on the devil-take-the-hindmost plan, very little can be done. It is certainly not the business of street railway companies to set up schools of polite manners, save as they may teach by example, and they are not obliged to apply to themselves any of the present series of newspaper tirades on the subject.

Nor do we think that any material good can be accomplished by municipal enactments. Even the move-over rule cannot be trusted to work well in practice, for it may compel the short-ride contingent to climb over the knees of those who are there to stay. There is no great comfort to be derived from having a couple of fat parties on the off-side trampling over one's feet in the endeavor to get out in a hurry—it were better had they stayed upon the other end of the seat. Surely no small proportion of end-seat occupants are better settled in their appropriate corner seats. The protests against the habits of this member of the porcine family are numerous and vivid, but can every objector be guaranteed regularly to keep out of the coveted corner himself (or herself)? By no means, and unless we mistake, the complaints are quite as frequently the squeals of envy as they are the voice of righteous indignation. That there is need of more courtesy to each other among street-

car passengers we cannot deny. The flower of courtesy does not flourish as we would wish in the soil of a 6 o'clock crowd, but regrets are vain, and the attempt to make the leopard change his spots is still more vain. We are sorry that every passenger is not a mind reader, who can place himself at once in the most convenient spot, and so relieve the present situation. We of the street railway fraternity have to take him—a great many of him—just as we find him, and make the best of his idiosyncrasies. We wish the public would be more considerate in many places, notably elevated platforms, and at all times, but we cannot do more than to express our feelings in the matter without overstepping our proper powers.

The Engineer Gets Left

The commencement season of multitudinous colleges and universities is now over, the graduates have their sheepskins and distinguished alumni are made happy with academic honors. But, in reading over the lists of honorary degrees conferred, one is struck by the fact that in the distribution of these honors the narrow lines of the older education are still slavishly followed, and those graduates who have merely rendered illustrious their Alma Mater by distinguished success in the technical advancement of civilization are as a rule left out in the cold. The lawyer who has organized a great trust purrs comfortably under the robe of a Doctor of Laws, while the engineers, perhaps from the same university, who have made it possible and are directly responsible for its future, have nothing but the consciousness of work well done. We are not disposed to deny that this consciousness is a finer thing in its essence than any academic recognition thereof, but men at large are not, and should not, be entirely insensible to an appreciation of merit, and it should not be denied them if, by their intellectual powers, they have achieved greatness in those lines for which they were, by their academic experience, especially fitted. We can quite understand the hesitation of university authorities in granting honors to those who, however successful, have won their place in the world by efforts outside the strict lines of academic training, but why deny them to those who have gone on into the very fields for which they were fitted by their attendance and studies at the university?

The time has come when engineering in its varied branches should be taken without qualification in the honorable fellowship of the learned professions. Time was when the engineer was only an advanced artisan, graduated only from the workshop and rising above it by his own unaided efforts. That time is now long past, and for the adequate training of the engineer there is demanded a course of instruction far more thorough and vastly wider in its scope than that customarily demanded of the doctor, lawyer, or minister. The engineering course in a modern university demands severer application and more thorough preparation than the so-called liberal arts' course in the same institution. No student ever picked an engineering course out of the curriculum as a "soft thing." And it is a fact that entrance into a first-class engineering school is beset with far more difficulties than entrance into the usual law school or medical school. After graduation, the engineer has to keep in closer touch with his technical training than almost any other professional man, for his field of work is expanding and developing new requirements at a rate unknown in other professions, not even excepting medicine. The law is largely a crystallization of precedents, brought down through centuries, and divinity cannot be regarded as a field for the exploitation of new conceptions, unless one wishes to qualify for an accusation of heresy, while engineering continually discloses new methods and new concepts, which must be grasped and applied with swift decision. It is to-day in every sense a learned profession, and none the less so because it is a product of the new education rather than the old.

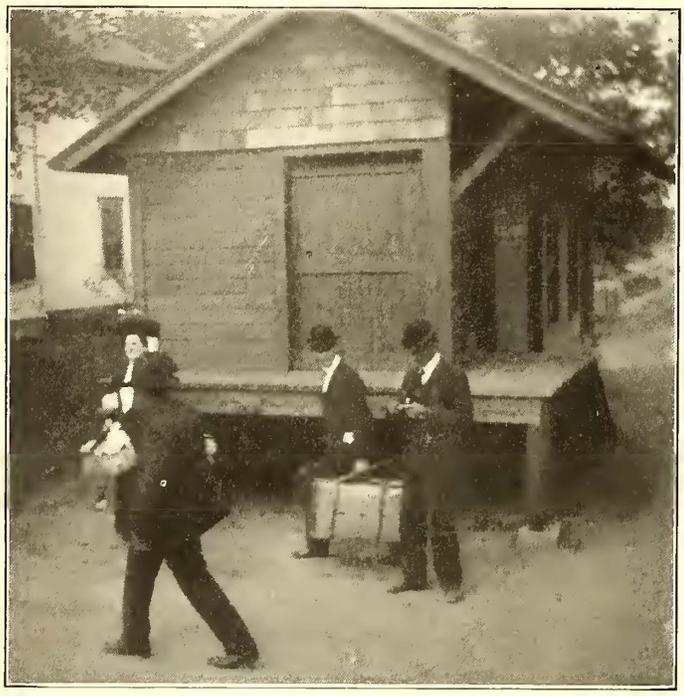
But academic authorities have been slow to grasp the situation. The degrees which they have in stock seem consecrated to antiquity, or unavailable for modern uses. The two higher scientific degrees—Ph.D. and D.Sc.—are by common consent and wisely reserved as the laurels of post-graduate study, and are not now granted by self-respecting institutions causa honoris, save in case of extraordinarily distinguished merit. And for such use they seem scarcely adequate—an honorary Ph.D. for Darwin, for example, would have been an idea to provoke a grin. There are no distinctly engineering degrees above graduate rank, and if there were they would not fill any long-felt want—for the list of tentatively-used miscellaneous degrees is already ridiculously long. There are, however, available, the two time-honored and dignified degrees of LL.D. and D. C. L., both noble relics of the time when all learning that was not theology was law. These have long been used abroad, and particularly in England, to honor men pre-eminent for learning and intellectual achievements, or those who in other paths have left a deep mark on the world's progress. Statesmen, scientists, jurists and men world-known in art and letters are joined in this notable company. Why should not our universities more frequently grant these degrees to renowned sons who have won unquestioned place in engineering? They seldom have seen fit to do so in the past, but is not this failure a mere remnant of the old prejudice that ranked monkish Latin higher than mathematics, and long denied to science a coordinate place in a liberal education. We believe heartily in a liberal education, the deeper and wider the better, but we would not confine its rewards to a few time-worn fields of scholarship. The new education and the chieftains in its victories are equally worthy of honors.

The Chicago Union Traction Tangle

The Chicago Union Traction Company at the present time presents one of the most colossal financial tangles in the history of the electric railway business. This may appear to some of our readers as an unnecessarily plain statement of fact, but those who are well acquainted with the paper know well that we are not given to idle or useless criticism. Our policy is to build up, rather than tear down. Criticism is useful only where it points the way to improvement. In calling attention to the unfortunate condition of the aforesaid company, we are not so much offering criticism as mentioning a fact that is a matter of common conversation wherever street railway men acquainted with the facts get together. It is not our purpose here to go into a detailed history of the reasons for this gigantic financial wreck, for our subscribers might object if we were to give over several entire issues to a history of the troubles of the Chicago Union Traction Company. Leaving aside all the legal tangles and internal strife, and getting down to the bottom causes, it appears to be a simple, old-fashioned case of overcapitalization, aggravated first by long-continued troubles over franchises with the city, and second by an entire lack of adequate depreciation, reserve and sinking funds in years past. Big wrecks of this kind, however delightful from a purely spectacular standpoint, are anything but pleasant to those of us who have the permanent welfare of the street railway business at heart. If they serve as a warning to other companies, all of the money lost in them by over-sanguine purchases of securities will not have been entirely wasted.

THE CLEVELAND, PAINESVILLE & ASHTABULA ELECTRIC RAILWAY

Reference has been made in these columns on a number of occasions to the great chain of electric lines that is paralleling the main route of travel between New York and Chicago. As is generally known, it is now possible to travel from Western New York entirely across Northern Pennsylvania and Ohio to points in the interior of Michigan, and roads are under construction which within two or three years will make possible through electric travel between Buffalo and Chicago. Some of the recent builders along this route have appreciated the possibilities for future through traffic, and have used great care to design their roads for heavy high-speed service. From point of construction, one of the best of these properties is the Cleveland, Painesville & Ashtabula Railway, operating between Painesville and Ashtabula, Ohio. This road was placed in operation in the fall of 1903, and is the connecting link in the chain of lines mentioned above as being now in operation.



STATION AT A SMALL TOWN

The proposition was projected originally by the Everett-Moore syndicate, of Cleveland, as an extension of the Cleveland, Painesville & Eastern Railway. A greater portion of the right of way had been obtained, and some work done when the syndicate became financially embarrassed and the extension project was sold to a syndicate headed by J. W. Holcomb and E. J. Latimer, of Cleveland. The road was engineered and built by the Electric Construction Company, which was composed of Messrs. Holcomb and Latimer, and it was financed by W. J. Hayes & Sons, Cleveland, bankers, who now have the controlling interest and management of the property.

The section of Ohio tributary to this road is part of the Western Reserve, which was early settled by thrifty emigrants from Connecticut, and is now thickly built up, this being particularly true of the main east and west highway, which is closely paralleled by the electric road. The country district is devoted largely to the production of fruit and produce, including large quantities of butter, cheese and milk. Some of the largest nurseries in the country are located in this district; that of Storrs & Harrison, about three miles east of Painesville, is said to be the largest in the country, and employs several hundred persons during the busy season.

The mileage, population of towns and rates of fare are shown in the accompanying table:

Population	Distance	Name	Fare
5,024	..	Painesville	.. "
500	6	Perry	15 cents
2,720	10½	Madison	25 "
400	13½	Unionville	30 "
2,342	18	Geneva	35 "
1,200	23	Saybrook	45 "
12,949	28	Ashtabula	55 "

Except in the terminal towns, the company does not maintain ticket agencies, and no round-trip tickets are sold. Conductors sell two forms of coupon books containing 5-cent coupons, one of them containing $2.50 worth of rides for $2, and the other $1.25 worth of rides for $1. These books are good until used and are transferable; a passenger may pay fares of several in a party if he desires. Two stubs are attached to the books; one of them is detached by the auditor when he issues the book, and the other is detached by the conductor when the book is sold. The conductor turns his stubs in each night.

The company's cars enter Painesville from the village limits over the tracks of the Cleveland, Painesville & Eastern Railway, a distance of 1¼ miles. Except for a stretch of two blocks, the Cleveland, Painesvlle & Ashtabula Company has exclusive use of this track, and pays for it at a fixed rental, furnishing its own power and maintaining the line. Cars make direct connection at the Public Square with the Cleveland, Painesville & Eastern cars for Cleveland. The latter company operates local cars in Painesville, and the two roads exchange transfers on the local service. This was required by franchise, and it gives Painesville excellent local service.

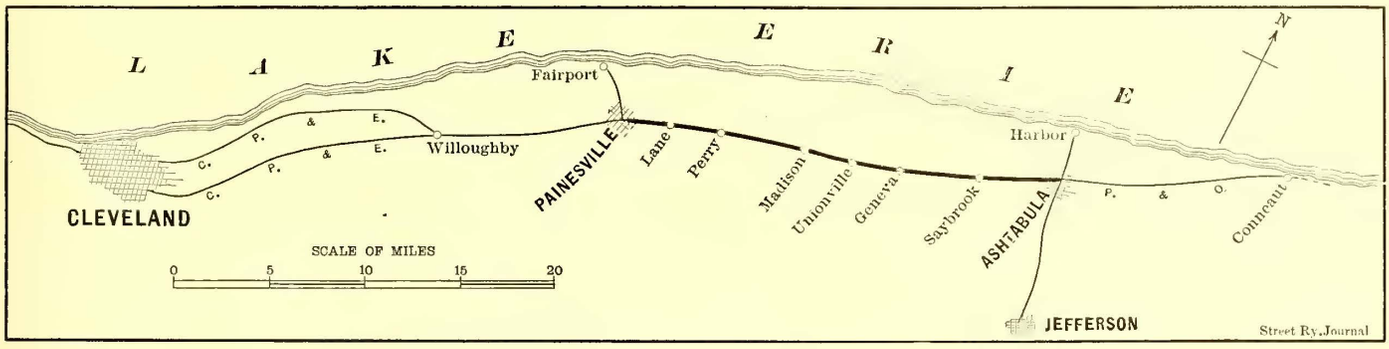
In entering Ashtabula the company operates for 1½ miles over the tracks of the Ashtabula Rapid Transit Company. The interurban company furnishes the power on this section, and there is a division of the local fares collected on the interurban cars. At Ashtabula the company makes direct connection with the cars of the Pennsylvania & Ohio Railway Company, which operates two branches—one running south to Jefferson, the

MAIN STREET IN PAINESVILLE, JUNCTION OF THE CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY AND CLEVELAND, PAINESVILLE & EASTERN RAILWAY

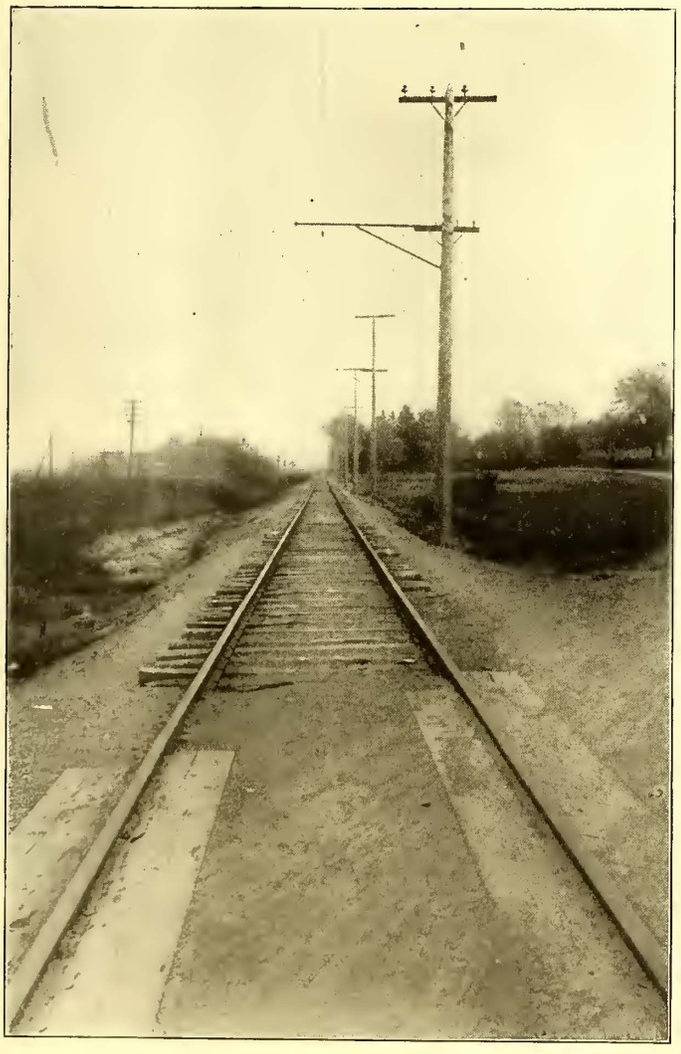
county seat, and the other to Conneaut, making connection for Erie and points east.

Through limited service between Erie and Cleveland has been discussed by the managers of the various roads interested, and a few weeks ago a party of managers made an inspection trip over the various properties with this point in view, but nothing definite has been accomplished along this line, as it was the general opinion that some of the roads were not in physical condition to admit of the high speed that would be necessary to compete with the great steam line which parallels the roads. However, an attempt will be made at through excursion business, and on July 17 a special car will make the round trip from Erie to Cleveland and return, and if the venture proves successful it will be repeated at intervals during the summer.

The Cleveland, Painesville & Ashtabula Railway is built entirely on private right of way from 40 ft. to 60 ft. wide, except in villages, and in all towns it has 25-year franchises. Over a considerable portion of the distance the right of way adjoins that of the Lake Shore & Michigan Southern Railway (steam). The country is very level, and the maximum grade is but 1½ per cent, this being at an undergrade crossing. This crossing is of peculiar construction, as the tracks cross a small stream on a timber trestle at the point of passing under the steam line. The arrangement obviates the possibility of water remaining in the tunnel, and it also reduced the cost of the undergrade crossing, as the steam road already had a bridge at that point. Approaching Painesville it was necessary to erect a large viaduct across the wide valley of the Grand River. A great deal of money was saved on this piece of work through the use of sections of two steam road bridges purchased from the Nickel Plate Railroad. These bridges had been replaced with heavier structures by the steam company, which was rebuilding its line to admit of heavier freight traffic. The bridge was erected by a competent bridge-building concern, and all sections were thoroughly tested for a wide margin of safety over any requirements for a service of this character. Crossing the stream a timber section 80 ft. long and resting on concrete piers was inserted. The entire length of the bridge is 1056 ft., and it is 80 ft. above the water. The power station of the road was erected adjoining the west end of the bridge, and a chute was built into the bridge so that fuel is delivered from bottom dump cars to within a short distance of the boiler room door. It is the intention to alter this chute so that the fuel may be delivered directly into the boiler room by gravity. Views of the viaduct, the timber section with concrete piers, and the fuel chute are shown herewith.



MAP OF CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY SYSTEM



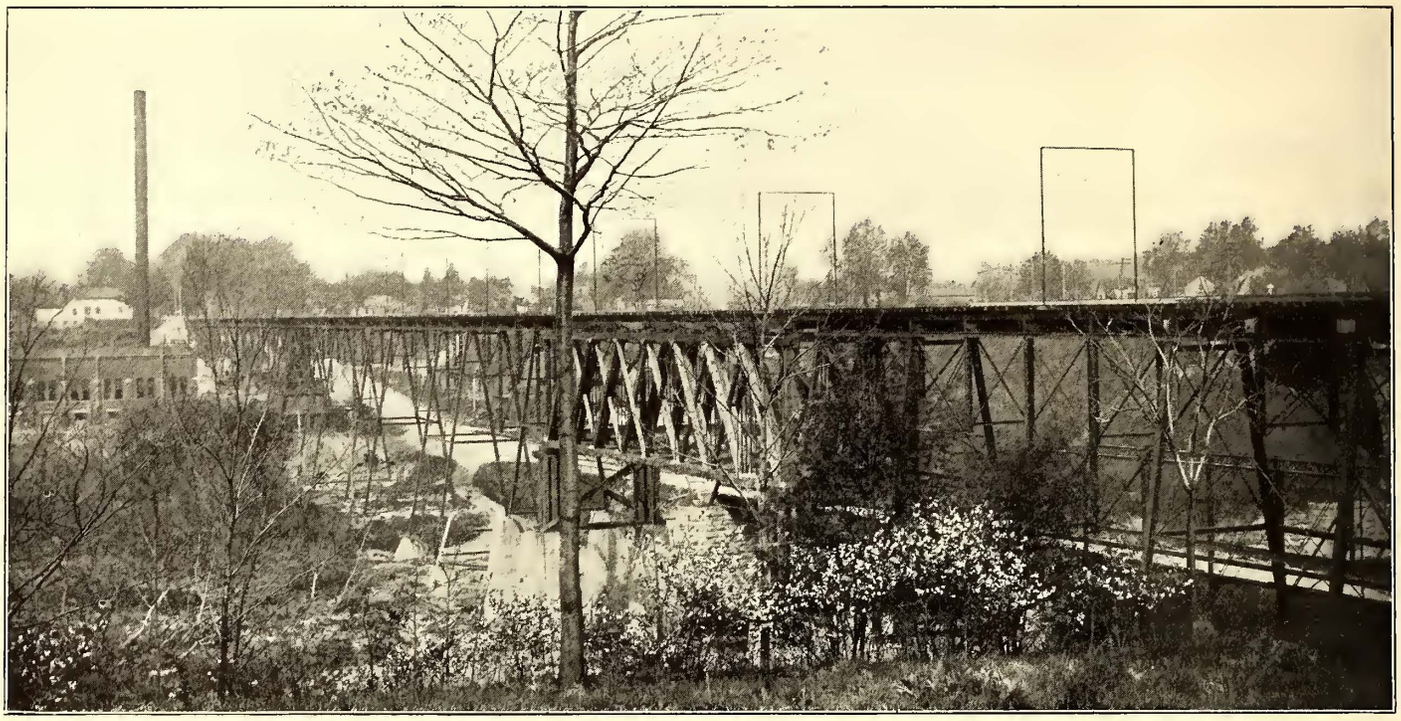
LINE VIEW, SHOWING OVERHEAD CONSTRUCTION

The track is built on standard steam road specifications. Rails are standard 70 lb. 30 ft. length, laid on standard white oak ties, 2640 to the mile. Six-bolt fish-plates are used at joints, and bonds are 9 in. No. 0000 Ohio Brass Company's under the fish-plates. The track is cross-bonded every 1000 ft., and bonded around all switches and frogs. In villages where there is pavement, a 90-lb. girder rail is used. The side bracket type of overhead is used. Poles are 35 ft., with 7 in. tops, and brackets are 9 ft. 1½ in. iron pipe, guyed above and braced below. Trolley wire is No. 0000, Fig. 8. The high-tension feeders are three No. 2 aluminum designed for 13,000 volts. High-tension insulators are 7-in. Hemingray glass. Garton pole lightning arresters are used, two to the mile, and they are grounded to the rail by soldering the connection to a rail bond. The only grade crossing on the line is protected by an interlocker having semaphores on the steam track and semaphores and derailers on the electric tracks. The signal on the steam track is set for "danger" before the derailer can be opened for the electric. Originally, the crossing was operated by the conductors of the electric cars, being arranged so that the conductor, after entering the booth, could not leave it until the car had crossed and the semaphores and derailers returned to their normal position. It was found that this arrangement took too much time, and now a watchman is maintained at the crossing at all times.

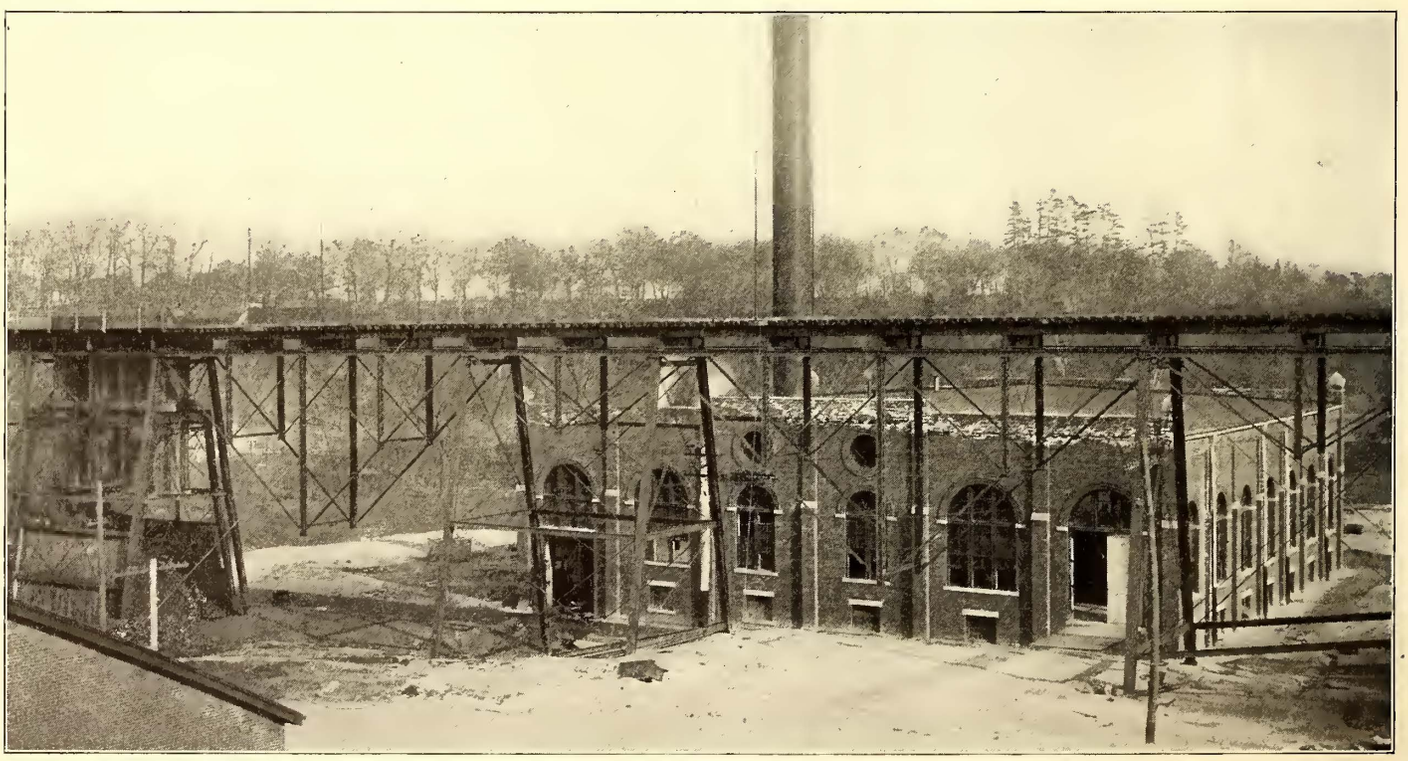
The rolling stock is of the most modern pattern, consisting of six straight passenger coaches, built by the Jewett Car Company, of Newark, Ohio.

The principal dimensions of this car are as follows: Length over buffers, 53 ft. 1½ in.; width over posts, 8 ft. 9 in.; distance between centers of trucks, 33 ft.; height from rail to top of roof, 12 ft. 9 in. There are six longitudinal yellow pine sills in the floor framing running the full length in one continuous piece. The side sills are additionally strengthened by a 6-in. x 6½-in. steel plate. All cross timbers are of the best quality of white oak. M. C. B. construction is used in the bolster and truss-rod work. The body framing is white ash, steam-car construction. The cars are equipped with Jewett standard vestibules, with double folding doors on each side and automatic trap doors over steps.

Each car is divided into three compartments: passenger, smoker and baggage. The distance from the front end of the car to the front of smoking compartment is 8 ft., and there is a double door opening into the compartment. The company decided it would be desirable to have all cars of this type, because a great many traveling men cover this route who desire to take their sample cases with them, and would not use the electric road if they could not do so. The plan also provides space for handling considerable package express, and



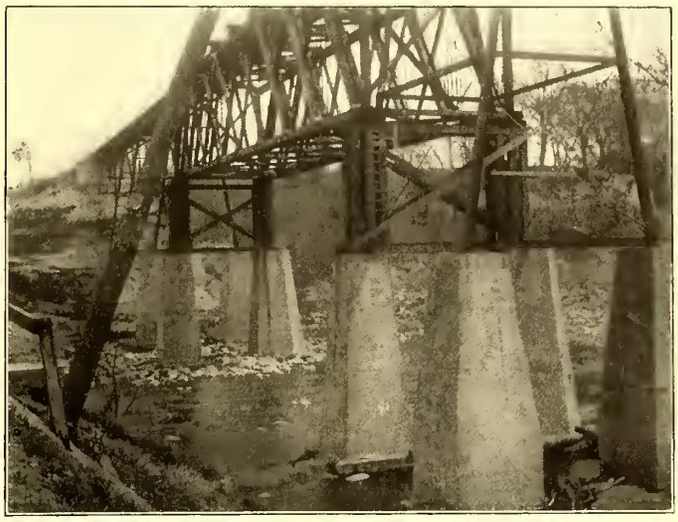
STEEL VIADUCT AT GRAND RIVER



VIADUCT AND POWER HOUSE, SHOWING COAL CHUTE FROM VIADUCT

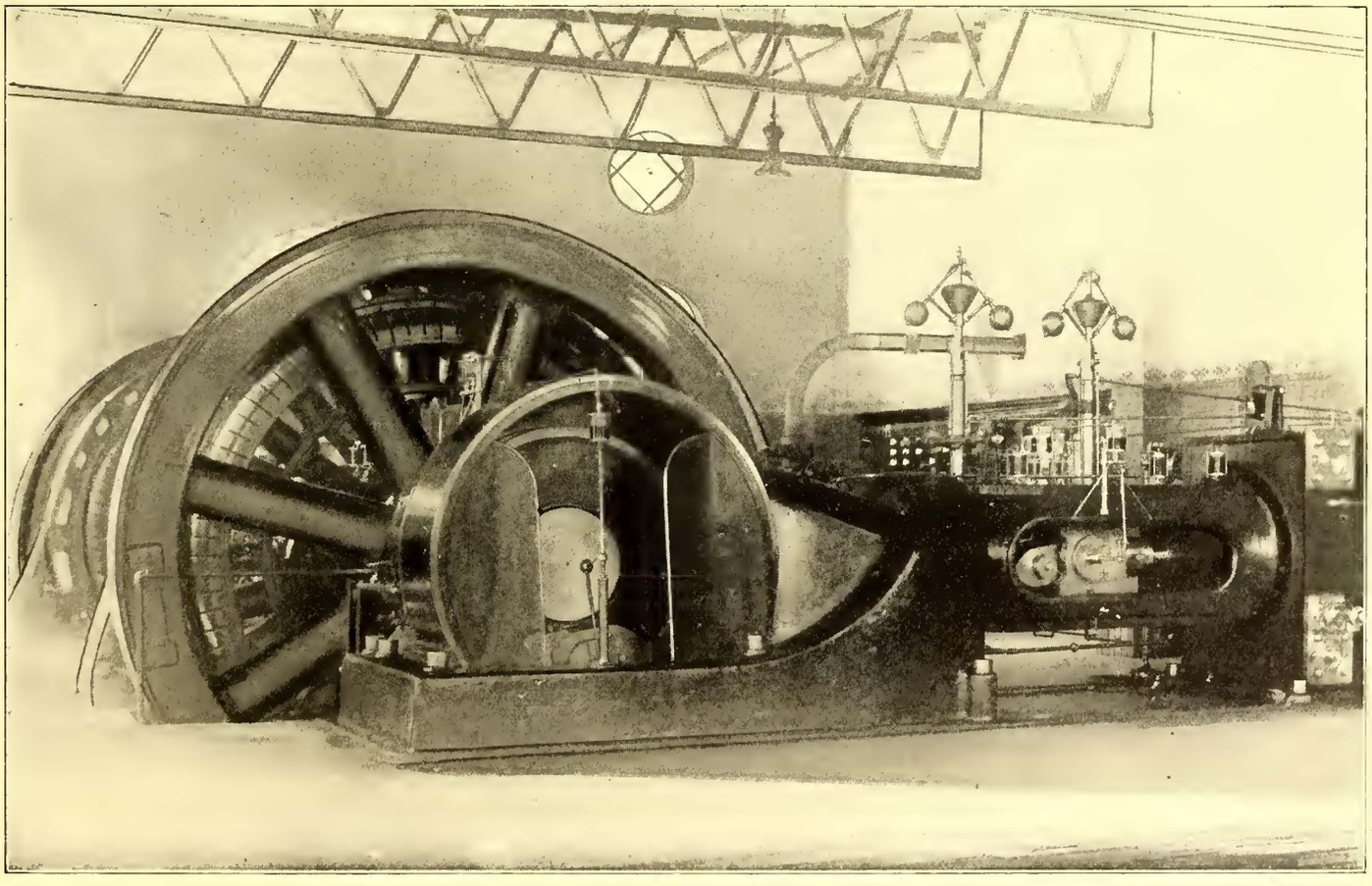
up to the present time the company has not found it necessary to install exclusive express cars, as this class of matter can be handled on any run.

The main and smoking compartments are finished in Honduras mahogany, inlaid with marquetry, and the baggage compartment in white ash natural finish. The ceiling is green, with gold decorations. Hale & Kilburn "walkover" seats are used, being green plush in the main compartment and rattan in the smoker. The windows are of polished plate glass, except the gothics, which are green opalescent leaded glass, and the deck lights of white chipped glass. Trimmings are of solid bronze and the curtains of the "Crown" goods, Forsyth type. The cars are lighted by 35 single incandescents, distributed evenly from the roof. They are heated by the Peter Smith hot-water system, and are equipped with Christensen straight-air, style 2-B, power brakes; Van Dorn drawbars; locomotive type of pilot; arc headlights, and De France patent air-blast sanding device, made by the Newark Air Sand Box Company, of Newark, Ohio. The trucks are of a special type, built by the Peckham Company, and are a combination of the 36-A and the No. 39 London Special, and depart somewhat from the usual practice in that the top frame is of 4-in. angle-iron. Four G. E. No. 57 motors are used, with K-10 controller, the cars being single enders. Each car is equipped with a Stromberg-Carlson telephone; the connection is made by plugging in at a pole located between the tracks at each siding, or, if necessary, the despatcher may be reached at any point on the line by making a connection with the telephone wire by means of a jointed bamboo rod.



TIMBER SECTION BRIDGE ON CONCRETE PIERS

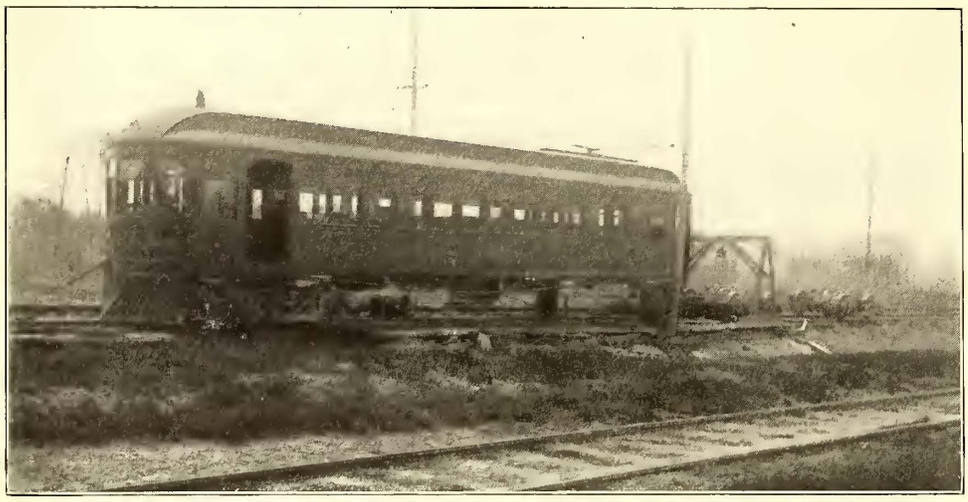
The power station for the road was located at Painesville, at the extreme west end of the line, primarily because the best available water supply was located at that point, and also because it was deemed probable that at some future time this property might be consolidated with the road running west from Painesville, and the station then would be in position to handle the entire system. With this view the station building was made large enough for double the present equipment, and it was designed with a view to future building extension. The building is machine-brick, with stone trimmings, and has a flat tile roof on iron trusses. The flooring is all concrete, laid with corrugated steel. A 175-lb. steel stack, 7 ft. inside diameter, extends from the center of the boiler room, and is guyed to the roof and bolted down to the foundations. The engine and building foundations are brick and concrete, carried down to solid rock. The building is equally divided into two rooms, each 54 ft. x 94 ft., there being a fire wall between. The boiler-room floor is 6 ft. below the level of the engine room, and a pit below one-half of the engine room is 13 ft. deep.



INTERIOR OF ENGINE ROOM

Two 300-hp Stirling boilers are installed at present, and there is space in the house for four more of the same size. These boilers are of standard design, each having 3200 sq. ft. of heat-

ing surface, with plain grates having 64 sq. ft. of grate surface. They are guaranteed for 50 per cent overload and run at 150 lbs. steam pressure. Each has two 4½-in. roll-pops, with Reliance water columns and extra water alarms. The company has a gas well adjoining the house, and it is used for heating and lighting the offices, and at times the pressure is strong enough to enable its use in the boilers, and they are provided with gas burners in the arch above the door. There is a space

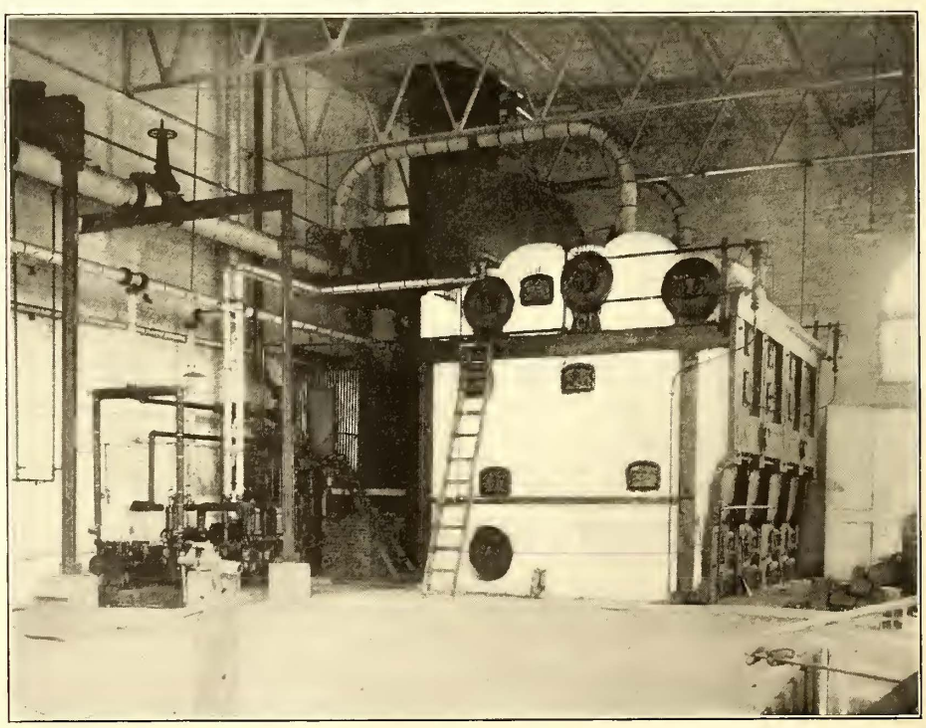


REPAIRING CARS OUT OF DOORS

of 18 ft. in front of the boilers, arranged for coal storage, and the boilers are 12 ft. from the division wall, leaving ample room for the piping and for the pumps.

The water supply is taken from a 14-ft. well at the side of the river, the well being provided with a filter. The condenser intake is a 12-in. cast-iron pipe, and there is also a 6-in. feed-water line. The condensers are of the Wheeler surface type, and are located in the pit below the engine-room floor. The air and circulating pumps, of the Laidlaw-Dunn-Gordon type, measure 10 ins. x 12 ins. x 14 ins. x 18 ins., and are set at the side of the condensers. The intake line is 216 ft. in length, and there is a lift of 22 ft. for the condenser water. Between the condensers there is a hot well consisting of a 4 ft. x 12 ft. steel tank. The hot well receives all water of condensation and the jacketing water from the engine bearings. Water is taken from the hot well by low-duty Laidlaw-Dunn-Gordon hot-well pumps, which deliver it to a 1200-hp A Cochrane heater, located at the rear of the boilers. The feed-water pumps are two Laidlaw-Dunn-Gordon 8 in. x 5 in. x 10 in. outside plunger type, each of sufficient capacity to supply both boilers at full load. They take water from the Cochrane heater, and the feed piping is arranged so that it is also possible to take cold water through the line from the river. The hot-well water is thoroughly filtered by packing the well with 20 ins. of charcoal and 2 ft. of clover hay, which is changed from time to time. The engines are two Cooper-Corliss tandem-compound; high-pressure cylinder, 18 in.; low pressure, 36 in., and 42 in. stroke, and they turn at 112 r. p. m. The engines have sole plates extending their entire length. The cross-heads are forged steel and extra heavy. They have Corliss valves and safety governors operated by butterfly valves. They develop 650 hp with 125 lbs. of steam at quarter cut-off, and are guaranteed to use not to exceed 13 lbs. of steam per i. h. p. They will operate under 160 lbs. of steam, and will develop 900 hp condensing. Steam for the boilers is conveyed to the steam heater through long bends entering at the top. The supply for the engines and auxiliary machinery is taken from the bottom of the heater directly into large receiver separators, there being one separator for each engine. Steam for the engines is taken from one side of the separators, and on the other side is a connection to the auxiliary header, which supplies the pumps and condensers. The condensers are piped independently of one another, and they are interchangeable for either engine. An automatic oiling system, with overhead supply tank, lubricates the working parts of engines and auxiliaries, the oil being filtered in a Burt automatic filter located in the basement. The engines are fitted with Phœnix oil pumps for cylinder lubrication, and the main engine bearings are cooled by streams of water from the city mains running around them.

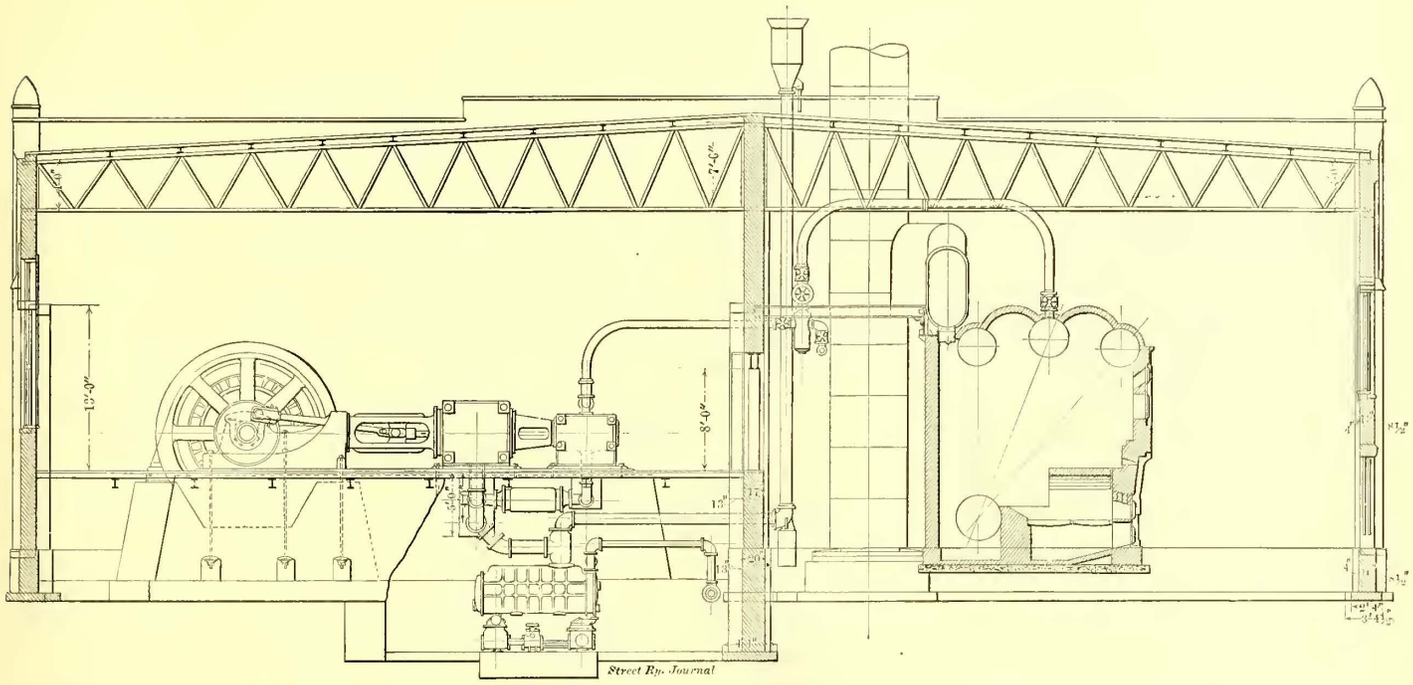
The main generators are located on the engine shafts and are of the General Electric Company's revolving field, alternating-current type. They generate three-phase 25-cycle current at 13,200 volts pressure. Directly connected on the extended shafts of the engines are the exciters, consisting of 17½-kw generators supplying current at 125 volts. About 60 amps. are required for exciting each engine, and each exciter is sufficiently large to supply both main generators, and



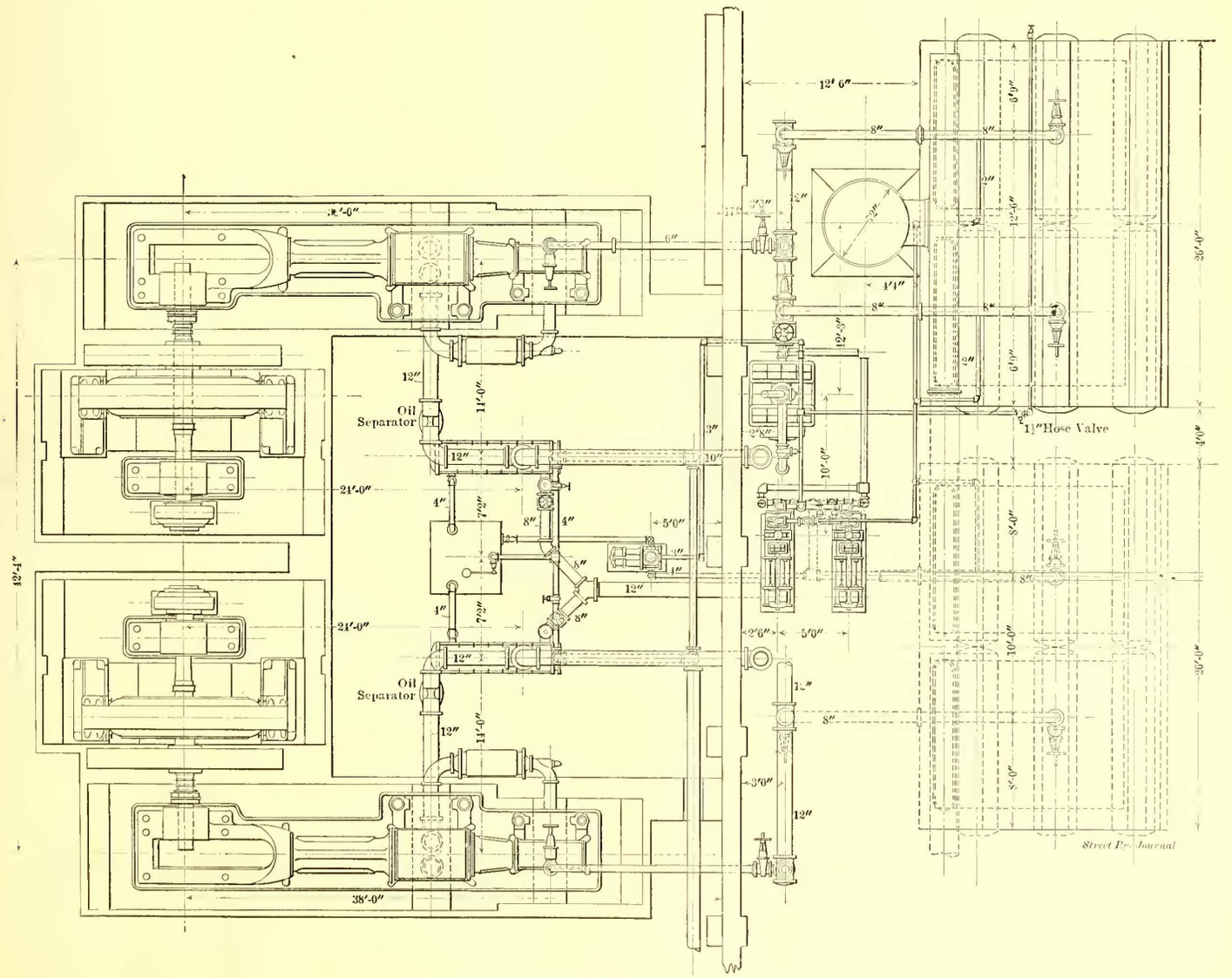
BOILER ROOM OF CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY

at the same time supply the lighting for the power house.

F. B. Perkins, of Toledo, the electrical engineer who designed the plant, has followed the plan of directly connecting the exciter to the main generator in all his recent installations, and he claims it has worked out satisfactorily in every case. It saves space and dispenses with considerable piping, and it is claimed that the extra steam required to pull the added load



CROSS SECTION OF POWER STATION



PIPING PLAN FOR POWER STATION OF CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY

on the engine is insignificant. It gives a slow speed exciter in place of a high-speed machine, which is likely to give trouble, and Mr. Perkins claims there is no objection to giving the exciter the same speed variation as that of the main generator.

The rotaries used are compounded rather heavily, and the generators are run with a low-power factor on light loads. With a variation of voltage of 10 per cent at the main power

TRANSFORMERS AND WIRING IN BASEMENT OF POWER STATION

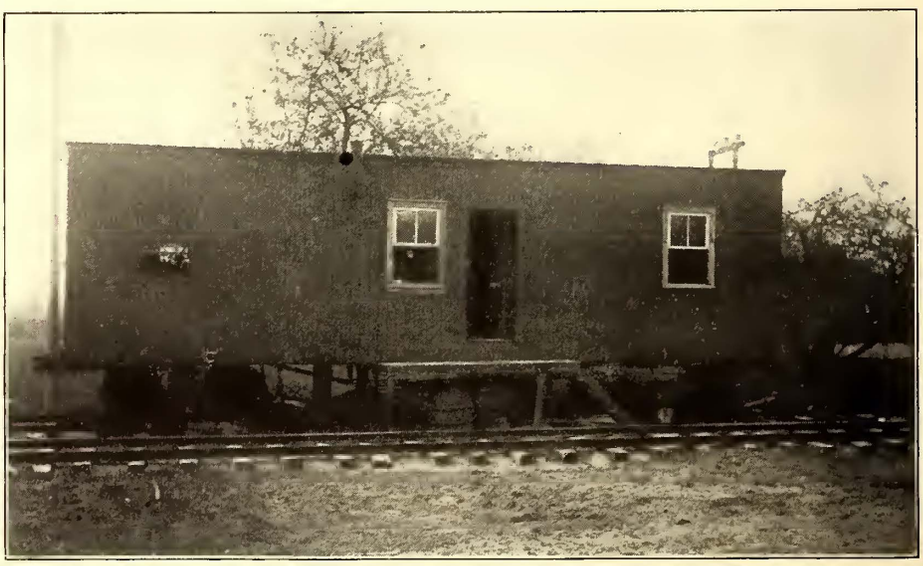
station, the voltage at the Geneva station 20 miles east is held to within 1 per cent variation. One of these units has been found amply large to handle the full load at all times. In addition to 29 miles of interurban road, with hourly headway, the station assists in handling the Ashtabula city cars, and at times takes care of the lighting load at Geneva, consisting of 70 arc lamps and 1500 incandescents. The average output of the station is 4500 ampere-hours per day. To supply this requires on an average from 8 to 9 tons of run of mine fuel, for which the company pays $2.15 per ton, delivered. But six men are used in the house—three in the engine room and three in the boiler room. The cost of current, including all overhead expenses, has been brought down to very close to 1 cent per kw, it is claimed.

A rotary sub-station is located in the main power station, the rotary converter being a 360-kw General Electric six-pole machine, revolving at 500 r. p. m., and delivering 600 volts direct-current to the line in that vicinity. Directly below the rotary in the basement are three 110-kw Type H, oil-cooled, step-down transformers. Current from the generators is delivered to these at 13,200 volts, and stepped down to 370 volts, passing from them to the rotary.

The accompanying illustration shows the transformers in the basement, together with the high-tension wiring running to them. The high-tension wires are No. 4 copper, insulated with 5/8 in. of rubber, and they are carried in triangular arrangement by means of a special three-way porcelain clamp hung from the basement ceiling, as shown in the illustration.

The switchboard controlling the electrical apparatus in the station is made up of 18 panels, finished in black, the entire board being built into the wall separating the engine room from the boiler room. Two steel I-beams support the board, while the wall above is carried on another I-beam, and there is an ornamental cornice above the board. All the wiring comes up from the basement through wood and porcelain insulators. Back of the switchboard, on a level with the engine room and partitioned off from the boiler room with a sheet-iron partition, is a separate room for the high-tension oil switches. The oil switches are the G. E. Form I, hand-operated type, and they are hung from a pipe rack with special clamps. The first two panels on the switchboard are blank for indicator for future engines. The third and fourth panels contain steam gages, vacuum gages and receiver gages. The third and fourth panels are the d. c. feeder panels, containing circuit breakers, voltmeters, ammeters and switches. The fifth panel controls the station lighting; current may be taken from either of the exciter generators or from the city lighting system by means of six double-throw double-pole switches, and the board contains a voltmeter and an ammeter. The sixth and seventh panels control respectively No. 1 generator and its exciter, while the eighth and ninth control the second machine and its exciter; the machine panels have a. c. voltmeters, ammeters, wattmeters, power-factor indicators and mechanism operating oil switches, while the exciter panels have ammeters, double-throw, double-pole field switches and three-pole double-throw main switches. The exciter panels are arranged to work in multiple, with fields of generators in multiple or with exciters feeding each separately. Each exciter is of sufficient capacity to supply exciting current to both generators. The next two panels control the high-tension feeders, and each contains three ammeters, mechanism for operating oil switches and automatic relays. The remaining three panels are blanks for future feeders. The lightning arresters are standard G. E. 2000-volt arresters, arranged with four on each leg half way to the ground, and three between the different legs and the ground.

In addition to the sub-station in the main station, there are three sub-stations, giving an average distance between sub-stations of 7 miles. When the road was first projected, the

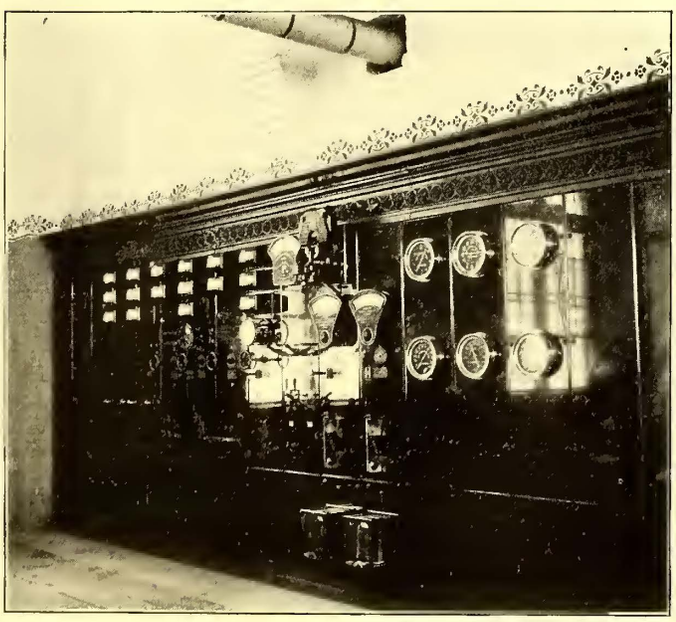


PORTABLE SUB-STATION ON CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY

company purchased the local lighting plant in Geneva, and utilizes the building as a sub-station. Giving consideration to the possibilities of consolidation with other neighboring roads and desiring the extreme flexibility made possible by this system, it was decided to place the other two sub-stations in box cars and use them as floaters. One of them is located on a siding near Madison, and the other at a siding two miles west of Ashtabula. Two large standard steam flat cars were purchased for this service, and a body 40 ft. long and 9 ft. high

was built. No motors are used, and the cars are towed when it is desired to change their position. In one end of the car is a 360-kw rotary, and at the other end are three 110-kw oil-cooled transformers. A direct-current board controlling the d. c. side of the rotary and the two outgoing d. c. lines is placed against the wall on one side, while across the center of the car, forming a partition between the transformers and the rotary, is the a. c. board containing three panels. The high-tension line panels contain three ammeters, voltmeters, three-pole double-throw 500 amp. quick-break switches, and switch mechanism for the oil switches, which are at the end of the car, 15 ft. back of the board, enclosed in marble partitions. The line panels are equipped with automatic overload relays, and there are automatic trips on the d. c. circuit breakers, which cut out the station in case the high tension goes out. There are no high-voltage lightning arresters in the car, but the d. c. feeders are tied through lightning arresters. The floater near Ashtabula supplies about 125 kw to the Ashtabula city lines, while the station at Madison is designed to supply lighting current for that village, as well as taking care of its portion of the road.

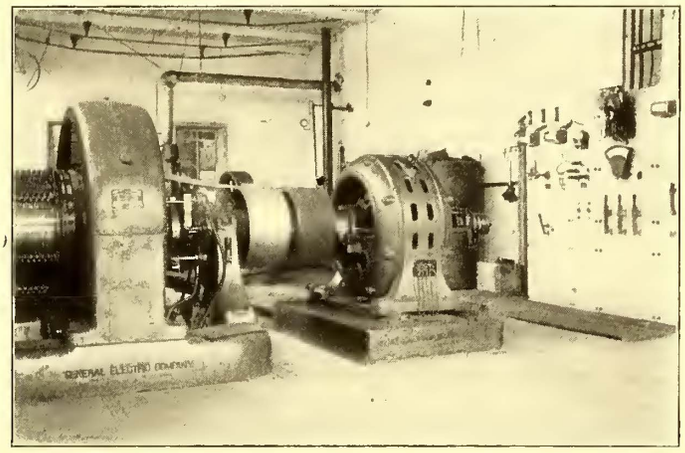
The old Geneva lighting plant was equipped with two 100-hp Erie boilers, a 100-hp Armington-Simms simple engine, belted to a 150-kw G. E. three-phase a. c. 2300-volt generator, which supplied both arc and incandescent loads in Geneva and the neighboring village of Unionville. The railway converter was placed immediately adjoining the lighting generator, and for a time the latter was operated by means of a clutch, dispensing with the engine. This did not prove entirely satisfactory, however, because the two machines were designed for different speeds, and to obviate this difficulty a pulley was placed on the end of the converter shaft and the two machines were belted back to a jack shaft. As it was not considered economical to run the main power station for the all-night load at Geneva, the engine for the lighting plant was retained and used for the



SWITCHBOARD BUILT INTO WALL

night load. The scheme of changing the belts each day is not altogether convenient, and it is the intention to install a 75-kw generator, which will be belted to the rotary for the day service, and then run the old outfit as originally designed for night load. To take care of the irregularity of the speed of the generator when it is being driven by the rotary, a Chapman voltage regulator has been installed. This is connected between the exciter and field of generator, and the variation on the incandescent circuit has been reduced to one volt either way. For the railway side of the house there are three 110-kw transformers, with a reactive coil between the transformers and the rotary. The switchboards, oil switches and other apparatus are practically the same as those in the floating sub-stations, except that the station is protected by high-tension lightning arresters. Following the latest practice, the rotaries in every case are started from a half voltage tap on the low-tension side of the transformers.

The Cleveland, Painesville & Ashtabula Railroad Company has a capital stock, authorized and issued, of $1,000,000, with



LIGHTING PLANT IN GENEVA SUB-STATION

first mortgage bonds issued to the amount of $850,000, and bonds in the treasury for future extensions of $150,000. The road was placed in operation in November, 1903, but it was not until May, 1904, that cars were operated to the center of Painesville, owing to a controversy with the village authorities. Since that time the property has been showing very satisfactory earnings, and has more than earned its bond interest. The officers of the company are: A. B. Cleveland, Unionville,

GRADE CROSSING PROTECTED BY INTERLOCKER ON CLEVELAND, PAINESVILLE & ASHTABULA RAILWAY AND NICKEL PLATE RAILROAD

president and general manager; W. J. Hayes, Cleveland, vice-president; Miss M. A. Phillips, Cleveland, secretary and purchasing agent; Joseph R. Kraus, Cleveland, treasurer; F. B. Perkins, Toledo, consulting engineer. The general offices of the company are at Painesville, Ohio.

RULES GOVERNING CAR WIRING AND EQUIPMENT OF CARS

The Underwriters' National Electrical Association will shortly issue rules on car wiring and equipment of cars, which have recently been adopted by that association. These rules are the product of a special committee from the Underwriters' National Electrical Association and a committee from the American Street Railway Association appointed by President Ely.

The following gentlemen constitute this conference:

On behalf of the Underwriters' National Electrical Association: Ralph Sweetland, chairman, Electrical Engineer, New England Insurance Exchange, Boston, Mass.; William McDevitt, Chief Inspector, Philadelphia Board of Fire Underwriters, Philadelphia, Pa.; Bruce E. Loomis, Electrical Inspection Bureau, New York City.

On behalf of the American Street Railway Association: W. A. Pearson, chairman, Electrical Engineer, New York City Railway Company; Richard McCulloch, recently Assistant General Manager of the Chicago City Railway Company, now of the St. Louis Transit Company; C. B. King, Assistant to the President, Detroit United Railway Company; Henry M. Ballard, Superintendent Car Equipment Shops, Boston Elevated Railway Company; E. A. Sturgis, Superintendent of Motive Power and Machinery, Worcester Consolidated Street Railway Company.

The conference also had the assistance of J. S. Pevear and E. H. Nagelstack, of the engineering department of the General Electric Company; I. S. Perkins, of the engineering department of the Westinghouse Electric & Manufacturing Company; C. M. Goddard, secretary of the Underwriters' National Electrical Association; H. O. Lacount, of the Factory Mutual Insurance Companies, and O. B. Johnson, of the Boston Board of Fire Underwriters.

The compilation of rules on car wiring have been under consideration, as many of the readers of this paper know, for about a year. Numerous conference meetings have been held by the commission during this time. The rules, which are given below, are believed to cover the subject, at least as well as could be expected, considering that the subject is entirely a new one. The rules follow:

CAR WIRING SUPPLEMENT

TO THE 1903 EDITION OF THE "NATIONAL ELECTRICAL CODE."

Rules and Requirements of the National Board of Fire Underwriters for the Equipment and Wiring of Electric Railway Cars. As recommended by the Underwriters' National Electric Association.

CLASS C.—INSIDE WORK. LOW-CONSTANT-POTENTIAL SYSTEMS. 550 VOLTS OR LESS

32. Car Wiring and Equipment of Cars.

a. Protection of Car Body, etc.

1. Under side of car bodies to be protected by approved fire-resisting insulating material, not less than ⅛ in. in thickness, or by sheet iron or steel, not less than .04 in. in thickness, as specified in Sections 2, 3 and 4. This protection to be provided over all electrical apparatus, such as motors with a capacity of over 75 hp, each, resistances, contactors, lightning arresters, air-brake motors, etc., and also where wires are run, except that protection may be omitted over wires designed to carry 25 amperes or less if they are encased in metal conduit.

2. At motors of over 75 hp each, fire-resisting material or sheet iron or steel to extend not less than 8 ins. beyond all edges of openings in motors, and not less than 6 ins. beyond motor leads on all sides.

3. Over resistances, contactors and lightning arresters, and other electrical apparatus, excepting when amply protected by their casing, fire-resisting material or sheet iron or steel to extend not less than 8 ins. beyond all edges of the devices.

4. Over conductors, not encased in conduit, and conductors in conduit when designed to carry over 25 amps., unless the conduit is so supported as to give not less than ½ in. clear air space between the conduit and the car, fire-resisting material or sheet iron or steel to extend at least 6 ins. beyond conductors on either side.

Note.—The fire-resisting insulating material or sheet iron or steel may be omitted over cables made up of flameproof braided outer covering when surrounded by ⅛-in. flameproof covering, as called for by Section *i*, 4.

5. In all cases fireproof material or sheet iron or steel to have joints well fitted, to be securely fastened to the sills, floor timbers and cross-braces, and to have the whole surface treated with a waterproof paint.

6. Cut-out and switch cabinets to be substantially made of hard wood. The entire inside of cabinet to be lined with not less than ⅛-in. fire-resisting insulating material, which shall be securely fastened to the woodwork, and after the fire-resisting material is in place the inside of the cabinet shall be treated with a waterproof paint.

b. Wires, Cables, Etc.

1. All conductors to be stranded, the allowable carrying capacity being determined by Table A, of Rule No. 16, except that motor, trolley and resistance leads shall not be less than No. 7 B. & S. gage, heater circuits not less than No. 12 B. & S. gage, and lighting and other auxiliary circuits not less than No. 14 B. & S. gage.

The current used in determining the size of motor, trolley and resistance leads shall be a per cent of the full-load current, based on one hour's run of the motor, as given by the following table:

Size each motor.	Motor Leads.	Trolley Leads.	Resistance Leads.
75 hp or less....	50%	40%	15%
Over 75 hp.....	45%	35%	15%

Note.—Fixture wire complying with Rule No. 46 will be permitted for wiring approved clusters.

2. To have an insulation and braid as called for by Rule No. 41 for wires carrying currents of the same potential.

3. When run in metal conduit, to be protected by an additional braid as called for by Rule No. 47.

Note.—Where conductors are laid in conduit, not being drawn through, the additional braid will not be required.

4. When not in conduit, in approved moulding, or when not in cables surrounded by ⅛-in. flame-proof covering, to be protected by an additional flame-proof braid, at least 1-32 in. in thickness, the outside being saturated with a preservative flameproof compound.

Note.—This rule will be interpreted to include the leads from the motors.

5. Must be so spliced or joined as to be both mechanically and electrically secure without solder. The joints must then be soldered and covered with an insulation equal to that on the conductors.

Note.—This rule will not be construed to apply to connection of leads to motors, plows, or third-rail shoes.

6. All connections of cables to cut-outs, switches and fittings, except those to controller-connection boards, when designed to carry over 25 amps., must be provided with lugs or terminals soldered to the cable, and securely fastened to the device by bolts, screws, or by clamping; or, the end of the cable, after the insulation is removed, shall be dipped in solder and be fastened into the device by at least two set screws having check nuts.

All connections for conductors to fittings, etc., designed to carry less than 25 amps., must be provided with turned-up lugs that will grip the conductor between the screw and the lug, the screws being provided with flat washers; or by block terminals having two set screws, and the end of the conductors must be dipped in solder. Soldering, in addition to the connection of the binding screws, is strongly recommended, and will be insisted on when above requirements are not complied with.

Note.—This rule will not be construed to apply to circuits where the maximum potential is not over 25 volts and current does not exceed 5 amperes.

c. Cut-outs, Circuit Breakers and Switches.

1. All cut-outs and switches having exposed live metal parts to be located in cabinets. Cut-outs and switches, not in iron boxes or in cabinets, shall be mounted on not less than ¼-in. fire-resisting insulating material, which shall project at least ½ in. beyond all sides of the cut-out or switch.

2. Cut-outs to be of the approved cartridge or approved blow-out type.

3. All switches controlling circuits of over 5 amp. capacity shall be of approved single-pole, quick-break, or approved magnetic blow-out type.

Switches controlling circuits of 5 amp. or less capacity may be of the approved single-pole, double-break, snap type.

4. Circuit breakers to be of approved type.

5. Circuits must not be fused above their safe carrying capacity.

6. A cut-out must be placed as near as possible to the current collector, so that the opening of the fuse in this cut-out will cut off all current from the car.

Note.—When cars are operated by metallic return circuits, with the circuit breakers connected to both sides of the circuit, no fuses in addition to the circuit breakers will be required.

d. Conduit.

Note.—When from the nature of the case, or on account of the size of the conductors, the ordinary pipe and junction box construction is not permissible, a special form of conduit system may be used, provided the general requirements as given below are complied with.

1. Metal conduits, outlet and junction boxes to be constructed in accordance with Rule No. 49, except that conduit for lighting circuits need not be over 5-16 in. internal diameter and ½ in. external diameter, and for heating and air-motor circuits need not be over ⅜ in. internal diameter and 9-16 in. external diameter, and all conduits where exposed to dampness must be water tight.

2. Must be continuous between and be firmly secured into all outlet or junction boxes and fittings, making a thorough mechanical and electrical connection between same.

3. Metal conduits, where they enter all outlet or junction boxes and fittings, must be provided with approved bushings fitted so as to protect cables from abrasion.

4. Except as noted in Section *i*, 2, must have the metal of the conduit permanently and effectively grounded.

5. Junction and outlet boxes must be installed in such a manner as to be accessible.

6. All conduits, outlets, or junction boxes and fittings to be firmly and substantially fastened to the framework of the car.

e. Moulding.

1. To consist of a backing and a capping, and to be constructed of fire-resistng insulating material, except where circuits which they are designed to support are nominally not exposed to moisture, they may be construed of hard wood.

2. When constructed of fire-resisting insulating material, the backing shall be not less than ¼ in. in thickness and be of a width sufficient to extend not less than 1 in. beyond conductors at sides.

The capping, to be not less than ⅛ in. in thickness, shall cover and extend at least ¾ in. beyond conductors on either side.

The joints in the moulding shall be mitred to fit close, the whole material being firmly secured in place by screws or nails, and treated on the inside and outside with a waterproof paint.

Note.—When fire-resisting moulding is used over surfaces already protected by ⅛-in. fire-resisting insulating material, no backing will be required.

3. Wooden mouldings must be so constructed as to thoroughly encase the wire and provide a thickness of not less than ⅜ in. at the sides and back of the conductors, the capping being not less than 3-16 in. in thickness. Must have both outside and inside two coats of waterproof paint.

The backing and the capping shall be secured in place by screws.

f. Lighting and Lighting Circuits.

1. Outlets to be provided with either single lamps of not over 32 cp, the lamps being supported in approved porcelain receptacles, or with approved clusters.

2. Circuits to be run in approved metal conduit, or approved moulding.

3. When metal conduit is used, except for sign lights, all outlets to be provided with approved outlet boxes.

4. At outlet boxes, except where approved clusters are used, porcelain receptacles to be fastened to the inside of the box, and the metal cover to have an insulating bushing around opening for the lamp.

When approved clusters are used, the cluster shall be thoroughly insulated from the metal conduit, being mounted on blocks of hardwood or fire-resisting insulating material.

5. Where conductors are run in moulding the porcelain receptacles or cluster to be mounted on blocks of hard wood or of fireproof insulating material.

g. Heaters and Heating Circuits.

1. Heaters to be of approved type.

2. Panel heaters to be so constructed and located that when heaters are in place all current-carrying parts will be at least 4 ins. from all woodwork.

Heaters for cross-seats to be so located that current-carrying parts will be at least 6 inches below under side of seat, unless under side of seat is protected by not less than ¼-in. fire-resisting insulating material, or .04 in. sheet metal, with 1 in. air space over same, when the distance may be reduced to 3 ins.

3. Circuits to be run in approved metal conduit, in approved moulding, or if the location of conductors is such as will permit an air space of not less than 2 ins. on all sides, except from the surface wired over, they may be supported on porcelain knobs or cleats, provided the knobs or cleats are mounted on not less than ¼-in. fire-resisting insulating material extending at least 3 ins. beyond conductors at either side, the supports raising the conductors not less than ½ in. from the surface wired over, and being not over 12 ins. apart.

h. Air Pump Motor and Circuits.

1. Circuits to be run in approved metal conduit or in approved moulding, except that when run below the floor of the car they may be supported on porcelain knobs or cleats, provided the supports raise the conductor at least ½ in. from the surface wired over and are not over 12 ins. apart.

2. Automatic control to be enclosed in an approved metal box. Air pump and motor, when enclosed, to be in approved metal box or a wooden box lined with metal of not less than 1-32 in. in thickness.

When conductors are run in metal conduit, the boxes surrounding automatic control and air pump and motor may serve as outlet boxes.

i. Main Motor Circuits and Devices.

1. Conductors connecting between trolley stand and main cut-out or circuit breakers in hood, to enter car through approved bushings, or to be protected where wires enter car to prevent ingress of moisture.

2. Conductors connecting between third-rail shoes on same truck, to be supported in an approved fire-resisting insulating moulding, or in approved iron conduit supported by soft rubber or other approved insulated cleats.

3. Conductors on the under side of the car, except as noted in No. 4, to be supported in accordance with one of the following:

a. To be run in approved metal conduit, junction boxes being provided where branches in conduit are made, and outlet boxes where conductors leave conduit.

b. To be run in approved fire-resisting insulating moulding.

c. To be supported by insulating cleats, the supports being not over 12 ins. apart.

4. Conductors, with flame-proof braided outer covering, connecting between controllers at either end of car, or, controllers and contactors may be run as a cable, provided the cable where exposed to the weather is encased in a canvas hose or canvas tape, thoroughly taped or sewed at ends and where taps from the cable are made, and the hose or tape enters the controllers.

Conductors with or without flame-proof braided outer covering connecting between controllers at either end of the car, or, controllers and contactors may be run as a cable, provided the cable throughout its entire length is surrounded by ⅛-in. flame-proof covering, thoroughly taped or sewed at ends, or where taps from cable are made, and the flame-proof covering enters the controllers.

Cables, where run below floor of car, may be supported by approved insulating straps or cleats. Where run above floor of car, to be in a metal conduit or wooden box painted on the inside with not less than two coats of flame-proof paint, and where this box is so placed that it is exposed to water, as by washing of the car floor, attention should be given to making the box reasonably waterproof.

Canvas hose or tape, or flame-proof material surrounding cables after conductors are in same, to have not less than two coats of waterproof insulating material.

5. Motors to be so drilled that, on double-truck cars, connecting cables can leave motor on side nearest to king bolt.

6. Resistances to be so located that there will be at least 6 in. air space between resistances proper and fire-resisting material of the car. To be mounted on iron supports, being insulated by non-combustible bushings or washers, or, the iron supports shall have at least 2 ins. of insulating surface between them and metal work of car; or, the resistances may be mounted on hardwood bars, supported by iron stirrups, which shall have not less than 2 ins. of insulating surface between foot of resistance and metal stirrup, the entire surface of the bar being covered with at least ⅛-in. fire-resisting insulating material.

The insulation of the conductor, for about 6 ins. from terminal of the resistance, should be replaced, if any insulation is necessary, by a porcelain bushing or asbestos sleeve.

7. Controllers to be raised above platform of car by a not less than 1 in. hardwood block, the block being fitted and painted to prevent moisture working in between it and the platform.

j. Lightning Arresters.

1. To be preferably located to protect all auxiliary circuits in addition to main motor circuits.

2. The ground conductor shall be not less than No. 6 B. & S. gage, run with as few kinks and bends as possible, and be securely grounded.

k. General Rules.

1. When passing through floors, conductors or cables must be protected by approved insulating bushings, which shall fit the conductor or cable as closely as possible.

2. Moulding should never be concealed except where readily accessible. Conductors should never be tacked into mouldings.

3. Short bends in conductors should be avoided where possible.

4. Sharp edges in conduit or in moulding must be smoothed to prevent injury to conductors.

NOTE.

The foregoing rules are laid down as embodying the principal precautions necessary in safeguarding street railway cars from the fire hazard of their own electrical appliances. It is not expected that old equipments will be rapidly brought up to this standard, but it should be required that all new equipments and repairs to old equipments closely follow the rules.

CORRESPONDENCE

THE NEW YORK CENTRAL ELECTRIC LOCOMOTIVE

New York, July 4, 1904.

Editors Street Railway Journal:

I have read with great interest the description appearing in your issue of June 4 of the motors which are to be employed in the locomotives in the New York Central tunnel. If I understand the illustration and figures correctly, these motors are to be gearless. The armature is to surround the axle, and lacks only 10 ins. or 15 ins. of the diameter of the 44-in. driving-wheels. Moreover, the armature and commutator fully fill the space from wheel to wheel. The iron work composing the locomotive frame also does duty as a return magnetic circuit, and is spring-suspended from the axle. The pole pieces of the motor are mounted on cross members between the side frames of the locomotive. In order that the up and down motion of the frame shall not cause the armature to come in contact with the pole pieces, the machine is made bi-polar, with horizontal salient poles, and the faces of the latter are to be vertical plane surfaces, without the usual polar arc. The brushes are mounted on spider-like arms, which are fastened to the axle box, reach around the driving wheels and support the brushes on opposite ends of a diameter. No figures are given as to the number of armature conductors, or the field strength, or the number of turns on the field bobbin, and therefore in many respects there is still room for much speculation as to details.

I think I am safe in saying that many of the engineering profession will agree that did not this marvelous combination bear the seal of approval of a large manufacturing company, and of experts in its employ whose opinion we have long since learned to value, the whole arrangement would be in danger of criticism as fanciful and impractical. Under the present status, and considering the large size of the motor, one can only say that the proposition stands without precedent as the boldest move that has yet been made in railway motor design, the alternating series motor not excepted.

As no specific data have been given, one can only speculate, but some of the speculations seem to be very pertinent.

The magnetic circuit of the motor is exceedingly interesting from a designer's point of view. Truly, recent series railway motors are teaching us that the volumes that have been written on design are largely superfluous. All that seems to be necessary in modern railway motor design is to boldly construct, regardless of magnetic proportions or time-honored traditions, and produce a result that is satisfactory without any particular reason therefor. Certain it is that unless the able designers of this motor elect to expound or to build something entirely different from that which has been illustrated, we shall have a mysterious machine which will take its place alongside certain well-known arc dynamos which work well in spite of their design.

Discussing the details of the machine as it is described and illustrated, and considering further the magnetic circuit, its dimensions as shown seem insufficient from a magnetic standpoint. Comparing these with the armature diameter and remembering that the machine is a bipolar one, we are forced to the conclusion that the density in the armature is very low; in fact, nothing like what has previously been good railway practice. Even if the cross members on which the pole pieces are mounted had depth to touch the rails, their section seems insufficient, and so arranged they would form a serious obstacle to brake-shoes and kindred mechanism. Small flux means many armature conductors if large torque is to be secured, and many armature conductors and small flux means field distortion and variable points of commutation.

The gap space is a still more wonderful creation. One certainly cannot accuse the machine of lack of graded field for

commutation purposes. Even the minimum air gap at the point of tangency must be not only large, but variable, for one-eighth of an inch is close railroad mechanics in fitting axle boxes to pedestal jaws.

Figures may tell a different story, but looking at the wash drawing, for it is obviously not a photograph of the machine itself, and having appreciated the poverty of iron in the magnetic circuit as far as the drawing will permit, the additional reluctance of the gap space, and the obvious magnitude of the leakage coefficient, causes one to look doubtfully at the rather diminutive field bobbin there portrayed, and still the wonder grows.

Accustomed as we are to railroad motor commutation which is prevented from pyrotechnics only by the grasp of an overmastering field flux, it becomes a matter of congratulation that the machine is bipolar, and evidently has many bars between the brushes.

The commutator itself is depicted of noble dimensions. From the appearance of the drawing one may gather that it clears the tops of the rails by only 10 ins. The armature perhaps escapes the rail by a matter of 8 ins., and if the picture is to be believed, one cannot complain of lack of ventilation. The open motor has not proved entirely satisfactory on elevated railway work where the permanent way is comparatively clean, and if the structure as depicted in your columns is to be actually put in service on the New York Central installation, then the days of motor curtains have surely returned. When one considers this large commutator receiving as it does 600 amps. at a potential of 650 volts, and delivering the same to an armature which revolves in a field of very doubtful characteristics, and considerably exposed at best to the splash of water and mud from the wheels, one can be pardoned for wondering why it is not reasonable to expect that the machine might spill over at the brushes. A spill-over on a machine of such dimensions is a formidable catastrophe. The fertile imagination has visions of a most edifying newspaper description of the electric demon of the tunnel proceeding on four thunderous catherine wheels of blue flame.

Surely, the designers for the New York Central tunnel locomotive have taken all these matters into consideration, and have good answers to all of these questions. I must confess that I await with interest the reasons for justifying the remarkable designs submitted, for they must not only be very convincing, but must almost contain a new principle.

Perhaps after all we have not seen the motors, but only the preliminary dream of some well-meaning artist of the publishing department. Every reliable and energetic manufacturing concern has made many pictures of machines that were never built, and this may be one of them.

GEORGE T. HANCHETT.

THE DEPRECIATION PROBLEM

Denver, Col., June 30, 1904.

EDITORS STREET RAILWAY JOURNAL:

It is a singular fact that the owners and managers of roads will devote the most painstaking attention to methods of cutting down operating expenses which can be directly expressed in dollars and cents, and yet largely overlook the indefinite, and yet important, questions of depreciation, simply because so many uncertainties are involved in the life of their plants.

The electric railway offers an admirable opportunity for the study of depreciation, composed as it is of a great variety of physical features. On a large system, the mechanical department deals with an enormous multiplication of parts of machinery, and the material is at hand to enable very interesting and accurate data to be collected upon the life of every kind of apparatus, from brake-shoes to car cushions. Ask the master mechanic how long his motors last in service and he will probably be able to answer you with pretty fair accuracy, but it is another story when we dissect the machinery and endeavor to form a correct notion of the depreciation of brushes, commutators, bearings and armature shafts. The point which I wish to make is, that while there may be what the psychologists call a "sub-conscious impression" prevalent in the minds of the mechanical force as to how long apparatus lives in service under varying conditions, there is an unfortunate absence of exact information in the company's files based upon experience. It is all the more important that each company should secure this kind of data from its own costly experience, because the conditions of operation vary so widely on different roads. In a good many cases it is possible to disentangle from the records of shop repairs a vast amount of data upon the cost of maintaining the plant, but in other instances the entire energy of the mechanical department is used up in keeping the road moving, records of money spent on repairs being simply kept in the aggregate, as, for example, "$500 in a certain month was expended upon car equipment"—not the slightest intimation being given as to how much went to motors, controllers or trucks.

It is a notable fact that there are few things which the practical mechanic in a street railway repair shop dislikes doing more than preparing a report or "doing bookkeeping" in connection with his work. He would much prefer to be let severely alone with his tools and the diseases which they cure, and the writer has considerable sympathy with this point of view. Certainly, the repair-man's first duty is to keep the rolling stock in condition to move, and on a busy system if such a man should devote the necessary time to getting together all this data upon depreciation, the chances are that in a short time the road would find itself crippled for cars, or else short of power in the engine room.

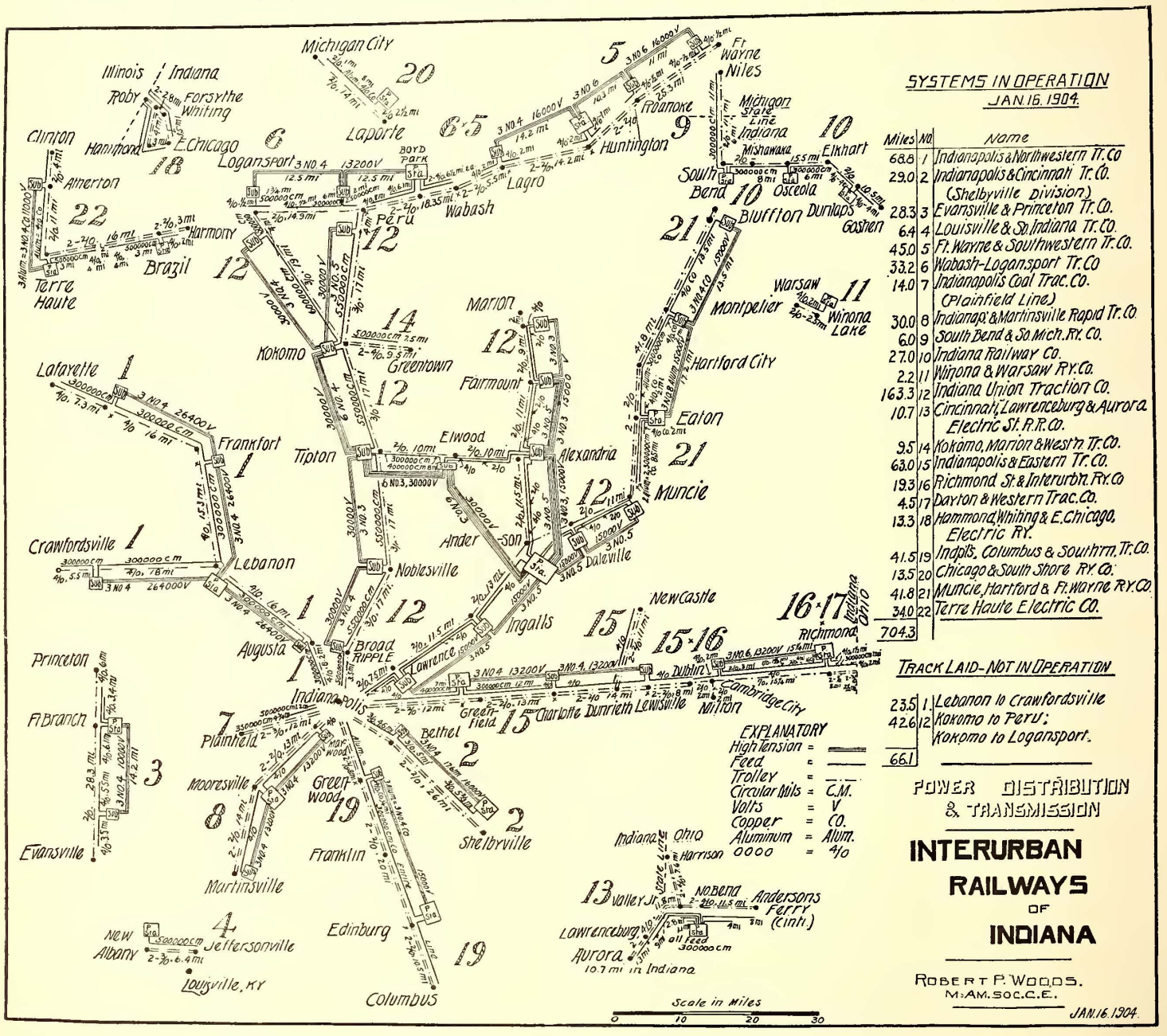
In the writer's judgment, this is a task which should fall to the auditing department. What is needed is co-operation between the mechanical man and his clerical brother, if results are to be secured which will be valuable. The problem is simply one of properly recording every expense which is incurred in the life of a given piece of apparatus, with the dates of repairs, and some data as to the conditions under which it works. The card catalogue lends itself admirably to this sort of problem, and one of the best things about it is the ease with which it may be kept up to date. As an experiment it may be begun in a small way and with a very few items, such as car bodies, motors, controllers, wiring, trucks, brakes, engines, generators, boilers, switchboards, condensers, pumps, piping, track and overhead lines. Steadily such a system will prove its value and expand to meet the growing plant and rolling stock equipment. A daily visit to the repair shop by one of the auditing clerks will generally enable sufficient data to be filled in the card catalogue to permit accurate study of depreciation. On very large systems it is profitable to have a single clerk devote most of his time to gathering information upon this branch of electric railway economies.

It may very properly be asked, "What is the use of all this data after you have collected it?" The value of it lies in the power conferred upon the company to put its finger upon any unusual departure from regular operation which is a source of waste, and which might otherwise run along to the tune of many hundred dollars a year, unnoticed and unrelieved. There is abundant room for the exercise of graphical diagrams. Even with great care in purchasing, the quality of materials is likely to vary from time to time, and if this variation appears in the auditing department's maintenance record, as it is bound to do if the quality of materials deteriorates, there is a pretty good chance of its being discovered in time to prevent undue losses occurring. The electric railway can well afford to take a leaf from the book of the modern manufacturer in regard to studying depreciation, instituting economies in operation, and re-

placing old apparatus by new when it has ceased to be the most profitable known method of accomplishing a given result. Anything which can bring the different departments of a large transportation system into closer working harmony and appreciation of each other's problems, is bound to produce a lasting benefit and constitute an influence toward better economy. H. S. KNOWLTON.

POWER DISTRIBUTION ON INDIANA INTERURBAN RAILWAYS

An abstract was published in the June 18 issue of the STREET RAILWAY JOURNAL, of a paper presented by Robert P. Woods, of Townsend, Reed & Company, before the Indiana Engineering Society, giving particulars of the interurban electric railways in that State. Several tables of statistics of all of the Indiana interurban lines were published in that issue, together with a diagram showing the different forms of overhead construction in use. The accompanying diagram, showing the layout of the feeder systems of the different interurban electric railways, was also presented at that meeting and is published herewith; it is particularly interesting in view of the extent of the Indiana interurban railways, and the high voltages used on a number of the lines. Statistics as to the cars operated and other essential factors in connection with the system of feeder distribution of the different lines will be found in the tables already referred to in the STREET RAILWAY JOURNAL for June 18.



POWER AND TRANSMISSION SYSTEMS OF INTERURBAN RAILWAYS OF INDIANA

MANAGER PECK, OF SCHENECTADY RAILWAY, GIVES ENTERTAINMENT TO RAILWAY OFFICIALS.

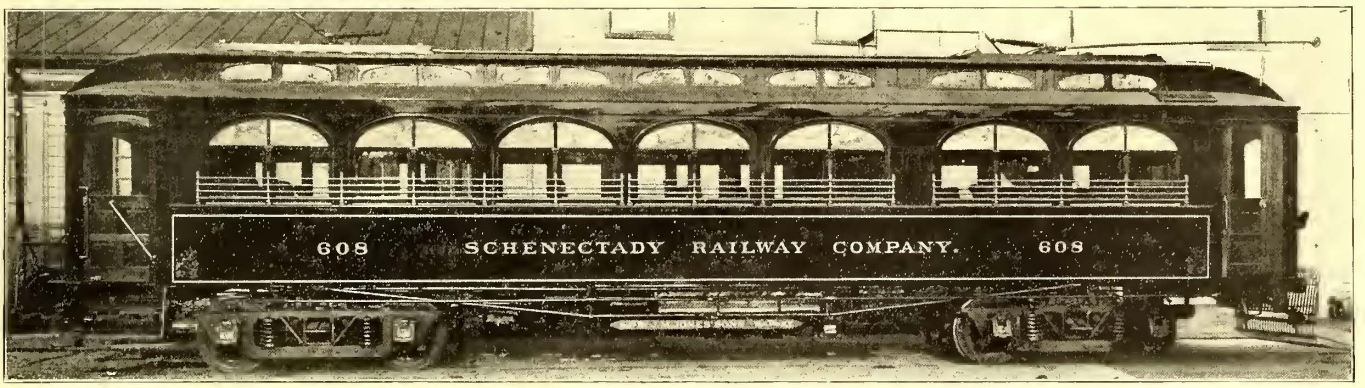
General Manager Edward F. Peck, of the Schenectady Railway Company, of Schenectady, N. Y., recently entertained prominent railway officials. The party left the office of the company on State Street in a private car—one of the handsome new coaches constructed expressly for the service upon the new Ballston division of the company. Upon their arrival at Ballston Lake the party embarked in a yacht and enjoyed a sail. Later the guests were entertained at Captain Guy Baker's. The guests included General Manager J. N. Shannahan, of the Fonda, Johnstown & Gloversville Railroad; General Manager George G. Blakeslee, of the Albany & Hudson Railway; General Manager C. Loomis Allen, of the Utica & Mohawk Valley Railway; Chief Engineer C. C. Lewis, of the Schenectady Railway Company, and Secretary and Treasurer James O. Carr, of the Schenectady Railway Company.

NEW CARS FOR THE SCHENECTADY RAILWAY COMPANY

J. M. Jones' Sons, of Watervliet, N. Y., have recently built for the Schenectady Railway Company, of Schenectady, N. Y., six fine interurban cars of the type shown in the accompanying illustration. The general dimensions of these cars are: Length, over all, 51 ft.; length over body, 41 ft.; width over all, 8 ft. 9 ins.; height from rail to top of trolley board, 13 ft.

The framing of these cars follows the best steam car construction, being furnished with steel platforms, 7-in. I-beam side sills and double posts for insuring great strength and rigidity. There are fourteen windows on each side, the window arching being in Colonial style, having polished plate glass in sash and cathedral opalescent glass in the fanlights. The fixtures for both the side and vestibule windows were furnished by the O. M. Edwards Company, of Syracuse, N. Y.

Each car is divided into a passenger and a smoking compartment. The regular compartment has eighteen cross-seats and two longitudinal spring-cushion seats. These seats have high backs, with head rolls and arm rests on the aisle end, and are upholstered in Epingle, an English covering of handsome design. The smoker has six cross-seats and two longitudinal seats, of the same type as those used in regular passenger compartment, except that the covering is of dark leather. All seats



INTERURBAN CAR FOR THE SCHENECTADY RAILWAY COMPANY

are of Hale & Kilburn manufacture. The ceiling is of full Empire design and painted a light green, with no decoration, the effect of the moulding arrangement being considered more pleasing. Continuous parcel racks, made of bronze, extend throughout the car on both sides. Coat and hat hooks are also furnished, in addition to register fixtures, bell-rope hangers, ventilator openers, etc.

The interior finish is of solid mahogany throughout, inlaid with marquetry work, the mouldings being plain, with rounded edges, to prevent the accumulation of dust in the depressed surfaces. The passenger compartment is illuminated by four four-lamp clusters of incandescent lamps, while one five-lamp cluster serves to light the smoking compartment. Each cluster is encased by a 12-in. Holophane globe, with bronze trimmings. The platforms are each furnished with one Holophane globe. The side curtains are of Pantasote. The cars will be heated according to the Peter Smith hot-water system, the pipes extending along the sides of the car and the heater being placed in one end of the smoker.

The platforms are arranged on one side of the center, with a partition for the motorman's cab. The cab in the smoker-end contains a slate panel, on which are placed all switches, etc., all enclosed by a casing lined with the H. W. Johns-Manville Company's new fireproofing material known as "Transite." The step-opening arrangement in the platforms is of Edwards' design.

The car exteriors are painted in the Schenectady Railway Company's standard colors, the body being maroon, with black and nickel striping, the name of the company appearing in large gold letters through the center, and the ends having corner ornaments of gold. The roof color is a dark Pullman.

The electrical equipment consists of four G. E. No. 66 motors, geared for 70 miles an hour, and operated by Type M control. These motors are mounted on the American Locomotive Company's M. C. B. trucks, which have 34-in. wheels and a 6 ft. 6 in. wheel-base. The air brakes are of the General Electric Company's straight-air type, and the arc headlights are also of that company's manufacture. The lower part of the car is also fireproofed by Transite boards.

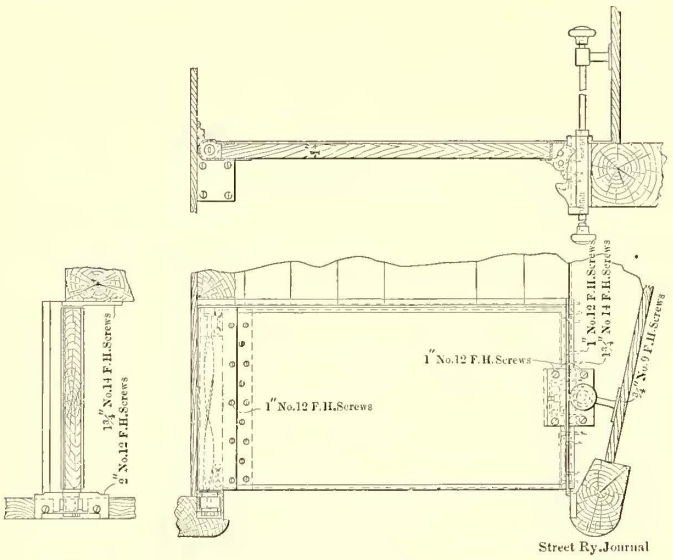
Reference has already been made to the window and trap-door designs, but as these possess several interesting features, they will now be described in detail.

The style of window design adopted for the side windows of all the cars is known as No. 7-B1. In this design of window, having a single sash in two parts, the sash is connected with the spring roller sash balance by two chains arranged to draw at an angle and not overlap in winding and unwinding upon the roller. These chains are attached to the sash by a rock shaft having the two ends extending at an angle to each other, where the chains are attached so that the rock shaft will rotate in its bearings to give and take any variations as the chains wind and unwind upon the roller in raising or lowering the window, thereby causing the chains to pull with equal tension. The spindle end of the roller is received in a worm-gear roller bracket, by which the spring in the roller can be adjusted as desired without removing the roller from the brackets or disturbing the finish. This is accomplished by inserting a socket wrench through an opening provided in the finish and engaging with the end of the worm projecting from the bracket. The roller brackets have extending flanges designed to receive the sash when raised to its limit, and the sash is provided with rubber buffers placed to strike against the bracket flange.

In this style it is intended that the roller shall be adjusted to balance the sash. At each of the two sides of the window a metal bar is applied to the stop casings having a bearing surface at an angle to the inside surface of the sash. At each of the two bottom corners of the sash a lock is placed having a beveled bolt operated by a pivoted lever or finger latch, the bevel bolt being normally held by a spring against the level surface of the bar upon the stop casing, thereby wedging the sash firmly against the outside stops at the bottom of the window with a yielding pressure which is self-adjusting to varying conditions, such as shrinking or swelling of the wood, and always maintaining a tight joint at this point, excluding dust and cinders from the car and preventing any rattling or play of the sash. The stop bars have recesses near the bottom ends designed to receive the bevel bolts and to lock the sash when in a closed position. The length of the stop bars is determined by the raise of the sash and the corresponding travel of the lock bolt with which they engage.

At each of the two sides of the window a roller-bearing is applied to the stop casings a distance above the stop bars, ar-

ranged to bear against the two top corners of the sash when the sash is in a closed position, holding the sash securely against the outside stops at the top of the window with a yielding pressure which is self-adjusting to varying conditions, and maintaining a tight joint at the top of the sash. Weather stripping



EXTENSION PLATFORM TRAP DOOR. DESIGN S

is provided at both the top and bottom edges of the sash, applied so as to maintain a tight joint at these two places. In operating the sash the bevel bolts are withdrawn, when the sash is readily raised or lowered by hand, the pressure of the roller-bearing always remaining against the sash.

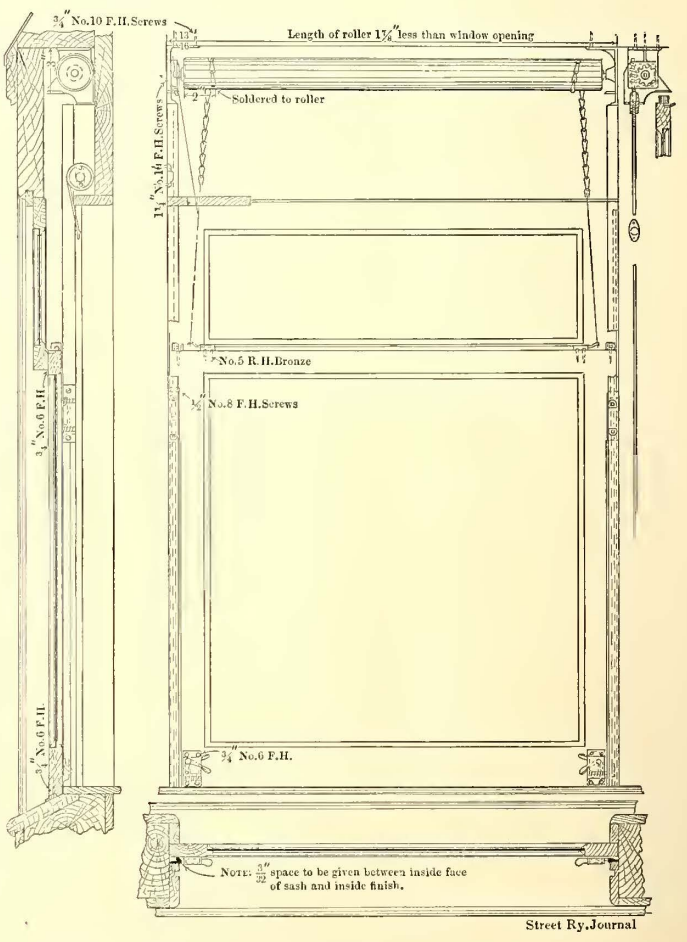
For the vestibules of all the cars, the company's window design No. 8 is employed. In this pattern the sash is connected at its lower edge with a spring-roller sash balance, located beneath the sill by a linen band, the arrangement being such that the sash lowers beneath the sill to open the window. The spring in the roller is adjusted in the same manner as in window design No. 7-B1. In this type it is intended that the roller shall be adjusted to raise the sash automatically, and to close the window when the sash is released and free to move. The two stop casings, which form the finish at the sides of the window, are connected at their lower ends by a sill piece, and are pivoted at their upper ends, the three pieces forming a pivoted frame, which is normally held against the sash when the window is closed or partly open, by two springs, one at each side, forcing the sash against the outer stops with a pressure which adjusts itself to varying conditions.

When the window is closed the sash rests upon the sill over a slightly projecting ledge. To open the window, the sash is lifted to clear the ledge and the stop frame withdrawn, when the sash, by connection with the spring-roller sash-lift, is drawn to a position where it can be readily pushed down against the stress of the roller into the pocket beneath the sill. The construction is such that the sill piece of the pivoted frame is withdrawn to release the sash, which, when thus released, will raise automatically by means of the roller sash-lift and its connecting band to a point where it is only necessary to lift the sash over the projecting ledge of the sill to its intended position. The sash will be held at any point in a partly open position by pressure of the pivoted frame. This design, with varying construction, is especially adapted to all windows having sash which lower to open the window.

The following is a description of the Edwards type "S" trap-doors used on the Schenectady cars:

The trap-door is attached to the hinge, being received between the flanges, which are screwed to the door above and beneath. The hinge is pivoted at its two ends by brackets or journal bearings, one being attached to the step timber, and the other to the end of the car. The door is supported in a closed position at its opposite edge by a support bar held by brackets screwed to the platform and sill, openings being left back of the bar to allow snow or other material to fall through, thus giving the door proper freedom to close. The hinge is designed to receive either two or three flat spring bars, as the weight of the door may demand. These bars extend throughout the length of the hinge, and are held at one end in the hinge and at the other end in a ratchet wheel located in the bracket or journal-bearing, which is attached to the end of the car. The ratchet wheel is normally held by a wedge piece inserted through an opening in the bracket case to engage the teeth of the ratchet wheel, and also has a nut extending through the bracket case to adjust the torsion of the spring bars, it being intended that the springs shall be adjusted to open the door automatically when released by the operating means.

A lock is located in the front edge of the door having a pivoted bolt designed to engage with the keeper-plate located opposite in the platform end sill to lock the door in a closed position. The operating means to raise the door embraces two operating handles, consisting of rods threaded at one end to screw into the casting, which casting is received in a recess in the platform end sill, the rods being fitted at the other ends by handle knobs. One handle extending above the platform is held at its upper end by a bracket attached to the vestibule side wall, designed to be operated within the vestibule above the platform. The other handle, extending through the end sill, is designed to operate the door from beneath the platform. The casting to which these two handles are attached and which



PLAN SHOWING APPLICATION OF WINDOW FIXTURES.

is located in a recess in the platform end sill is so designed that by an upward movement the lock bolt is first withdrawn or forced back by the inclined surface of this casting designed to contact with the lock bolt to release the door, and then, should the door stick or be bound by the platform, the knocker-end of the casting is brought in contact with the bottom of the door to loosen and start the door a sufficient distance to insure its

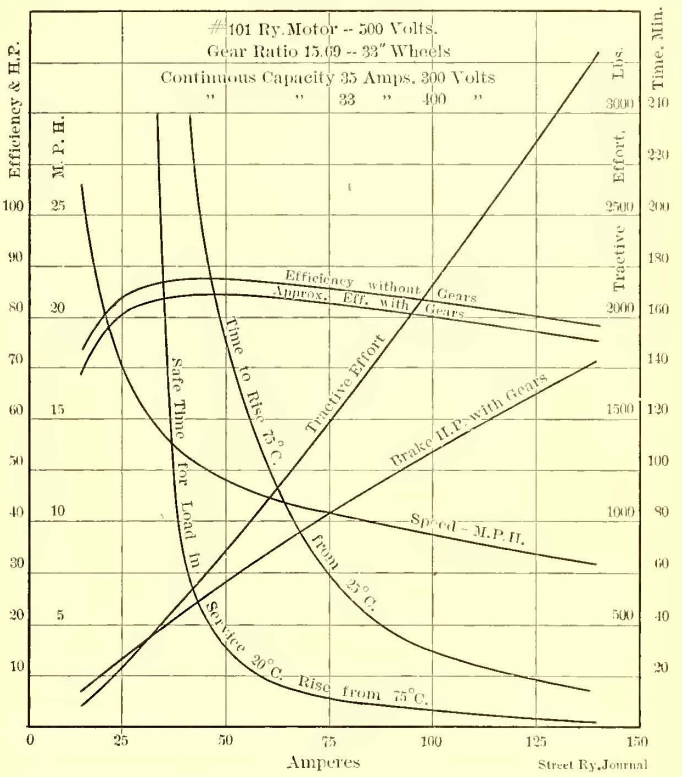
opening automatically. This arrangement does away with the necessity of a hand-lift in the top surface of the door. One-eighth inch clearance should be provided between the edges of the door and the platform. The trap-door is received upon its one side by a molded piece applied to the vestibule side door, and a molded piece is also applied in a manner to close the opening between the trap-door hinge and the end of the car.

This door is especially adapted and intended for the needs of vestibuled street and interurban cars. The simplicity and ease of appliances and maintenance of this door has brought it into general favor upon this class of cars.

THE WESTINGHOUSE NO. 101 RAILWAY MOTOR

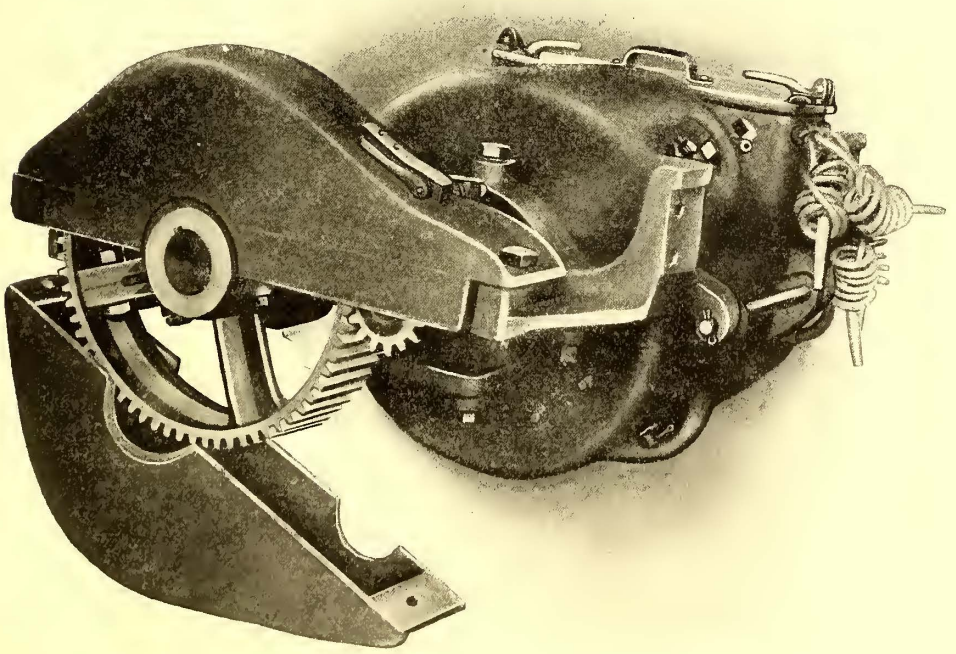
The No. 101 railway motor has recently been brought out by the Westinghouse Electric & Manufacturing Company to supply the demand for a motor of about 40 hp nominal rating. Under usual conditions of operation, a double equipment of these motors is suitable for single-truck cars, weighing from 16,000 to 18,000 lbs., without equipment or load, and for double-truck cars of equal or slightly greater weight. A quadruple equipment will, under similar conditions, successfully operate a double-truck car weighing approximately 30,000 lbs., exclusive of equipment and load. Schedule and running speeds, frequency of stops, construction of track, grades and other conditions of installation and operation must, of course, be more definitely expressed before an exact determination can be made.

The No. 101 motor, as stated, has a nominal rating at 500 volts of 40 hp for one hour. The curves herewith indicate more exactly the performance characteristics of the motor under the given conditions of gearing, load and speed. The motor has a continuous capacity of 35 amps. at 300 volts, or 33 amps. at 400 volts. At the close of a shop run of twenty-four hours' duration, at either of these loads, the rise in temperature of the motor windings, as measured by thermometer, will not exceed 75 deg C. When operated under a running car, better ventilation is usually secured, and the rise in temperature should not exceed 55 deg. C. Heavier loads may be safely carried for shorter periods, with corresponding higher temperatures, as indicated by the time-temperature curve, which is based on a temperature rise in the interior of the motor coils of 20 deg. C. above that of ordinary operation. If, for example, the motor has been running at a load of 35 amps. at 300 volts for such a time that a temperature of 75 deg. has been reached, it may then be operated for 1½ hours at a load requiring 37½ amps.,



PERFORMANCE CURVES OF NO. 101 RAILWAY MOTOR

or for one-half hour at a load of 50 amps, with an increased rise in temperature not exceeding 20 deg. C. These temperatures are well within safe limits, and do not subject the insulation to injury or rapid deterioration



MOTOR AND GEAR CASE COMPLETE

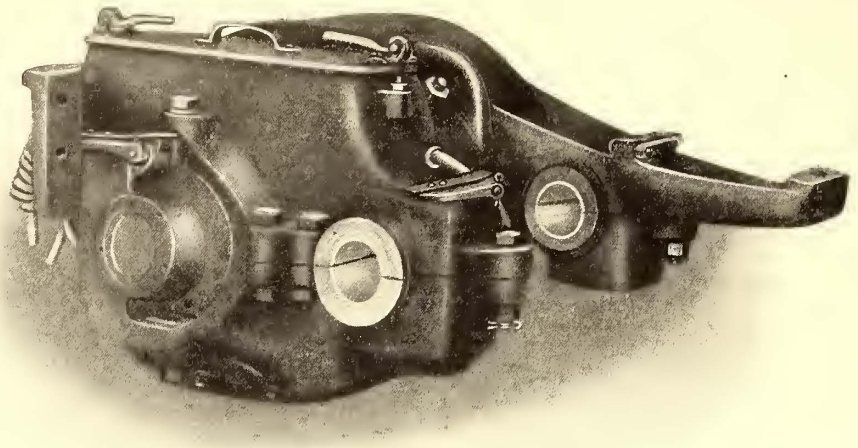
The No. 101 motor retains features standard in Westinghouse practice, but embodies modifications and improvements in design and construction which mark an advance over earlier types. The frame consists of two castings of high-grade steel, divided along a horizontal plane, and hinged together in such a way that on the removal of the bolts the lower field may be opened down either with or without the armature, and access obtained to any part for inspection or repair.

The motor field contains four poles of laminated steel bolted to the frames and riveted together between end plates of wrought iron. The holding bolts pass through the frame from the outside and terminate in heavy rivets provided for the purpose. The pole faces are thus left smooth and with unbroken surface. The pole tips are extended and serve to hold the field coils in place.

The coils are wound with copper strap, insulated with asbestos and mica, and protected by heavy wrappings of tape. Flat steel springs between the coils and frame prevent looseness due to shrinkage. Protection against mechanical injury is provided by leatheroid washers and oiled duck.

The armature core is made up of circular punchings of soft steel, built up on a cast-iron spider, and secured between end

plates of cast iron. The spider is pressed on the motor shaft and keyed in place. The armature coils are imbedded in rectangular slots in the core, and held in place by retaining wedges



NO 101 RAILWAY MOTOR, COMPLETE

of hard fiber. The completer armature is 14 ins. in diameter. Wiper rings are pressed on the shaft outside the armature. They prevent the introduction of oil within the motor frame.

The commutator is formed of 111 hard-drawn copper bars, built up together upon a cast-steel bushing and pressed on and keyed to the armature spider. The commutator face is 10 ins. in diameter by 4 1-16 ins. in width, and presents a wearing depth of approximately ¾ in.

The brush holders are independently supported from the upper frame and are of the sliding type, with shunts. Each arm carries two special brush springs of flat phosphor bronze. The shunts lie between the pressure fingers and the arm. The brushes, two per arm, are each ½ in. x 1¾ ins. in section.

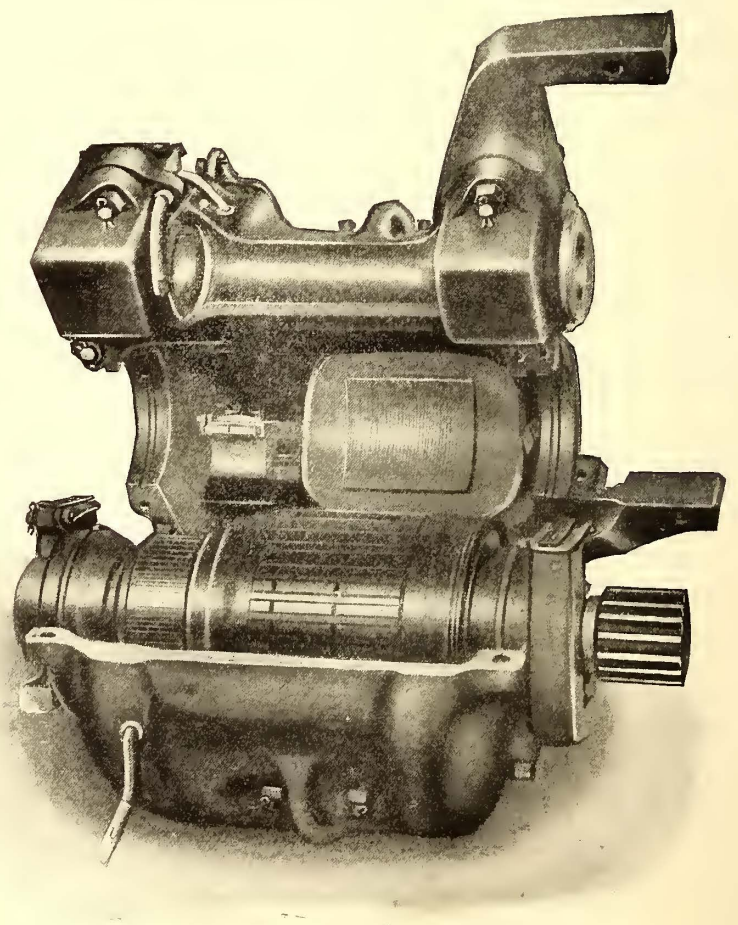
Solid sheets of cast iron, lined with babbit metal and pressed in circular housings of cast-iron, form bearings for the armature shaft. The bearing housings are securely held between the upper and lower motor frames, and retained in place by finished flanges on the inner ends, which fit finished surfaces on the frames. Screw taps are provided so the housings may be bolted to either frame and the armature. The bearing houses contain oil and waste reservoirs, which extend around one side and below the armature shaft, and allow the saturated waste to come in contact with the shaft through large openings in the low-pressure side of the bearings. This method of lubrication is similar to that used in car-journal boxes on interurban and steam roads. The ends of the housings next the armature are extended to include the wiper rings so that oil thrown off by these rings or drippings from the housings is drained directly into separate wells in the bottom of the housings. The armature-bearing at the commutator end is 7 1-16 ins. long; that at the pinion end 8½ ins. long. Both are bored for a shaft diameter 3¼ ins. The axle bearings consist of cast-iron shells, divided horizontally and lined with babbit metal. They are held between projections from the upper frame and caps of cast steel, which are bolted to these projections. These caps may be taken off and axle and wheels removed without disturbing motor or suspension. The axle bearings are 8 ins. in length and may be made for any shaft diameter not exceeding 5 ins. Lubrication is obtained by the use of oil and waste, as in the armature bearings. A large reservoir, with an opening through the upper frame, is located in the axle cap behind each bearing, and feeds the axle through an opening in the lower half of the bearing.

Lugs cast solid with the upper frame provide for suspension from the trucks by means of bars set parallel with the motor shaft.

A forged steel pinion, with machine-cut teeth, is keyed to the shaft and held upon its seat by a nut and lock-washer. The gear is made of cast-steel in two parts, which are bolted together and keyed to the axle. The face is 5 ins. wide. Gear ratios of 15:69 to 26:58 may be used; 15:69, 18:66 and 22:62 are standard.

The gear is made of malleable iron in two castings, which are secured at front and back to the upper half of the motor frame by bolts which pass through lugs on each half of the gear case and the extension from the motor frame shown in the illustrations. The gears may be run in oil.

The diagram on the previous page gives the performance curves of the motor with a gear ratio of 15:69 and 33-in. wheels.

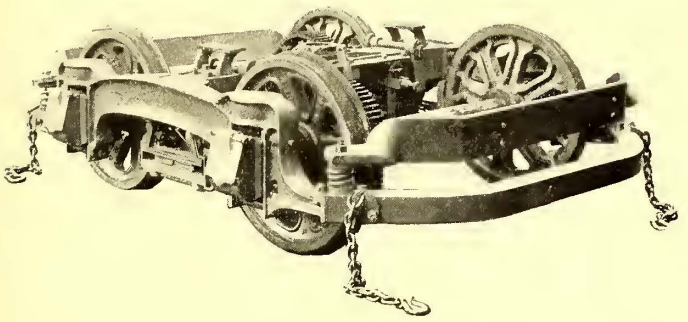


MOTOR OPEN, SHOWING ARMATURE

The weights of the No. 101 motor are approximately as follows: Motor alone, 2315 lbs.; motor complete with gears and gear case, 2645 lbs.; armature complete with commutator and shaft, 593 lbs. A complete double equipment, including two motors, two controllers and the usual details will weigh, approximately, 6430 lbs. A corresponding equipment of four motors, two controllers, etc., will weigh, approximately, 12,160 lbs.

NEW TYPE OF TRUCK FOR KANSAS CITY

The St. Louis Car Company is now turning out a new design of truck for use under the cars which it is supplying to the Kansas City Railway & Light Company.* This truck is built along the same lines as the previous No. 47 trucks, but it has heavier frames, and instead of the swinging link brake-shoe hangers used on the No. 47 truck, the new No. 47-A truck has

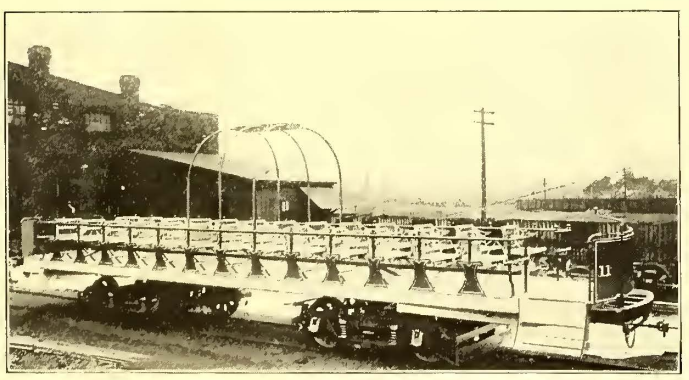


HEAVY TRUCK, WITH SLIDING BRAKE BEAMS, USED IN KANSAS CITY

sliding brake beams. The latter are well shown in the accompanying illustration. The space occupied by the beams is directly under the spring plank. The entire arrangement is very compact and substantial. Flat kick-off springs are employed for releasing the brakes. The truck is made to receive two G. E. 57 motors, outside hung. The axles are 5 ins. in diameter and the standard Master Car Builders' wheel tread is used, that tread having been adopted as standard in Kansas City.

AN INTERESTING EXCURSION CAR FOR TEXARKANA

The Texarkana Light & Traction Company, of Texarkana, Tex., has lately received from the American Car Company the interesting type of summer excursion car shown in the accompanying illustration. The St. Louis Transit Company last year built a number of cars somewhat similar, the difference being that they were provided with awnings, the seats extended all the way across, and a running-board on one side gave entrance to each bench. In England there are cars like the type illustrated, which have been in use for the past year or two at



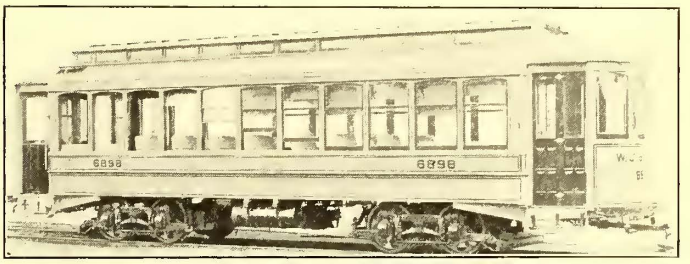
ROOFLESS EXCURSION CAR FOR TEXARKANA, TEX.

watering places, and have proved very popular. The English are accustomed to riding in the open on double-deck cars, and therefore take kindly to an arrangement such as this.

As the car is carried on high-speed trucks, the seats are enclosed with railings for safety, and entrance only at the ends. The advantage of such a car is, of course, that it provides at smaller expense a means of carrying the crowds, which on fair days flock to the parks. As the illustration shows, the car is very stanchly built, including heavy trusses and sill plates, and strong braces on the inside of the panels; the side sills are 4¾ ins. x 7¾ ins., with 8-in. x ⅝-in. sill plates on the outside. The length over the crown pieces is 41 ft. 6 ins.; the width over sills and plates, 8 ft. 6 in. The length of the seats is 36 ins. and the width of aisle, 24 ins. The heights of the steps is respectively 16⅞ ins., 11 ins. and 11 ins. The trolley board is firmly supported by continuing three of the tubular posts at the center of the car and arching them at the proper height. The seats are composed of ash slats, with open spindle backs; the seating capacity is fifty-two. The car is equipped with American Car Company's sand-boxes, Brill angle-iron bumpers and ratchet brake handles.

FINE CARS FOR ATLANTIC CITY, N. J.

The West Jersey & Seashore Railroad Company, of Atlantic City, which is owned and operated by the Pennsylvania Railroad, has lately placed in commission twenty semi-convertible cars, built by the J. G. Brill Company. The lines on which these cars are to be operated extend from what is known as the Inlet, at the north end of the city, to Longport, several miles to the south, and run for a distance of 9 miles close to the beach. The route is exceedingly attractive, and the cars are largely used by those who ride for pleasure. The low sides of the cars give them a very light and airy appearance when



DOUBLE VESTIBULE SEMI-CONVERTIBLE CAR OPERATED IN ATLANTIC CITY, N. J.

the window sashes are raised into the roof pockets. The car in the illustration has a number of windows raised to different heights, showing that passengers may have as little or as much air as they please. The window sills are 24⅝ ins. from the floor and have the builder's patented arm-rest, which adds considerably to the comfort of passengers and does not interfere with the window locks. Seats accommodating four passengers each are placed longitudinally at the corners; the rest of the seats are 36 ins. long, with the aisles 22 ins. wide. Mahogany ornamented with marquetry comprise the interior finish, with ceilings painted light green and striped with gold.

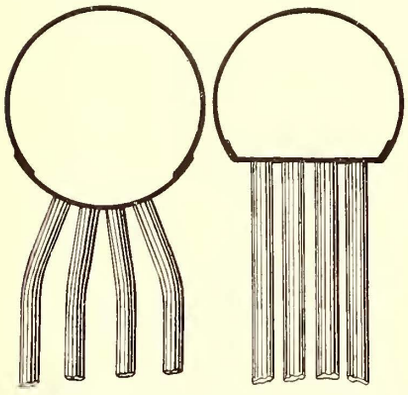
The cars measure 30 ft. 8 ins. over the body, and 40 ft. 1 in. over the vestibules; from end panels over vestibules, 4 ft. 8½ ins.; width over the sills, 7 ft. 10½ ins., and over the posts at belt, 8 ft. 2 ins.; sweep of posts, 1¾ ins.; the side sills, of long-leaf yellow pine, are 4 ins. x 7¾ ins., with 12-in. x ⅜-in. plates on the inside, which take the place of upper and lower trusses; the end sills, of white oak, are 5¼ ins. x 6⅞ ins.; the stringers are 3½ ins. x 4¼ ins., re-enforced with 4-in. x 3-in. angle-iron. The thickness of the corner-posts is 3¾ ins. and of the side-posts, 3¼ ins. The angle-iron bumpers, draw-bars, brake handles, platform and conductors' gongs, etc., are of the builder's manufacture. The trucks are Brill 27-G-1, equipped with two 40-hp motors. The cars are framed for four motors, but two only are used at present, both on the rear trucks. The weight of a car and trucks, with motors and controller, is 34,200 lbs.

The Toledo & Western Railway Company has been awarded a contract for carrying United States mail between Toledo and Pioneer. A special compartment car will be fitted up and mail will be distributed at all the intermediate towns.

THE RUST WATER-TUBE BOILER

Although the Rust water-tube boiler has been before the engineering public only a short time, it has already been adopted by several important power plants, and a description of its principal features should therefore prove of interest. This boiler was designed by E. G. Rust, formerly chief engineer and general superintendent of the Colorado Fuel & Iron Company, and was first placed in service in the Minnequa Steel Works of that company. It is now being manufactured by the Rust Boiler Company, of Pittsburg, Pa.

While investigating the question of boilers with a view to equipping a number of important steam plants, Mr. Rust became strongly convinced that there was no boiler obtainable which would prove a safe and economical steam generator and be easy to clean and repair. This conviction induced him to undertake the design of a water-tube boiler that would be free from the disadvantages possessed by other boilers, such as flat surfaces requiring staying; construction in which it is frequently found necessary to cut out good tubes to replace defective ones; curved tubes which render difficult or even impossible the removal of scale and make it necessary to keep on hand for repairs a multitude of tubes of different shapes and lengths; horizontal tubes, or tubes slightly inclined to the horizontal, which allow scale and mud to lodge in the bottom of the tubes, causing them to burn out; a multitude of hand-pole plates to be removed and replaced with every cleaning; excessively thick metal in heating surfaces; short and too direct path for flames and hot gases, thereby not allowing sufficient time for contact with heating surfaces, and consequently resulting in high chimney temperature and low efficiency; lower drums subject to corrosive action on the outside, due to being built up closely into brickwork of setting and bridge wall.



FIGS. 1 AND 2.—SHOWING TWO COMMON METHODS OF CONNECTING TUBES TO DRUMS

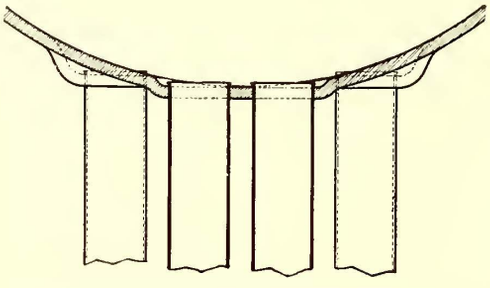


FIG. 3.—RUST CONSTRUCTION FOR WATER-TUBE BOILERS, EMBRACING THE USE OF CYLINDRICAL DRUMS WITHOUT FLAT SURFACES OR BENT TUBES

The most novel and characteristic feature in connection with this boiler is the special tube sheet used in the construction of the drums. It is the use of this tube sheet that makes possible the best construction for water-proof boilers, namely, cylindrical drums without flat surfaces or bent tubes. The construction of this sheet is clearly shown in the accompanying cuts, Fig. 3 and Fig. 4.

This tube sheet is formed by heating the flat plate to the proper temperature, then pressing in a hydraulic press fitted with dies especially constructed for that purpose, the pressing being done at one operation. An important feature of the construction of these tube sheets is that between each pressed-up portion and those adjacent, there remain undisturbed cylindrical portions or belts of the original surface of the drum. This construction provides a drum in which bent tubes or stayed surfaces are not necessary, and which at the same time is in every way as strong and reliable as those in which it is necessary for the tubes to enter radially.

This pressed tube sheet is considered by the designer to mark a great advance in boiler construction. Aside from this, the Rust boiler in its fundamental principles of construction and operation is in no wise a radical departure from old and well-established types. It is believed that through the development of this tube sheet there have been embodied in this boiler the best features of older boilers, while their defects have been eliminated.

The boiler proper consists of two steam and water drums, two mud drums and an auxiliary drum, each steam and water drum being placed directly above a mud drum and connected with the same by a bank of straight vertical tubes, the two mud drums being connected by a row of tubes. The auxiliary drum is placed above and between the mud drums and is connected to one of them by a row of short tubes and to a series of small headers by a bank of straight vertical tubes. These headers are placed between the steam and water drums and connected with the same by short straight tubes or nipples. Each drum is fitted with a pressed tube sheet, which has already been described.

The holes for the tubes forming the main banks are so spaced that the tubes are staggered—that is, the two inner rows are placed on a line between the tubes of the outside rows, thereby securing a more complete exposure to the hot gases, which, in order to reach the chimney, are forced to completely surround and envelop the tubes.

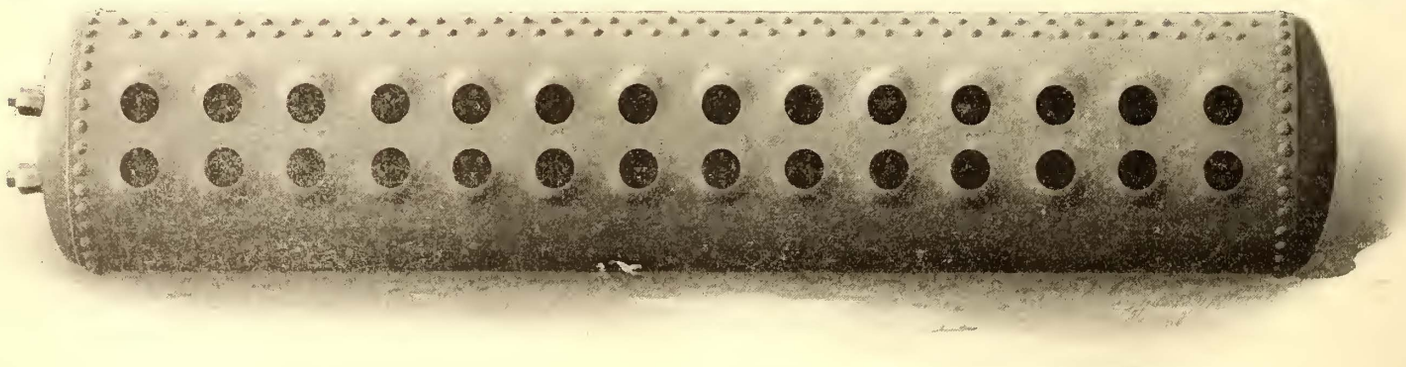


FIG. 4.—AUXILIARY DRUM FITTED WITH PRESSED TUBE SHEET

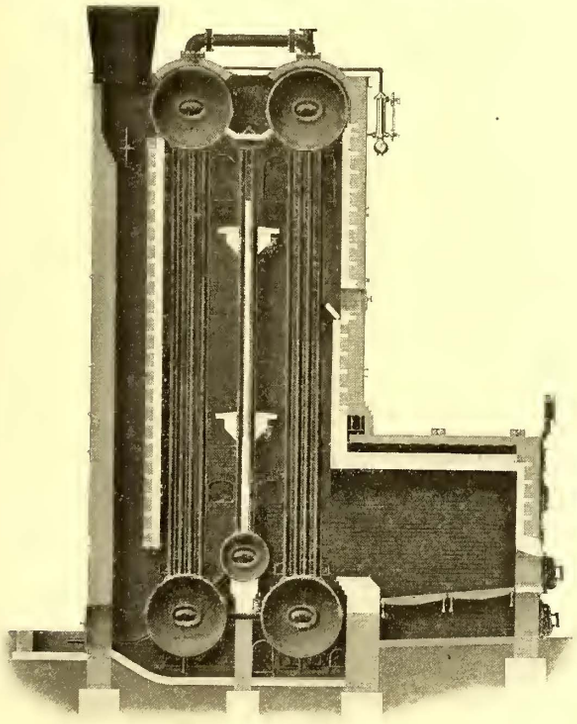
The spacing of these tubes is such as to leave room enough between the tubes of the outside rows to remove the tubes of the inner rows, thus making it a simple operation to remove and replace any tube without disturbing any other tube or any of the brick work. After a defective tube has been removed from the bank, it is passed out through doors placed in the side

of the setting for that purpose. By the introduction of the auxiliary drum and central bank of tubes, the space necessarily left between the main banks of tubes is so utilized as to secure a serviceable and convenient support for the baffle wall, the tiles forming which are placed between and supported by the rows of tubes forming this bank, and owing to the consequent increased heating surface a boiler of larger capacity results without additional floor space, fittings or cost of setting.

The boilers are made right and left hand, and are arranged to be set singly or in batteries of two. Each drum is provided with a manhole in one end to permit of access to the interior of the drum, and in the top of each header there is an oblong hand-hole through which to reach the interior of the tubes of the central bank.

The steam spaces of the steam drums are connected by cross-pipes of liberal dimensions. On top of each is an outlet, on which is placed a safety valve. The steam outlet is placed on top of and at the center of the rear steam and water drum.

The boiler is supported by four large cast-iron saddles resting on masonry foundations, one saddle being placed under each



SECTIONAL VIEW OF BOILER

end of each mud drum, the saddles under one of the drums being placed on rollers so as to permit of any slight movement that may be necessary on account of expansion.

By referring to the sectional view of the boiler it will be observed that the top of the central baffle wall is far enough below the headers to leave sufficient space for the products of combustion to pass from the front to the rear bank of tubes. It will also be observed that there are horizontal baffles or bracket tiles which project from this central baffled wall, and which serve to deflect the current of hot gases so as to force them toward and between the tubes of the main banks.

The setting does not require any special shapes of brick; is symmetrical and durable, and is firmly bound together by buck-stays, rods and angle binders at the corners. At the top of the setting and bolted to the corner binders is placed a box-shaped frame made up of channels and plates, which furnishes a rigid support for the brecching and stack, and also serves to firmly bind the brickwork at the top of the setting, and at the same time results in a neat finish.

On one side of the setting, near the top, are placed four small doors, which furnish access to the interior of the brickwork, and through which the tubes are passed in and out when replacements become necessary. Doors with small self-closing openings, through which to insert a hose for blowing off the top of the tube sheets, are placed near the bottom of the setting, and other doors are furnished for securing access to the interior of the setting and for blowing deposits from the exterior of tubes.

Over each steam and water drum and a little above it is placed a light steel arch, which serves as a center to support the brick arches over the drum during construction, and makes an air-tight covering for the setting. These arches are placed sufficiently above the drums to permit all possible upward expansion of the boiler, without interfering with the brick covering. Between the two arches are placed doors through which access is given to the headers.

Other very desirable features of the setting are its ready adaptability to an underground flue connection without the use of any pipe or plate work, and its adaptability for the use of waste gases from blast furnace and heating or puddling furnaces.

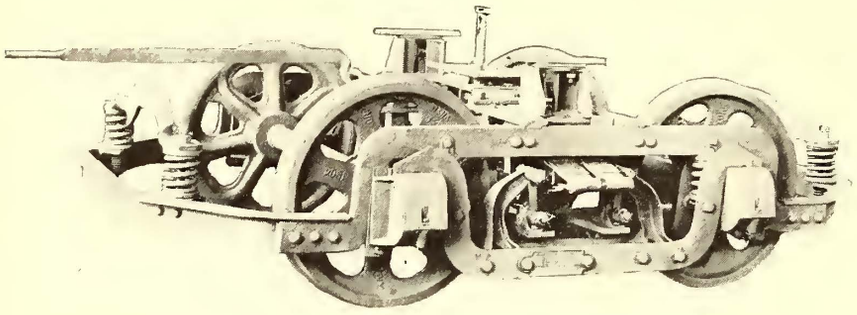
The furnace is of the exterior type, which experience has proved to give the best results, being convenient and of ample capacity, allowing proper admixture of air and fuel and complete combustion before the gases reach the cooling influence of the heating surfaces. The brick arch also retains sufficient heat to tend to preserve a uniform temperature in the furnace. This type of furnace permits the ready adjustment of grate area to suit any kind of fuel, and the application of any style of grate bar or stoker. The ratio of heating surface to grate area is such as to give the best results under average conditions, but may readily be proportioned to suit the kind of fuel to be used. The front is of cast-iron of ornamental design, surmounted with a bracket in the center for supporting the steam gage, and is so arranged as to permit the application of gas burners or any form of stoker.

Rust boilers were first used in Western plants, which use coal containing a high percentage of volatile matter and moisture. During a test, one of these boilers, rated at 200 hp, developed over 400 hp in evaporation, furnishing dry steam and showing a boiler efficiency of over 67 per cent and an average temperature of escaping gas of only 545 degs. F. The same boiler on another test, running slightly over its rated capacity, employing an inexperienced fireman, and using low-grade Western bituminous coal, evaporated 10.4 lbs. of water per pound of combustible and maintained a boiler efficiency of over 70 per cent.

The Grand Rapids Railway Company, of Grand Rapids, Mich., has just issued a new resort book for distribution in that city and in towns within a radius of 75 and 100 miles of the city. The book was designed by Arthur W. Jordan, of the company, and to say the least is exquisitely done. The title is "What Mr. Sueji Miyamori Saw in Grand Rapids," and the narrative describing the various local resorts is by Mr. Miyamori, a Japanese student in the University of Chicago, who inspected the resorts last summer in connection with the preparing of the book. His narrative is bright, novel and readable, and he draws some interesting comparisons between Japanese and the local resorts. The book also contains a picture of the young Japanese. It is profusely and handsomely illustrated with numerous half-tones of scenes at the local resorts and in addition contains two fine illustrations in colors. One of these is of the entrance at John Ball Park, with the Spanish trophy cannon, and gives a view of flower beds and foliage done in colors. The other, an equally artistic production, is a view of the car landing at Reed's Lake. The last illustration is of a neatly drawn female figure representing Miss Grand Rapids. Illustrations of the various lake attractions are also shown.

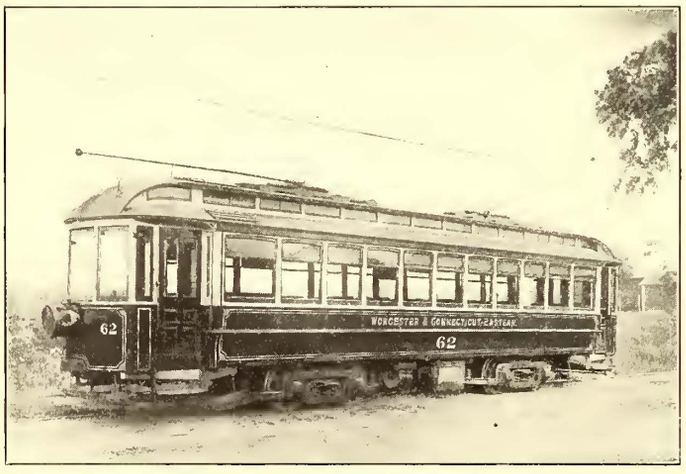
FORGED STEEL TRUCK

The accompanying illustrations show a new type of short-wheel-base truck, a pair of which have recently been placed in service on the Worcester & Webster division of the Consolidated Railway Company. The trucks were designed by W. G. Price and were constructed by the Standard Steel Car Company, of Pittsburg, Pa. They are somewhat similar in design to those described in the issue of June 25, 1904.



SHORT WHEEL-BASE OF FORGED STEEL TRUCK

One feature of special interest is the use of equalizer bars in a short wheel-base truck having the motors suspended outside of the wheel base. The equalizer springs are located between the equalizer bars and close to the side of the journal boxes. The brake-shoes are hung from brackets, which are secured to the equalizer bars so that the shoes retain a fixed height on the wheels. The journal boxes and bearings are of the forked check-plate type. The boxes are planed inside to one exact width, and the bearings are planed to a width 1-32 in. less than the boxes. Although the bearings are fitted so closely to the boxes, the construction is such that they have ample movement required to prevent binding and heating. The boxes are rigidly connected by the equalizer bars, so that when the brakes are applied the journal boxes are not forced against the pedestals. The rigid connecting of the journal boxes increases the efficiency of the brakes and greatly reduces the amount of air required to operate them and the amount of wearing away of the metal between the boxes and pedestals.



DOUBLE-TRUCK CAR ON WORCESTER-WEBSTER DIVISION OF THE CONSOLIDATED RAILWAY COMPANY

All parts which have to withstand a tensile strain are made of rolled open-hearth steel, without welds, and are pressed to the required forms. All castings, except the wheels and brake-shoes, are of malleable iron. The king-pin is screwed into a nut in the bolster, and the bolster is secured to the transoms, so that the car body can not tip off from the trucks. The bolster is carried by swinging hangers. The wheels are 30 ins. in diameter. The wheel base is 4 ins. x 3 ins. The elliptic bolster spring is double, 4 ins. x 34 ins., with four leaves.

THE NILES-BEMENT-POND COMPANY AT THE ST. LOUIS FAIR

One of the finest machinery exhibits at the Louisiana Purchase Exposition is that of the Niles-Bement-Pond Company, of New York. The machine-tool exhibit is located in sections 17 and 25, of the Palace of Machinery. All machines exhibited are either of entirely new designs or embody radical modifications of older patterns, and are well worth the careful study of all machine users. All of the larger machines are driven by direct-connected motors. Among the many interesting tools shown are a No. 3 12-in. double axle lathe; an 80-in. extra heavy driving-wheel lathe; a lathe designed for trimming or truing up two car wheels of 42 ins. or smaller diameter at the same time, without removing from the axles; rapid-reduction lathes; turret lathes; forge planer; milling, slotting, shaping, boring and drilling machines; hydraulic riveters, steam-hammer, etc.

In addition to the general exhibit in Machinery Hall, a number of the company's machines are shown in the Electrical Building in the exhibits of various manufacturers of electrical apparatus. The company has also equipped the Official Machine Shop at the Exposition, where its machines may be seen in commercial operation.

The Pratt & Whitney Company will also exhibit a large number of entirely new machines, all of which are extremely interesting.

EXHIBIT OF THE PHOTOSCOPE COMPANY

The St. Louis headquarters of the Photoscope Company, of New York, makers of the well-known nickel-in-the-slot photographing device called the "Photoscope," will be found in the Liberal Arts Building, where visitors can secure information booklets and examine the products of the machine. The company, however, has not confined itself to merely exhibiting this machine, for about seventy-five are in active service throughout the Exposition grounds. Seventy more are to be shipped there within a month.

PHOTOSCOPE COMPANY'S BOOTH IN THE LIBERAL ARTS BUILDING

FINANCIAL INTELLIGENCE

WALL STREET, July 13, 1904.

The Money Market

Nothing of note has developed in the money situation during the past week. It is taken for granted by all authorities that there will be no change from the present very low rates until the superabundant bank reserves begin to be drawn down for the autumn crop-moving purposes. The movement of currency inward from the interior has fallen off somewhat, but the weekly gain is still considerably larger than at the corresponding period of previous years. Last week, as was the case in the preceding weeks, the increase in cash holdings was offset by expansion in loans, and the surplus reserve as a result remained stationary. People have ceased to regard the heavy loan account as a serious matter, now that it has been demonstrated that the enlargement during the past twelve months is entirely due to the withdrawal of the trust companies from the market and the assumption by the Clearing-House banks of a large share of the credits formerly carried by these institutions. It is rather surprising that the starting up of activity again upon the Stock Exchange should not have caused a greater loan expansion during the past month than has actually taken place. The fact at least is established that borrowing for new security syndicates is over for the time being, and consequently that the principal demand for new accommodations has been exhausted. At any other season of the year the present conditions would probably result in our sending gold to Europe. As it is now, however, the foreign money markets themselves are extremely easy and there is not enough activity in any quarter abroad to call for a transfer of capital for the purpose of equalizing interest rates. Moreover, Europe is preparing to make payment for the usual heavy purchases of American cotton and food products, which occur in the autumn months, and would therefore not be disposed to incur further obligations simply because our market was in shape to extend them. The situation is reflected in the refusal of sterling exchange to move toward the export point, rates being, if anything, a trifle lower than they were a fortnight ago. Call money on the Stock Exchange commands only nominal figures, the bulk of the business being done at 1 to 1⅛ per cent. For time money 2¼ per cent is the ruling rate for sixty-day loans, 2½ for three months, and 3½ per cent for six months.

The Stock Market

This has been the busiest week that the Stock Exchange has known for some time, both in respect to the volume of transactions and the movement of prices. All the active issues have advanced sharply, and while there has been no great amount of what might be called outside buying, the absorption of securities from important Wall Street sources has been heavy and persistent. It is not correct to attribute the cheerful feeling in Wall Street and the improvement in the market to any single cause. Two circumstances have exerted greater influence than anything else—the excellent crop outlook on the one hand, and the disappearance of the chief reason for uncertainty and anxiety over the presidential election, on the other hand. Neither of these matters by itself would have been sufficiently powerful to induce the change that has developed, but in combination they clearly enough account for the improvement that has taken place. The facts concerning the crops as brought out in Monday's monthly government report and in the weekly weather bulletins are these: The outlook for corn is decidedly more favorable than it usually is at this time of the year. The crop will probably not reach the record total of 1902, but barring some great mischance between now and harvest time it will be well above the average. Spring wheat promises a somewhat larger yield than usual; winter wheat, which has suffered considerably from excessive rainfall and floods, will be relatively a short crop. Taken as a whole, the yield of wheat will probably fall below last year, but not to an extent sufficient to be regarded very seriously. Cotton, unless all signs fail, will be the banner harvest next autumn, the present estimates of acreage and condition indicating the largest production in the history of the country. This situation alone suffices to explain a great deal of the active buying which has converged upon the active railroad shares. But it admits of no doubt that the developments at St. Louis, confirming, as they do, the final suppression of the radical elements of the Democratic party, which, for the last eight years have been a constant dread to business interests, have added a powerful incentive to the purchasing movement.

The local traction shares have moved forward with the rest of the list, but have scarcely taken their proportionate part in the week's advance. In the case of Metropolitan the indications are that the speculators who bought the stock for a rise ten days ago have taken advantage of the general strength to secure some of their profits. These realizing sales have been sufficiently heavy to hold the Metropolitan issues in check. The backwardness of these shares has had some effect, sympathetically, on the market for Brooklyn Rapid Transit, although a further reason for the sluggishness in this stock is doubtless to be found in the unreadiness of the inside party to take an active hand in the speculation. Manhattan has made the best showing among the tractions in point of advance, reaching the highest figures of the season during the week. The rise in this quarter has been largely influenced by the sharp advance in Interborough Rapid Transit shares on the curb.

Philadelphia

New high records for the season have been made in several instances in the week's Philadelphia dealings. Union Traction is up from 52¼ to 53½, and Philadelphia Traction from 98 to 98½—the best prices that either has made in a long while past. Beginning with July 1, Union Traction goes from a 3½ to a 4 per cent dividend basis under the graduated advance system agreed upon at the time the property was taken over by the Philadelphia Rapid Transit Company. Rapid Transit shares have not joined in the general improvement, owing to the dissatisfied view taken of recent earnings. Several hundred sold during the week at a decline from 12 to 11¾. Philadelphia Company common, without gaining much, was firm between 39 and 39⅜, and the preferred was dealt in at 45. Philadelphia Electric was heavy around 6. One hundred and twenty Fairmount Transportation went at 20, a trifle up from the last previous sale. American Railways rose fractionally to 45¾. Consolidated Traction of New Jersey, on sales of about 800 shares, reacted from 67¾ to 67. One hundred Reading Traction sold at 32, forty-five shares of Railways General at 1⅛ to 1, and ten Pittsburg Traction preferred at 49.

Chicago

According to an official of the Union Traction Company, June was a good month for traffic, but the increase in gross receipts was small, owing to the handicap the road is under with regard to its inability to handle the crowds. Operating expenses have been reduced a little, but are still abnormally high, and the net earnings are small as a result of such a condition. For the fiscal year thus far the Metropolitan Elevated railroad has earned at the rate of 4¼ per cent on its preferred stock. Close friends of the company say the present showing is sufficient to permit resumption of dividends, but in view of the expense entailed by a number of improvements, under way and contemplated, it is not believed the stock will be returned to dividends in August. Under the circumstances, these interests contend, next April would be the more logical time to begin disbursements. The company in the meantime should have a semi-annual meeting during the first week next month. Traffic of the Aurora, Elgin & Chicago Electric line over the Fourth of July holidays was the largest in the company's brief history. Officials say that for the first time since the road's inception they had to operate three-car trains, and that the service through the summer will now be kept on fifteen-minute schedule. The Metropolitan Elevated is deriving a big revenue from the traffic turned over to it by this road. Dealings in the various traction issues during the week were of little consequence. Metropolitan Elevated common declined from 20 to 19½, and rallied to 20. Odd lots of the preferred sold between 52 and 52½. Forty shares of City Railway went at 168, one hundred and fifty shares of South Side Elevated at 91, and fractional lots of Lake Street at 3½, North Chicago at 72, and West Chicago at 46.

Other Traction Securities

Boston Elevated, on small transactions, recovered all the ground lost during the week before. The stock advanced from 149 to 151¾. Massachusetts Electric issues were inactive but firmer, the common selling up to 20, and the preferred rallying from 72½ to 73. West End common changed hands between 90½ and 91, and the preferred rose

two points from 110 to 112. Small lots of Georgia Railway and Electric common went at 40½, and the preferred at 80. In sympathy with the buoyancy of the general market, the United Railway issues of Baltimore recovered sharply, the income bonds getting back to 46 from 43¼, and the stock rallying from 5¾ to 7, on sales of 1200 shares. The 4 per cent generals were fractionally higher at 90½, selling first at 90¼. Other Baltimore transactions of the week comprised City Passenger 5s at 106⅝, Nashville Street Railway 5s from 102½ to 103⅜, Wilmington (North Carolina) Railway Light & Power 5s at 97⅜ to 97¾, Anacostia & Potomac 5s at 99, Atlanta Street Railway 5s at 105 and City & Suburban (Washington) 5s at 98½. The only incident of the week on the New York curb was another very sharp rise in Interborough Rapid Transit. Ten thousand shares of the stock changed hands between 123 and 131½, and 3100 between 131½ and 134½, which was the high level. Yesterday the stock dropped back to 130, but rallied to 133 at the close. No explanation, other than the growing appreciation of the company earning's expansion, was advanced for the spectacular movemnt.

Security Quotations

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

	Closing Bid	
	July 5	July 12
American Railways	45½	45½
Aurora, Elgin & Chicago	a14	a12
Boston Elevated	148	151½
Brooklyn Rapid Transit	49¼	50½
Chicago City	a168	168
Chicago Union Traction (common)	4⅞	a16½
Chicago Union Traction (preferred)	a30	a30
Cleveland Electric	70	70
Consolidated Traction of New Jersey	*67¼	66½
Consolidated Traction of New Jersey 5s	106¾	107
Detroit United	61	62½
Interborough Rapid Transit	124¼	132¾
Lake Shore Electric (preferred)	—	a20
Lake Street Elevated	3⅜	3¼
Manhattan Railway	149⅞	151½
Massachusetts Electric Cos. (common)	19¾	19½
Massachusetts Electric Cos. (preferred)	*72	73½
Metropolitan Elevated, Chicago (common)	18½	19½
Metropolitan Elevated, Chicago (preferred)	52	52½
Metropolitan Street	115	115⅞
Metropolitan Securities	84	88
New Orleans Railways (common)	9	9
New Orleans Railways (preferred)	29	29
New Orleans Railways, 4½s	74	73
North American	86½	87¾
Northern Ohio Traction & Light	13¼	13
Philadelphia Company (common)	38¾	38¾
Philadelphia Rapid Transit	11¾	11¾
Philadelphia Traction	98	98⅞
St. Louis (common)	12¾	9¾
South Side Elevated (Chicago)	90¾	91
Third Avenue	121½	121½
Twin City, Minneapolis (common)	94½	94½
Union Traction (Philadelphia)	51⅞	53¼
United Railways, St. Louis (preferred)	56½	54
West End (common)	90½	90½
West End (preferred)	110	111

a Asked.

Iron and Steel

The latest estimates of pig iron production show a considerable decrease during the month of June. It is still a matter of some doubt whether the restriction of output will prove to have been great enough to offset the falling off in consumption, the more so as a further shrinkage of consumptive demand is to be expected during the next two months. But at all events, a healthier relation now obtains between demand and supply than was the case a month ago, and this fact is encouraging for the position of the entire iron trade. Quotations are as follows: Bessemer pig iron, $12.65; Bessemer steel, $23; steel rails, $28.

Metals.

Quotations for the leading metals are as follows: Copper, 12⅝ to 12¾ cents; tin, 25⅞ cents; lead, 4¼ cents, and spelter, 4⅞ cents.

The application for the appointment of a receiver for the North Jacksonville Street Railway, Town & Improvement Company, operating an electric railway in Jacksonville, Fla., and dealing in real estate in that city and the suburbs, has been denied.

THE ST. LOUIS TRANSIT COMPANY'S EARNINGS

The St. Louis Transit Company reports gross earnings for the last six months of $4,247,433. Of this total $837,873 was earned in May, and $925,386 was earned in June. With five more months of the Fair and most of the new equipment ready, the officials of the company feel emboldened to state that the total gross earnings for the year will be in the neighborhood of $10,000,000. As an evidence of the increase in the receipts of the company, the June statement shows that the gross earnings in that month were $279,797 more than the earnings in June, 1903.

Estimating upon the basis of the receipts of the last six months, and not taking into account the most important factor that the best five months of the Fair are to come, the gross earnings for the year would be $8,494,866, an increase over the gross earnings of 1903 of $1,235,406.

To go back farther regarding the yearly increase in gross earnings, the records show that the gross earnings of the company for 1903 exceed those of 1902 by $708,680, which was considered remarkable, and at the close of 1902, the deficit was for the first time kept within five figures, being $62,787.

While a statement has not as yet been made of the operating expenses by which the net earnings can be estimated, it is believed that under the careful management of Captain McCulloch the proportion of operating expenses and taxes to the gross earnings will not exceed 64 per cent, in which event the operating expenses in the last six months should not have exceeded $2,718,357, leaving a net profit of $1,529,076.

Based upon the gross earnings of the last six months, and upon the probable cost of operation, as stated, the net profit of this year should be $3,058,152, which would exceed the net earnings in 1903 by $312,207. The net earnings of 1903 exceeded those of 1902 by $274,878.

At the close of 1903 the company with net earnings of $2,745,945 and fixed charges of $2,845,119, had a deficit of $62,787, while at the close of 1902 the deficit amounted to $268,083. By a recent deal the company has floated additional securities by which the notes outstanding for the aggregate deficit of $856,490, and the money borrowed for the extensive improvement work could be retired, and it is estimated that the total fixed charges this year will not exceed $3,000,000, in which case, based upon the figures given, the company, for the first time in its history, may be able to close the year without a deficit.

TOLEDO, BOWLING GREEN & SOUTHERN TRACTION TO BE TAKEN OVER BY A HOLDING COMPANY

The Toledo Urban & Interurban Railway Company, recently incorporated, will take over the Toledo, Bowling Green & Southern Traction Company, so it is said. As now outlined, the plan of the Toledo Urban & Interurban Company is to lease the Toledo, Bowling Green & Southern Company, and guarantee a dividend on the Toledo, Bowling Green & Southern Company's common stock. The dividend will probably be on a sliding scale, as is guaranteed by the lessors of the Millcreek Valley lines. The holding company will also pledge itself to pay off all the indebtedness of the Toledo, Bowling Green & Southern, and complete the road into the city of Toledo. Just what improvements will be made has not yet been decided upon. Among those in contemplation is the erection of a large central power house for the system. George B. Kerper, president of the Toledo, Bowling Green & Southern Company, states that the new holding company will probably take hold of the property about Jan. 1, 1905.

The Toledo, Bowling Green & Southern Traction Company was organized according to the laws of Ohio in 1901, as a consolidation of the Findlay Street Railway, the Toledo, Bowling Green & Fremont Railway, and the Hancock Light & Power Company. It operates in all about 60 miles of electric road, extending from Findlay, Ohio, to Toledo.

The capital stock authorized and issued is $1,500,000, having a par value of $100 a share. The dividends paid on the common stock was, Jan. 1, 1902, 1 per cent; July 1, 1902, 1½ per cent; January, 1903, 1½ per cent. The bonded debt is $1,225,000, first mortgage 5 per cent gold bonds, due May 1, 1921. There have been sufficient of these bonds issued to retire the prior mortgages.

The road has secured 2½ miles of private right of way in Toledo and will run in from the end of its right of way into the business center of the city over the tracks of the Toledo Railway & Light Company.

It is now urged that the road from Findlay to Lima be completed. When this is assured there will be an electric line constructed to Fort Wayne, Ind. This will give a stretch of electric road from Cincinnati to Toledo.

PLANS BEING COMPLETED FOR NEW ORLEANS POWER STATION

Sanderson & Porter, of New York, have been retained by the New Orleans Railways Company to draw up plans and supervise the work of constructing the huge power station which the company is to build on the water front. Messrs. Porter and Blossom, of Sanderson & Porter, have just returned from New Orleans, where they went to look over the ground and to confer with E. C. Foster, the president of the New Orleans Railways Company. While full details as to the plans are not available at this time, it can be said, however, that the capacity of the plant will be, in the first instance, about 10,000 hp, and that ultimately no less than 50,000 hp will be generated. The initial equipment will be contracted for as soon as the plans have been finally approved of by the company, which, it is expected, will be inside of thirty days.

REPORT OF CHICAGO UNION TRACTION FOR NINE MONTHS AND THE THREE ENDING MAY 31

In pursuance of a new policy the receivers of the Chicago Union Traction Company have made public a statement showing the financial condition of the company as a result of operations during the month of May. It indicated that the corporation had operated at a loss of $68,909 for that period. The report of the company printed in the STREET RAILWAY JOURNAL in June showed that during six months the deficit of the company had been $392,188 for the West Side lines and $191,360 for the North Side, a monthly average of nearly $65,364 for the former and $31,893 for the latter. The report for May shows a deficit of $21,815 for the North Side line and $47,093 for the West Side. On the North Chicago account the deficit is more than covered by two items which are in controversy before Judge Grosscup. There has been allowed $28,470 for depreciation and $12,815 for accrued interest. If these are eliminated the account for the road will show a small balance. A similar condition holds good for the West Chicago Street Railroad Company, where a balance would be shown if it were not for a depreciation account of $57,057 and an interest account of $7,158. The reports show that the North Chicago lines made $77,081 net income, less operating expenses, during the month, and that the West Chicago lines made $137,241 from operation.

The figures in detail follow:

ALL LINES FOR MONTH OF MAY

	West Chicago	North Chicago	Both	Consol. Traction
Gross earnings	$481,486	$274,707	$756,192	$136,161
Operating expenses	244,244	199,177	543,421	109,166
Net	$137,241	$75,530	$212,771	$26,995
Other income	4,448	1,551	5,999	6,651
Total income	$141,689	$77,081	$218,770	$33,646
Tax, interest, rent	115,158	61,007	176,165	59,633
Surplus	$26,531	$16,074	$42,605	*a* $25,987
C. C. Traction defici	16,567	9,420	25,987	.....
Depreciation	57,057	28,470	85,527	.....
Deficit	47,093	21,816	68,909	25,987
Per cent expenses	71.91	73.32	72.51	80.45

a Deficit.

THREE MONTHS ENDING MAY 31, 1904

	West Chicago	North Chicago	Both
Gross earnings	$1,351,876	$767,128	$2,119,004
Operating expenses	1,074,686	600,406	1,675,092
Net	$277,190	$166,722	$443,912
Other income	11,812	5,549	17,361
Total income	$289,002	$172,271	$461,273
Deductions:			
Taxes	$41,543	$40,554	$82,097
Int. funded debt	151,205	57,795	209,000
Other interest	21,565	33,957	55,522
Rental accrued	130,491	51,867	182,358
Total	$344,804	$184,173	$528,977
Deficit	55,802	11,902	67,704
Other deductions:			
C. C. Traction deficit	$93,646	$52,955	$146,601
Depreciation reserve	171,172	85,410	256,582
Total	$264,818	$138,365	$403,183
Total deficit	320,624	150,268	470,889
Per cent expenses	80.0	79.22	79.72

Note.—Interest on funded debt accrued consists of interest on bonds of the West Chicago Street Railroad Company and the North Chicago Street Railroad Company. Rental of leased lines accrued consists of interest on bonds of Chicago West Division Railway, Chicago Passenger Railway, North Chicago City Railway and of the guaranteed dividends on outstanding stocks of those companies.

CHICAGO CONSOLIDATED TRACTION EARNINGS

Earnings:	3 Mos. to May 31	9 Mos. to May 31
Passenger	$337,660	$978,143
Mail	1,080	3,241
Advertising, etc.	1,306	4,369
Gross	$340,046	$985,753
Operating expenses:		
Maintenance way	$30,968	$101,516
Maintenance equipment	47,607	97,134
Transportation	189,084	565,494
General	34,450	100,393
	$302,109	$864,537
Net	37,937	121,216
Other income	19,956	60,204
Total income	$57,893	$181,420
Deductions:		
Taxes accrued	$10,268	$30,457
Int. funded debt	146,457	439,372
Int. floating debt	2,125	6,193
Rent leased lines	19,875	59,625
Total	$178,725	$535,647
Deficit	*a*120,832	354,227
Per cent expenses	89.18	88.09

a Increased to $146,602 by charge of $25,770 to correct item of taxes accrued for six months ending Feb. 29.

NINE MONTHS ENDING MAY 31, 1904

Earnings	West Chicago	North Chicago	Both
*a*Passenger	$3,960,806	$2,233,729	$6,194,535
Mail	17,447	5,564	23,011
Advertising, etc.	25,597	27,038	52,605
Gross	$4,003,850	$2,266,331	$6,270,181
Operating expenses:			
Maintenance way	$247,874	$166,040	$413,914
Maintenance equipment	375,254	237,003	612,257
Transportation	1,813,860	1,034,417	2,848,277
General	545,563	253,396	798,959
Total	$2,982,551	$1,690,856	$4,673,407
Net	1,021,298	575,475	1,596,774
Other income	31,255	17,014	48,269
Total income	$1,052,553	$592,490	$1,645,043
Deductions:			
Taxes accrued	$125,494	$123,814	$249,308
Interest funded debt	453,615	173,385	627,000
Interest mortgages	6,900	675	7,575
Interest floating debt	51,162	104,330	155,492
Rent leased lines accrued	391,474	155,602	547,076
Total	$1,028,645	$557,806	$1,586,451
Surplus	23,908	34,684	58,592
Other deductions:			
Chicago Consol. Traction deficit	$226,332	$127,895	$354,227
Reserve depreciation	510,386	248,418	758,804
Total	$736,718	$376,313	$1,113,031
Deficit	712,810	341,629	1,054,439
Per cent operating expenses	74.97	75.51	75.16

a Including chartered cars.

THE CROCKER-WHEELER COMPANY & BROWN, BOVERI & CIE

The Crocker-Wheeler Company has just announced that it has effected an arrangement with Brown, Boveri & Cie, of Baden, Switzerland, by which it secures their alternating-current designs, patents and rights to manufacture them in America. The Crocker-Wheeler Company has also retained the Swiss firm as consulting engineers, and is now putting on the market alternating-current generators, transformers and accessories of the latest design and construction, and adapted to American practice. Opportunities to bid on this apparatus are invited. The company has already closed a contract for a 200-kw, 60-cycle, 440-volt alternating-current generator, for the Atlanta plant of the Proctor & Gamble Company, Cincinnati.

A WOMAN ACCIDENT FAKIR RUN DOWN

General Manager Connette, of the Syracuse Rapid Transit Company, of Syracuse, N. Y., caused the arrest in that city a few days ago of a bold young woman accident fakir, who admits having obtained money from a number of street railway companies in different parts of the country on fraudulent accident claims. Her method of operation was very different from the ordinary way of the accident fakir. She tumbled off a car in any old way, and generally after the car had stopped. Then she would throw herself on the mercy of the officials of the company, depending on their generosity and sympathy for a settlement of the damages.

The young woman, Nellie Cummings by name, operated under the aliases, Madeline Banks, Trellas Reynolds and perhaps others. She came from Syracuse to Albany, where, by enlisting a clergyman in her service, she induced the United Company of that city to give her $35. On June 14 she registered at the Yates Hotel, Syracuse, and on June 21, one week later, deliberately threw herself from a car of the Syracuse Rapid Transit Railway Company at Salina and Genesee Streets. She met with pretty severe injuries in this fall and had to be taken to a hospital for treatment. Meanwhile Mr. Connette made a thorough investigation of the case, with the result that the young woman was turned over to the police when discharged from the hospital. The company did not, however, press the charge against her in the court, and she was released, the authorities feeling that she thoroughly repented of her evil deeds.

The young woman's history and her operations are interesting. A legitimate accident that she had in New York is said to have started her on her career of evil doing. She is said to have gone to Coney Island by trolley, and while there to have fallen from a car, receiving painful injuries. She was taken to the Brooklyn City Hospital, and on the following day the claim agent of the company settled with her for $50 cash and the doctor's bill. She remained in the hospital several weeks, and when released thought that inasmuch as this money had come so easy she would try and fall off cars again and get settlements. This, it seems, was in May, 1903. She visited different places in New York State, and fell off a car in Elmira, N. Y., under the name of Madeline Banks, but got nothing. In Binghamton, under the name of Nellie Cummings, she got $9 in cash and a pass on the trolley lines. In Albany, N. Y., she gave the name Trellas Reynolds. Here she got $35 cash and the company paid the hospital bill. From Albany she went to Syracuse. She admitted having "faked" accidents against companies outside of New York State, but declined to disclose the names of the places in which she operated.

INTERURBAN ROADS NOT AN ADDITIONAL SERVITUDE

The Indiana Supreme Court has just handed down a decision holding that an interurban railway with a franchise from the city to lay tracks in the streets with such rails as it sees fit, and to operate thereon by electricity cars running to and from other towns and cities, carrying passengers, baggage, light express and mail matter, or baggage, light express and mail matter without passengers, running not more than two cars in a train, is not an additional servitude which necessarily causes damage to an abutting owner and entitles him to enjoin the building and operating of such railway in a street, until his damages are assessed and paid, or tendered. Such owner can only have his action at law for actual damages suffered.

The decision was handed down in the case of Henry Mordhurst versus The Fort Wayne & Southwestern Traction Company, in which the appellant sought to enjoin the company from building and operating an interurban line past his place in the city of Fort Wayne extending to the city of Huntington. It was admitted that the city of Fort Wayne had granted a franchise, and the State had given a charter to the traction company, authorizing the road to be constructed, but it was insisted that such a company had no right to occupy the street without buying or condemning the privilege and compensating the abutting owners.

The fact that a city street railway is not an additional servitude in the street was long since decided by the courts of Indiana, and is equally well settled that a steam railroad must pay the lot owners for the privilege of building a track in a street. The question of an interurban company's rights in the streets, however, is a new one in Indiana. On this point the court said:

> If the use of the streets by the defendant in the manner and upon the conditions described and set forth in the contract would not create a new and additional burden upon the street, and a deprivation of plaintiff's beneficial interest therein, then he is not entitled to an injunction against the construction of the railroad. The kind of rail was not specified in this case, and a T-rail such as is used by steam and other railroads may be adopted.
>
> The fact that light express matter, passenger baggage and United States mail are carried on a car does not affect the property owner nor injure his property. The transportation of articles of this kind does not create any resemblance between the interurban electric road and a steam road carrying ordinary goods and merchandise, and results in none of the annoyances and injuries which are caused by either passenger or freight trains on a steam railroad. Trains on steam roads are drawn by locomotives, which constantly emit smoke, sparks, cinders and steam, and which drop coals of fire. Their passenger trains usually consist of an express and baggage car and from one to many large and heavy coaches. Freight trains are commonly made up of from one to thirty or more large and unsightly cars for the transportation of coal and other heavy merchandise and live stock. It is apparent that every objection founded upon injury to his property rights which the plaintiff can justly urge against its use by the defendant of Fulton Street in front of plaintiff's lot would apply with equal force to the use of that thoroughfare by an electric street railroad constructed wholly within the city limits.
>
> The business done by a local street railway, and the physical agencies and manner in which and by which it is carried on are consistent with the use of the street by the lot owner and general public, and if not directly beneficial to the abutting real estate, they are not detrimental to it. They relieve the street from some of the burdens of travel upon it, they facilitate travel between different parts of the city and enhance the value of abutting property by increasing the conveniences of access to it.
>
> Rapid and cheap transportation of passengers, light express and mail matter between neighboring towns and cities may be quite as necessary and as largely conducive to the general welfare of the places so connected and their inhabitants as the like conveniences within the town or city.
>
> Therefore, for any actual and special damage sustained by the abutting lot owner by reason of the construction of the appellee's railroad, or resulting from its use, the lot owner has his remedy by an action at law, and the interurban company will be liable to the abutting owner for any special injury to his property occasioned by the negligence of the company in constructing its road or in operating it.

The interurban interests in Indiana are greatly pleased over the result of this litigation. For some time there has been uneasiness lest the courts might make a distinction between street and interurban roads. Similar suits are now pending against the Indiana Union Tracton Company by citizens residing in College Avenue, Indianapolis. This decision, however, clears the way and grants to the interurban companies rights equal with those of a street railway company.

IOWA INTERURBAN EARNINGS FOR 1903

The interurban railways of Iowa have all filed with the Executive Council of the State, for assessment purposes, verified statements of their gross and net earnings, operating expenses, taxes, etc. The statements cover the year 1903.

The Boone Suburban Railway Company reports a mileage of 4.7; total gross earnings, $8,022; gross earnings per mile, $1,706; total operating expenses, $5,140; operating expenses per mile, $1,093; total net earnings, $2,882; net earnings per mile, $613; The total value of the road, as found by the Executive Council for the year 1902, was $18,800. After making deductions for taxes, it is found that the road earned 14 per cent on the above valuation.

The Cedar Rapids & Marion City Railway reports a mileage of 12.06, the same as for 1902; gross earnings of $113,743.50; gross earnings per mile, $9,431; total operating expenses, $89,886; operating expenses per mile, $7,453; total net earnings, $23,857, net earnings per mile, $7,453; total net earnings, $23,857; net earnings per mile, $1,978. The total value of the road as found by the Executive Council for the year 1902, with the same mileage, was $188,040. After making deductions for taxes, it is found that the road earned 11½ per cent on this valuation.

The Interurban Railway Company reports a mileage of 28.87; total gross earnings, $125,949; gross earnings per mile, $4,362; total operating expenses, $67,685; operating expenses per mile, $2,344; total net earnings, $58,263; net earnings per mile, $2,018. The total value of this road, as found by the Executive Council for the year 1902, with a mileage of 23.41, was $233,100. By adding $60,000 to this value for the additional mileage of 5.42, the total value for 1903 was $293,100. After making deductions for taxes, it is found that the road earned nearly 19 per cent on this valuation.

The Mason City & Clear Lake Traction Company reports a mileage of 14.62, the same as for 1902; gross earnings of $41,986, gross earnings per mile, $2,421; total operating expenses, $38,026; operating expenses per mile, $2,193; total net earnings, $3,960; net earnings per mile, $228. The total value of this road, as found by the Executive Council for the year 1902, with the same mileage, was $52,632. The road earned less than ½ of 1 per cent, after making deductions for taxes, on the above valuation.

The Tama & Toledo Electric Railway reports a mileage of 2.75, the same as for 1902; total gross earnings, $10,894; gross earnings per mile $3,961; total operating expenses, $8,347; operating expenses

per mile, $3,035; total net earnings, $2,547; net earnings per mile, $926. The total value of the road, as found by the Executive Council for the year 1902, with the same mileage, was $19,996. The per cent of earnings on this valuation, after deducting taxes, was nearly 12 per cent.

The Waterloo & Cedar Falls Rapid Transit Company reports a mileage of 54.73, or 23.53 miles more than for the year 1902. Total gross earnings, $90,772; gross earnings per mile, $1,658; total operating expenses, $47,385; operating expenses per mile, $866; total net earnings, $43,386, net earnings per mile, $792. The total value of the road for 1902, with a mileage of 31.2 was found by the Executive Council to be $312,000. By adding to this amount $235,300 for the additional mileage, the total value of the road for 1903 was $547,300. On this valuation the road earned more than 8 per cent, after making deductions for taxes.

All but one road earned more than 8 per cent on the actual valuation, and one as high as 18 and another 14 per cent. The one exception noted above was no doubt due to the unfavorable weather last year, the road depending largely on the lake resort traffic for its earnings. The total gross earnings for all six of the lines were $391,367; the average gross earnings per mile for all the roads were $3,324; the total operating expenses were $256,471; the average operating expenses per mile were $2,178; the total net earnings, $134,897; the average net earnings per mile were $1,146. The average earnings on actual valuation, after deducting taxes, were more than 10 per cent.

SELECTION OF ARCHITECTS FOR UNITED ENGINEERING BUILDING

The conference committee of the three national engineering societies and of the Engineers' Club, charged with the responsibility of giving effect to the gift of Andrew Carnegie of $1,500,000 for the erection of two buildings in New York City suitable for their respective purposes, has made the selection of architects for the respective structures. The successful competitor for the United Engineering Building is Herbert D. Hale, of Boston, with Henry G. Morse, of New York, as associate architect, and for the Engineers' Club, Whitfield & King, of New York. The successful competitors in the open class for four equal prizes of $400 each in addition to Mr. Hale are Trowbridge & Livingston, of New York; Frank C. Roberts & Company, with Edgar V. Seelcr associate, Philadelphia, and Allen & Collins, of Boston.

Details have already been made public as to the nature of the two buildings, which will require for construction from $1,000,000 to $1,200,000. The United Engineering Building will occupy land 125 ft. front by 100 ft. on West Thirty-Ninth Street, while the club, with a frontage of 50 ft. and a depth of 100 ft., will face on Bryant Park and the new Public Library. The United Engineering Building, aside from quarters for the American Society of Mechanical Engineers, the American Institute of Electrical Engineers and the American Institute of Mining Engineers, as well as other societies enabled to participate in the accommodations, will have several fine auditoriums and a magnificent library. The club building will be about 11½ stories high with the usual accommodations of a club and some sixty or seventy bedrooms for members.

LOS ANGELES RAILWAYS MAKE GENEROUS OFFER TO SPRINKLE STREETS

The Huntington electric railway companies of Los Angeles, through Attorney W. E. Dunn, have submitted to the City Council a proposal to oil that portion of the city streets occupied by railway tracks of the companies, and for a space of 2 ft. on either side of the right of way, provided the city authorities will oil the remaining portions of the thoroughfares.

The proffer, which, in all probability will be accepted, reads as follows:

We have heretofore refused to sprinkle the streets with water, under an ordinance recently passed by the Council, not because of the expense of sprinkling, but because we believe the law does not contemplate the placing of this burden upon us any more than upon other citizens who use the streets for trucking, driving and riding, and, further, because it must seem unreasonable to any fair mind that your Honorable Body should have the power to make it a crime for us not to sprinkle such portions of the streets as you may designate, when the only water available for the purpose is the water owned by you, for which you and succeeding Councils can charge us your own price. In short, you say to us: "We will imprison or fine you if you do not buy water from us at our price and sprinkle our streets with it."

There are many other reasons why it seems to us this is an unfair position on the part of the city, but we will not discuss them here.

It is essential to the success of our business, as well as to the comfort of the people, that the streets should be kept in good condition, and having that in view, and feeling as we do that the city cannot afford to use its water to sprinkle its streets for many years longer, we propose that we will begin with the city a system of oiling the streets, and that we will thoroughly oil and maintain that portion of the streets upon which we have tracks, between the tracks, between the rails, and for 2 ft. on each side thereof, as rapidly as the city will oil the balance of these streets. This will be a permanent and lasting improvement, and, while it will cost more than sprinkling for a time, it will in the end be economy.

Statistics show that during the last year the city's sprinkling bill was $125,000, or nearly $400 per mile.

CHICAGO COUNCIL ORDERS A UNION TRACTION LINE TO VACATE—OTHER FRANCHISE MATTERS

Another decisive move has been made by the Chicago City Council in the franchise matter. On Monday, July 11, the Council decided to offer for sale to a new company the Adams Street rights of the Chicago Passenger Railway Company, whose franchise expired April 21, and to order the present companies off the streets. The companies will be given three months in which to remove their cars and tracks. Before the end of that period the City Council will have resumed its session after the summer vacation, and the question of giving the streets to a new company will be taken up.

Alderman Foreman, chairman of the local transportation committee, introduced the resolutions and orders intended to bring about these results. One of the orders authorized and directed Mayor Harrison to invite proposals for the installation of a system of street railways upon the following streets: Adams Street, from Clark Street to a point 500 ft. west of Desplaines Street; Desplaines Street, from Adams Street to the south line of Harrison Street; Harrison Street, from the east line of Desplaines Street to the west line of Western Avenue; Western Avenue, from the north line of Harrison Street to the south line of Twelfth Street; Twelfth Street, from the east line of Western Avenue to Crawford Avenue.

These streets are now occupied by the Chicago Union Traction Company as lessee of the Chicago Passenger Railway Company. The resolution also provides for the extension of the system upon other streets now occupied by these companies at such times as the grants shall expire, and upon such other streets as may be advisable for the completion of a connected system of track.

The order provides that the proposals shall be invited on several plans for which terms, conditions and specifications will be furnished by the city; that the city shall require the deposit of a certified check for such sum as may be determined on with each proposal, and shall reserve the right to reject any or all bids, and that the proposals when received shall be reported to the City Council for its action.

The other order of Alderman Foreman directed the Mayor to notify the Chicago Passenger Railway Company and Union Traction Company, its lessee, to vacate and remove the tracks from Adams and other streets in the system in which the rights granted April 21, 1884, for twenty years, have terminated. Corporation Counsel Tolman was instructed to institute such legal proceedings and take such other steps as may, in his opinion, be necessary to carry out the purpose of the order.

The question of transfers came near to upsetting the negotiations of eighteen months between the city and the Chicago City Railway Company at the meeting of the Council on Monday. In fact, matters did come to a temporary halt when Col. Bliss, representing the South Side Railway Company, flatly refused to accede to the demand of the city for a reservation of the right to designate the points at which universal transfers might be issued. The transfer proposition was a new one, injected at the last moment, and provided that the company issue transfers between its line and those of other companies at all intersecting points, or where the tracks came within 200 ft. of each other. Col. Bliss said that this proposal meant bankruptcy for the company, and eloquently set forth his reason why the proposal was impossible of adoption. It was finally decided to appoint a subcommittee of the Council to investigate the transfer question with the officials of the company. In this connection it is interesting to note that the Council has retained George A. Yuille as expert to advise on street railway matters, particularly as to the location of transfer points. Mr. Yuille, it will be remembered, was at one time second vice-president and assistant general manager of the West Chicago Street Railway Company.

The St. Joseph Street Railway, Light, Heat & Power Company's system in St. Joseph, Mo., was recently tied up by a strike of powerhouse firemen.

STREET RAILWAY PATENTS

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

UNITED STATES PATENTS ISSUED JULY 5, 1904

764,007. Automatic Tramway Point; Richard H. Radford, Sheffield, England. App. filed Sept. 5, 1902. The rail has a recess with parallel opposing walls and a movable switch point having a portion adapted to enter therein and fit the walls so snugly as to form an air cushion, thereby preventing noise when the switch point returns to normal position.

764,020. Electrically Propelled Vehicle; Russell Thayer, Philadelphia, Pa. App. filed April 11, 1904. An electrically propelled vehicle provided with an electric motor and storage battery arranged to traverse the tracks of an overhead trolley system and provided with means whereby the vehicle may leave the track, pass an obstruction, and return to the track.

764,039. Overhead Trolley; Clide C. Chambers, Everson, Pa. App. filed Feb. 25, 1904. The wheel fork is pivotally mounted and adapted to swing on a segmental track to accommodate curves or kinks in the trolley wire.

764,043. Railway Switching Apparatus; John P. Coleman, Edgewood, Pa. App. filed Oct. 7, 1903. Means whereby indication is given when the switching mechanism has performed its function.

764,148. Third-Rail Guard for Electric Roads; John S. Payne, Midland Park, and James S. Payne, Wortendyke, N. J. App. filed July 23, 1903. A series of cover plates for the third rail and means for lifting them to allow the shoe to make contact with the rail, the plates dropping as the car progresses.

764,166. Railroad Switch; Fletcher T. Troutman and Albert Gonzalez, Los Angeles, Cal. App. filed March 29, 1904. Details of mechanism for throwing the switch from a moving car.

764,194. Trolley Pole; Caleb Jones, London, Ky. App. filed Dec. 17, 1903. A trolley pole which will automatically reverse its position when the direction of travel of the car is reversed.

764,211. Current Collector for Electric Railways; Frederick R. Slater, Yonkers, N. Y. App. filed Dec. 5, 1903. A guard is mounted above the conductor with its inner edge extending beyond the inner side face thereof, the collecting shoe making side-contact with the conductor.

764,224. Trolley; John Q. Brown, Oakland, Cal. App. filed April 12, 1904. Details of construction of a trolley particularly adapted for use on high-speed, heavy, multiple-unit electric trains.

764,244. Third-Rail System for Electric Railways; Washington H. Kilbourn, Greenfield, Mass. App. filed Oct. 1, 1903. Comprises a conductor and guard rails secured at opposite sides of and projecting above said conductor, and separated from each other above the conductor by an arm-receiving slot, said guard rails being composed of sections insulated from each other and from the conductor.

764,255. Car Fender; Alfred Robinson, Pittsburg, Pa. App. filed March 24, 1904. Details.

764,264. Railway Switch; John E. Swonson, Des Moines, Ia. App. filed June 3, 1903. Details of a switch which is thrown by an electric current taken from the trolley wire by the moving car.

764,317. Car Fender; Philip Todd, Homestead, Pa. App. filed April 12, 1904. Means for lowering the fender to bring it closer to the rails.

764,371. Trolley Wire Replacer; John D. Ratliff, Muncie, Ind. App. filed Feb. 15, 1904. Threaded screw-drums on each side of the trolley wheel in which the pitch of the threads is disposed toward the trolley wheel.

764,384. Insulating Support for Electric Third Rails; Frederick R. Slater, New York, N. Y. App. filed May 28, 1903. Details.

764,388. Electric Railway; Henry N. Sporborg, Rugby, England. App. filed Dec. 9, 1902. A plurality of conductors arranged parallel to the track rails and provided with means for connecting the conductors together and tripping coils for rendering the connecting means inoperative, adapted to be operated from a distant station.

764,392. Trolley; Bernard E. Sunny, Chicago, Ill. App. filed Dec. 10, 1903. A current collector for a double conductor electric system, comprising two members, one having a constant path of contact relatively to one conductor and the other adapted to have a shifting path of contact relatively to the other conductor.

764,400. Cut-Out for Trolley Conductors; Pendleton G. Watmough, Jr., Schenectady, N. Y. App. filed Nov. 1, 1901. A safety cut-out for trolleys comprising sectional trolley wires, a loop in each section and a guide bracket therefor, a weight at each loop for holding the conductor under tension, and a switch operated by the falling of the weight when the conductor yields or breaks to disconnect the trolley section from the feeder.

764,418. Multiple Trolley; John S. Briggs, Los Angeles, Cal. App. filed June 1, 1903. Two trolley wheels arranged in tandem, one of which is mounted in the harp and the other of which is connected thereto by a spring.

764,494. Fare Register and Recorder; Wilfred I. Ohmer, Dayton, Ohio. App. filed Nov. 28, 1903. The register produces two records, one consisting of a series of records of each individual trip and the other being a final record covering the totals of the several trip-records for any desired period of time.

764,505. Electric Switch; John L. Steeb, Butler, Pa. App. filed Sept. 29, 1903. Details.

PERSONAL MENTION

MR. H. C. SPAULDING has just been appointed assistant sales manager of the Triumph Electric Company, of Cincinnati, Ohio.

MR. C. NESBITT DUFFY, of the Chicago City Railway Company, was married on Wednesday, July 6, to Miss Clara Cunningham, of Chicago. Mr. Duffy's many friends will be greatly pleased to extend their congratulations to him on the happy event.

MR. A. L. WATERBURY, who was at one time first vice-president and general manager of the Citizens' Telephone Company, of Houston, Tex., has accepted a position as general manager of the sales department of the American Conduit Company. Mr. Waterbury will have his headquarters at the Chicago office of this company, 1005-6 Manhattan Building.

MR. JAMES D. HOUSEMAN has resigned as general manager of the St. Louis, St. Charles & Western Railroad, which runs from the terminus of the Eastern Avenue division of the St. Louis Transit Company to St. Charles, Mo. Mr. Houseman will in the future devote his attention to the Suburban Telephone Company and other enterprises with which he is connected. Mr. Houseman has announced that Mr. J. B. C. Lucas, president and treasurer of the railway company, has disposed of his interest in the company.

MR. H. M. LITTELL, general manager of the Chattanooga Rapid Transit Company, of Chattanooga, Tenn., recently addressed to the employees of the company a circular in which he complimented them on their efficient handling of the extraordinary business of the Festival week. Mr. Littell is a man of wide experience in the field, and is a strict disciplinarian, but he is ever ready to acknowledge unflinching loyalty. Mr. Littell said that never had he seen a road more smoothly operated.

MR. W. S. HOOK, who was vice-president, treasurer and general manager of the Los Angeles Traction Company, Los Angeles, Cal., before the absorption of that company by the Los Angeles Interurban Railway Company, died in Philadelphia a few days ago. After Mr. Hook disposed of his interest in the Traction Company he decided to take a long rest, as the exacting duties of his position with the company had slightly impaired his health. He went East soon after the sale, living for a time in Chicago. Later he moved to Philadelphia. Mr. Hook was, as a matter of fact, the real founder of the Traction Company. He planned the enterprise and carried it to a successful end. His favorite hobby in recent years was the building of a line to San Pedro. He organized a special company to build the road, and finally saw his dream realized. Mr. Hook was distinctly what is known as a family man. He is survived by a widow and two sons.

MR. SAMUEL JONES, Mayor of Toledo, Ohio, who was familiarly known by the soubriquet of Golden Rule Jones, died at his home in that city Tuesday evening, July 12. Mayor Jones was a man of strong personality, and during his brief public career did many noble things for which he should be justly praised. He was, however, in every sense a radical, and like others of his kind knew not the force of logic when applied to questions that were his hobbies. One of the Mayor's pet themes was the regulation of public service corporations, regarding the restrictions of which he had the most fanciful ideas. Some of these ideas he set forth plainly in a recent message to the City Council regarding the application of the Toledo Railways & Light Company for franchise renewals. Mr. Jones was serving his fourth term as Mayor when he died. His first term was served as a Republican. During the next six years he ran as an independent, as the Republican organization felt that it could not again nominate on its ticket a man whose views of municipal ownership, labor legislation and kindred subjects were not in keeping with the views of the organization. Despite this, however, he was elected each time he ran, showing that he was immensely popular.