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Of this issue of the ELECTRIC RAILWAY JOURNAL, 8600 copies are printed.

THE ATLANTIC CITY CONVENTION According to every indication the Atlantic City convention will be the largest in the history of the association. And it is well that it should be so. In each branch of electric railway work are important questions for settlement for which the co-operation of all interested in the industry is necessary. There is no obvious road toward improvement except conscientious hard work on the part of every member company of the association and co-operative service by all who can be enlisted to help in the desired end. Unless each does his share the industry must suffer. The executive committee has acted wisely in devoting the greater part of its opening session to the subject of valuations. In fact, the papers and addresses scheduled for this first meeting give the keynote to the entire convention of the American Association. They will be followed on Wednesday by the report of the committee on public policy and on Thursday by that on federal relations, the two most important subjects which the association has to discuss this year, and these reports should, and undoubtedly will, point the directions in which progress should be made.

VITAL PROBLEMS TO BE CONSIDERED During the past year various events have occurred which have a direct bearing upon the question of the valuation of railway properties. One of the most important, of course, is the appointment by the Interstate Commerce Commission under authority from Congress of a committee to undertake the valuation of interstate roads. Other recent events which have a bearing upon this same general subject or the attempt to solve the question of the relation between the carriers and the public have been the Minneapolis rate decision by the Supreme Court, the proposed new franchises at Kansas City and Detroit and the establish-

ment of a full-fledged municipal street railway in San Francisco. This is the proper time for the association clearly to define its policy upon these points. Is municipal ownership for all of our public utilities the proper solution? Will it be profitable for the city and advisable from a political standpoint? If not, what should be the relations between the city and the public utility companies? If some form of regulation, of what kind does the industry approve as best for the companies and best for the public? Finally, what should be the franchise relations between the city and the companies? If the electric railway companies are negligent in reaching a rational solution to these questions, others will not be backward in pushing forward their views. The association is the logical body through which this united action should be performed. It was organized primarily for such co-operative effort, and its members are not only vitally interested from a financial standpoint in seeing that their properties receive justice in the settlement of these questions, but, being thoroughly conversant with the transportation situation, they can give authoritative advice on matters regarding which the public is ignorant.

PUBLICITY AND A CAMPAIGN OF EDUCATION But a correct solution of the question is not alone sufficient. Coupled with it should be the ability on the part of the association to make its views known and to impress them upon the general public. Publicity is a matter which has been woefully neglected by the railway men in the past. Most of them now, we believe, realize the necessity for it, although all do not understand the best methods by which it may be secured. Nevertheless, it is quite essential to make people understand one's position on a public question if the arguments are to receive any attention. Here also is the place where every agency able to assist should be utilized. At the present time we believe that both the authorities and the public realize that there is much to be said on the railroad side of the case. They are willing to listen. They want to know what the railroads have to say in defence of their general position and what the companies offer as a practical solution for the difficulties of which they complain. Neglect of this opportunity will be interpreted as a confession of weakness or an absence of any definite program. There should be no doubt in the mind of anyone as to the policy for which the association stands. We hope that the reports of the committees which have been assigned to consider these important problems at the Atlantic City convention and the addresses which will be submitted there will furnish the ammunition for an active campaign of enlightenment and publicity and that the association and all concerned in the welfare of the industry will utilize this material to the very best advantage.

THE GEARY STREET MUNICIPAL RAILWAY

Elsewhere in this issue we publish a brief history of the Geary Street Municipal Railway of San Francisco, from June, 1896, when the privately owned Geary Street, Park & Ocean line had its application for a fifty-year franchise extension denied, down to August, 1913, when the popular vote of the city authorized more city-built, owned and operated street railways. Our facts have been taken neither from the mouths of extraordinarily zealous municipal advocates nor from the caustic criticisms that have been uttered by the adversaries of the system. We have derived our information solely from statements in the form of public documents submitted by city officials to the municipal bodies. At the end of our compilation of facts we have placed Mayor Rolph's statement that the proposition is a veritable "gold mine." With this conclusion, however, we think that many will not agree, for the city reports obtainable are so incomplete and so strangely inadequate as hardly to warrant such an unreserved prophecy.

The first omissions noticeable to us in these statements occur in connection with the cost of construction of the municipal line, which does not include the \$350,000 appropriated by the City Council for plans and specifications prior to the 1906 disaster. Apparently no one knows whether this sum was entirely spent for plans and specifications or swallowed up in the earthquake. The only tangible facts are that the plans already made were destroyed, that a vote of an additional sum after the disaster was declared illegal, that a bond issue had to be resorted to in order to raise the funds with which to proceed, and finally that in calculating the cost of constructing the road the city officials have relegated into obscurity this \$350,000 that had formerly been actually appropriated and presumably spent. This is of peculiar significance when we consider that \$32,418 is the only amount included in the cost of construction for plans and specifications. Why this expenditure, only 1.9 per cent of the whole construction cost, should be so low in comparison to the usual 7 to 10 per cent on electric railways, and also so much less than the amount the Council deemed necessary for plans and specifications a few years before, is indeed a mystery. Even if we add the items of \$500 for the city attorney's trip to Washington, \$2,000 for litigation and \$1,171 for Mr. Arnold's reports on cars, the percentage for expenses of engineering and superintendence during construction is only 2.1 per cent of the total cost. Looking at the question broadly, it is certainly impossible for a city or for a company to obtain the services of construction engineers or drawings or superintendence without charge, and if these expenses are not included in the official statement of construction cost they must be paid for in some other way.

Another item which seems to have been omitted in the official statement of cost of construction of the railway is the interest during construction. The rulings of the Interstate Commerce Commission expressly provide that interest paid or accrued on the capital investment prior to the actual moment of beginning operations shall be capitalized, but it appears that this item for the Geary Street road has not been computed as yet. Inasmuch as the city officials announce that they chose the Interstate Commerce Commis-

sion system of accounts and rulings because of the wide use of this system and because it gave the public a means for checking up the allocation and distribution of the various expenditures, it is strange that special care should not have been taken to compute this preliminary interest item before the first report was rendered.

It would be possible to criticise other faults in the statement of cost of construction, such as the omission of the \$91,905, the cost of the four special elections, which in a sense is comparable with the organization expenses of a private company and so should have been capitalized or amortized if a fair comparison with a private corporation is to be made. But instead of delving further into the construction account for errors of omission or commission we shall pass to the operating statement, which shows an equal lack of specific provision for certain charges. In this connection it is interesting to compare the operating expenses of the Geary road with the figures given in the special census report on electric railways for 1907 showing the percentage distribution of the operating expense accounts for thirteen selected electric railways in the largest cities of the country. With these roads the municipal railway is fairly to be classed so far as its operating conditions are concerned. On an aggregate basis of 100 per cent for all operating expenses, the average expenditure of the standard lines for maintenance of way was 10.1 per cent, while the Geary line expended only 2.59 per cent, made up of \$1,867 for cleaning and sanding tracks and of only \$37 for all of the other items in the way and structures account. The standard electric line maintenance was 1.8 per cent, the Geary item being 0.03 per cent, and the carhouse maintenance charges were 0.8 per cent and 0.005 per cent respectively. In the maintenance of equipment the standard lines expended 13.5 per cent, including 6.1 per cent for cars and 4.4 per cent for the electric equipment of cars, as against maintenance of equipment on the municipal line of 4.3 per cent, including 3.07 per cent for cars and 0.21 per cent for the electric equipment of cars.

In view of these figures, it might be safe to assume that those for conducting transportation will be interesting. This is where the question of politics enters, because the largest item in this primary account is that of wages of conductors and motormen. The parallel is instructive. In conducting transportation the standard lines expended 59.3 per cent, 44.7 per cent of which was for car operation, while the Geary line used 87.1 per cent for conducting transportation and 62 per cent for car operation. In regard to the last general operating expense group, that of general and miscellaneous expenses, the chief item here on which payment can be postponed is that of injuries and damages. In this account the standard roads expended 9.4 per cent and the Geary road 0.13 per cent. The totals upon which these standard percentages are based are fairly representative of the operating conditions in large cities, and the variations therefrom of the Geary percentages are quite illuminating.

It is to be expected that the cost of maintaining the track and roadway in San Francisco would be low at first owing to the recent entirely new construction, and the same conditions would apply to a large extent to maintenance of equipment. But the point for San Francisco to bear in

mind, in calculating the profits of its municipal system, is that its maintenance expenses have barely begun. On the other hand, the charges for conducting transportation are already a third higher than the standard. This is undoubtedly caused by the requirement that every municipal employee must receive \$3 per day, which makes an expenditure for motormen and conductors alone of 62 per cent of the operating expenses and 26 per cent of the operating revenue. There is no reason either for believing that the municipal road will be any more immune from the average injuries and damages charge than a privately operated system. Hence the amount of \$99 charged to this account during the first six months of operation can mean only that no attempt has been made to provide a fund for this accrued liability. Instead, as in the cases of track and equipment maintenance, these charges are cheerfully postponed, with the result that the report is to that extent misleading.

The operating report, which is a copy of that in the files of the Board of Public Works, concludes with this remarkable statement: "Surplus over audited expenses and interest charges, \$32,557.59, from which all depreciation, sinking fund, mythical taxes, insurance, etc., may be deducted." The italics are ours. In view of the fact that the city charter of San Francisco expressly provides that allowances for taxes must be made in the financial statements of all public utilities, whether they are assessable or not, it seems to us that the taxes in this particular case might well appear in more than a "mythical" form. It would be interesting to put these taxes in the form of a concrete estimate, as well as a few of those other charges that the city "may" deduct, if it so desires.

The city officials might, for instance, follow the plan employed in connection with the Chicago rehabilitation and charge off 16 per cent of the gross receipts, not an unduly large percentage, half for maintenance and half for depreciation. On its gross receipts of \$134,923 this would mean \$21,587, instead of nothing for depreciation charges and only about \$4,443 for maintenance. If to this 16 per cent for depreciation and maintenance it should add 5.5 per cent of its gross receipts for damages and 4.6 per cent of its gross receipts for taxes, percentages corresponding to those of the average city road according to the 1907 census report, it would have a total of 26.1 per cent of the gross operating revenue, or \$35,214, to be deducted from the present apparent surplus of \$32,557. Considering the \$4,443 that the municipal line has actually spent for maintenance, which must be excluded from the total of \$35,214, we admit that a small surplus is left, but were the city simply to carry fire insurance on its \$341,931 of cars and its carhouse costing \$234,688, even at the average rate of 37 cents per \$100, the threatened deficit would be a reality. When to this fact we add the statement that for the retirement of \$101,000 of the \$1,969,000 bond issue each year from 1915 to 1934 a sinking fund provision of approximately \$8,300 a month is required, the "gold mine" of Mayor Rolph becomes rather the illusory pot of gold at the end of the rainbow.

These are some of the points which occur to us in looking at the report of the municipal railway in San Francisco. Our deductions may not be exact, but they do take into

consideration several omitted points that directly affect the question of profit. In choosing the Interstate Commerce Commission classification of accounts the municipal authorities adopted a system that enables them to take care of all the constructional, operating and capital elements that may be present, and it is unfortunate that carefully constructed, absolutely complete statements of financial conditions and operations have not been rendered. As it stands now, the bookkeeper's report stops at the point where the question of profit begins to hang in the balance, and the final result is hidden under estimates. Our chief regret is that the report fails to afford electric railways, municipal authorities and even the layman any definite authoritative information on the subject of the success of the municipal railway in San Francisco.

THE SPLIT-PHASE LOCOMOTIVE

Induction motors have been used as phase splitters and phase shifters for a long time, and one is inclined to ask why they are only now being adapted to traction purposes by the forthcoming application on the Norfolk & Western Railway. The first element of the answer to this question is that a.c. power has had to overcome the same opposition in the traction field as in lighting and industrial power work. It should be noted further that until recently the phase converter has not been seriously considered as a commercial machine on account of its inherent limitations. In its elementary form it is not a good converter because the secondary emfs and currents are not well balanced. Invention has therefore been required to overcome the defects, and this is recent, having awaited the commercial pressure needed to render it productive. That commercial pressure has been provided through the realization of the excellent traction qualities of the polyphase motor for certain kinds of work, and it has led to a means of using this motor without the additional overhead conductors which hitherto have been necessary.

The propulsion element of the split-phase locomotive can hardly be considered an experiment, for the polyphase motor is appreciated as one of the best-seasoned pieces of electrical equipment extant. Its control and regenerative features are also well understood and must appeal strongly to the conservative instincts of the engineer, who always dislikes waste. The phase converter, which is the only novel element, is merely an induction motor used in another way. It will operate without phase-balancing devices and the motor will produce some torque even if the phases are not balanced, although it appears from tests already made that the phases can be balanced in one way or another. The General Electric Company has announced one plan as disclosed elsewhere in this issue, but it remains to be seen whether the same method will be applied commercially. The Westinghouse company has not announced the procedure to be used on the Norfolk & Western locomotives, but undoubtedly that company feels satisfied that it has a good one. In short, there is no electrical reason why the split-phase locomotive should not be an important factor in railroad electrification, provided that its first cost and operating charges are low enough, so as to allow it to compete with the types that are already in successful service.

Recent Repair Shop Improvements at Minneapolis

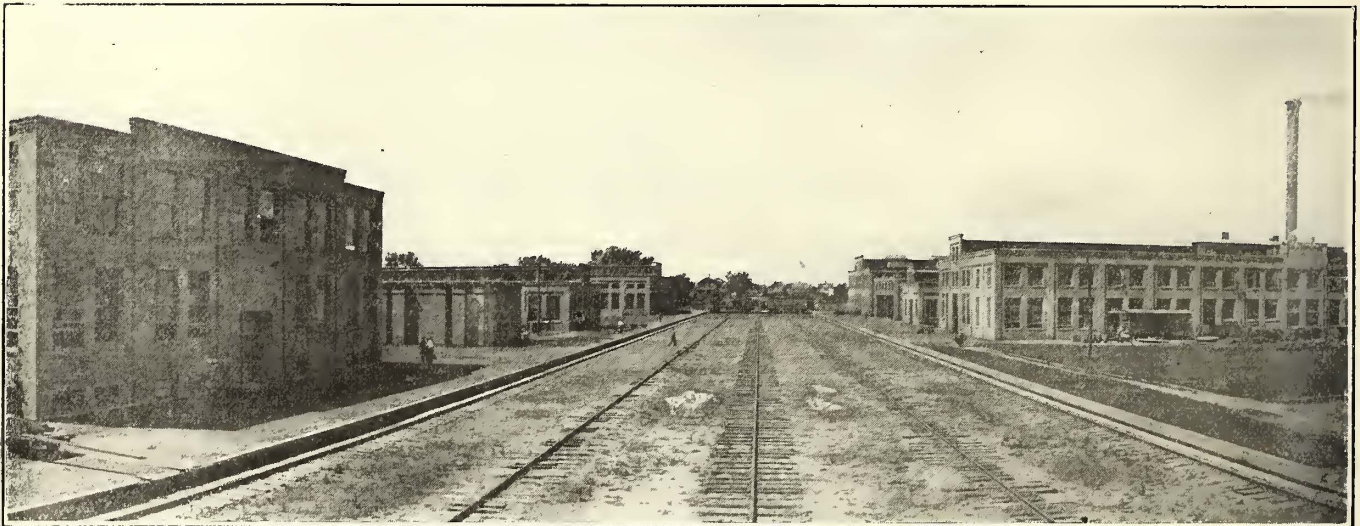
The Twin City Rapid Transit Company Has Recently Constructed Several New Shop Buildings, Thus Completing the Original Layout Which Was Planned Nearly Seven Years Ago—A Description of the New Structures Is Given, Together with Notes Upon Present Shop Practices

As is generally known, the Twin City Rapid Transit Company builds all of its regular and special cars. This practice was begun fifteen years ago and has been continued partly because the company believes there is a saving in so doing and partly because it enables the cars to be repaired by the workmen who originally constructed them. This is thought to result in efficiency and economy.

The shops are located on Snelling Avenue between University Avenue and St. Anthony Avenue and cover an area of about 30 acres. These shops have been described in considerable detail in previous issues of the *ELECTRIC RAILWAY JOURNAL*,* but since the last of these articles was written extensive improvements have been made, the most important of which are the construction of a new structural shop and an oil house and the rearrangement which has

to withstand long the severe wear and tear of shops in which heavy work is handled.

The new building is divided into two equal sections, one for forge, the other for structural work. In these the present tools have been placed in their permanent positions, which were planned to insure most economical handling of work. This leaves, at present, large floor spaces unoccupied. This is all provided, however, in accordance with a definite scheme, and as each new machine is added it can be placed effectively without serious disturbance to the previous equipment. Between the two sections is a small two-story building which contains the tool rooms, offices and wash and lunch rooms. While, at first sight, a building within a building strikes one as novel, the arrangement is logical. The interior building is accessible from all parts of the



Twin City Shop Improvements—Panoramic View of Snelling Avenue Shops

resulted therefrom. This work is now about finished, and it practically completes the original plan laid out nearly seven years ago. The general view which is published on this page was taken just before the construction of the structural shop was begun. The new shop occupies the vacant space in the foreground at the right of the picture. The diagram of shop layout shows the relation of the buildings forming the group.

The new forge and structural shop is 200 ft. x 120 ft. in dimensions with light structural steel frame and brick walls. The height is 29½ ft. from the ground to the top of the nearly flat roof. This roof was made light in weight to save expense and avoid the effects of vibration. It consists of pine planking 1¾ in. thick covered with five-ply paper and tar and gravel. The floor is a 1½-in. layer of asphalt mastic laid on a concrete foundation. The composition is 65 per cent gravel, rock and bank sand and 35 per cent mastic and flux. In order to avoid sponginess it was put down hot and thoroughly troweled. This type of floor is practically paving concrete. If it proves satisfactory, it will be used in other parts of the shops to replace cement concrete, wood and cast-iron floors, none of which is able

shop. The walls keep out noise and dirt and the large windows furnish ample light and a view of all parts of the building. The building is not carried up to the shop roof because two floors give all the space needed.

The arrangement of the tools is such as to facilitate the efficient handling of all structural steel needed for bridges, viaducts, buildings, all power station and substation steel construction, truck frames, car frames, tanks, boilers, in short, practically every kind of steel work. In the old shop which was replaced by this new one 1400 tons of steel work were handled in a year. The capacity of the new shop is much greater than this. To serve the tools economically a double system of cranes has been installed, a 20-ton traveling crane for the structural shop and individual 2-ton jib cranes of original design for all heavy tools. A second traveling crane will be installed later in the forge shop. The jib cranes take care of a large part of the lifting, leaving the large crane free for the heavy work and long-distance moving. The large crane is electrically equipped.

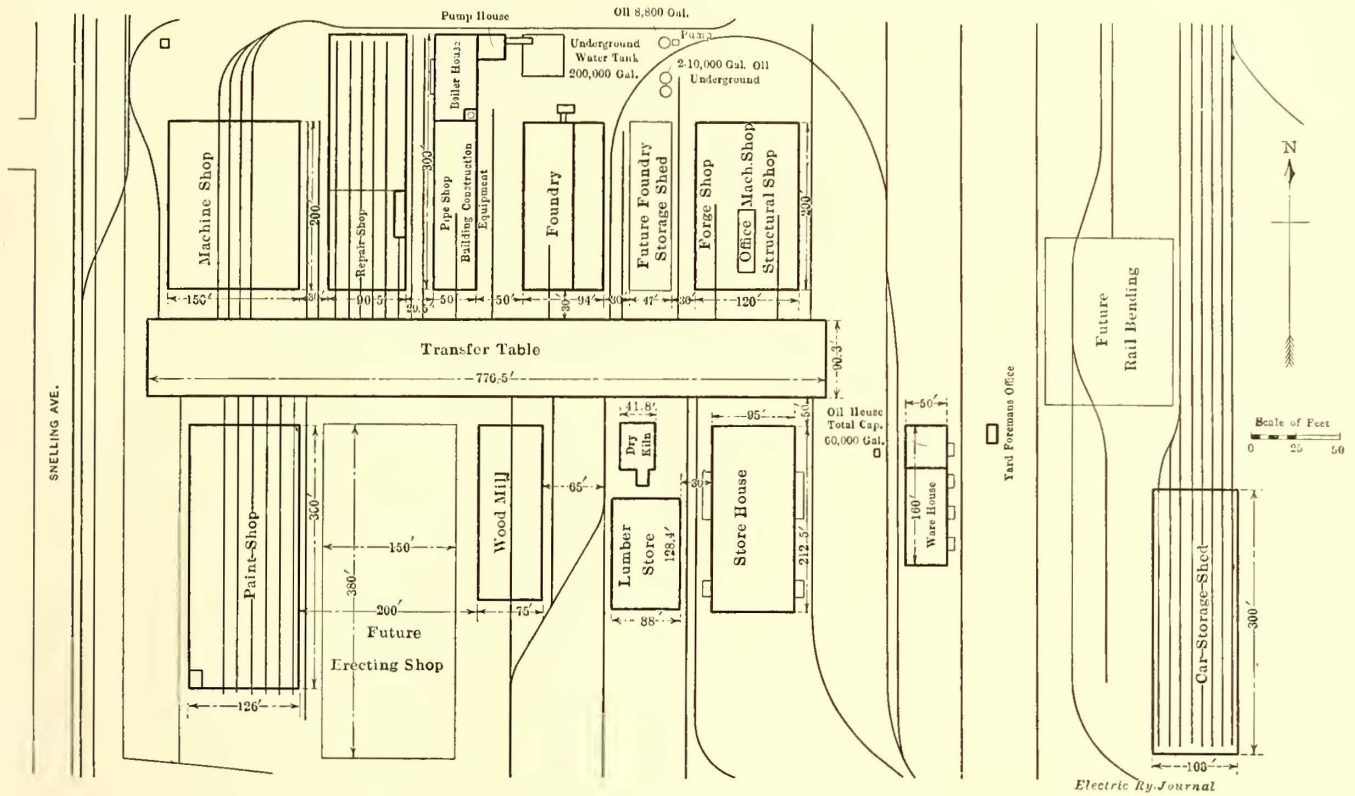
THE OIL HOUSE

The new oil house, while less pretentious than the forge and structural shop, is nevertheless an important addition to the plant. The building is 160 x 50 ft., with a basement under one end. Architecturally it conforms in style to the

*See particularly Vols. XXVIII, page 100; XXX, page 318; XXXII, pages 744, 890; XXXV, page 937; XXXIX, page 543.

group of buildings of which it forms a part. Only a third of the building is at present required for oils and waste, the rest being used for storage of track and line supplies. The oil tanks are compactly placed in the basement and will

The completion of the new buildings greatly relieves congestion in the former smith shop and storehouse. The pipe shop will continue to occupy part of the old smith shop, and the building department will occupy another part of it.

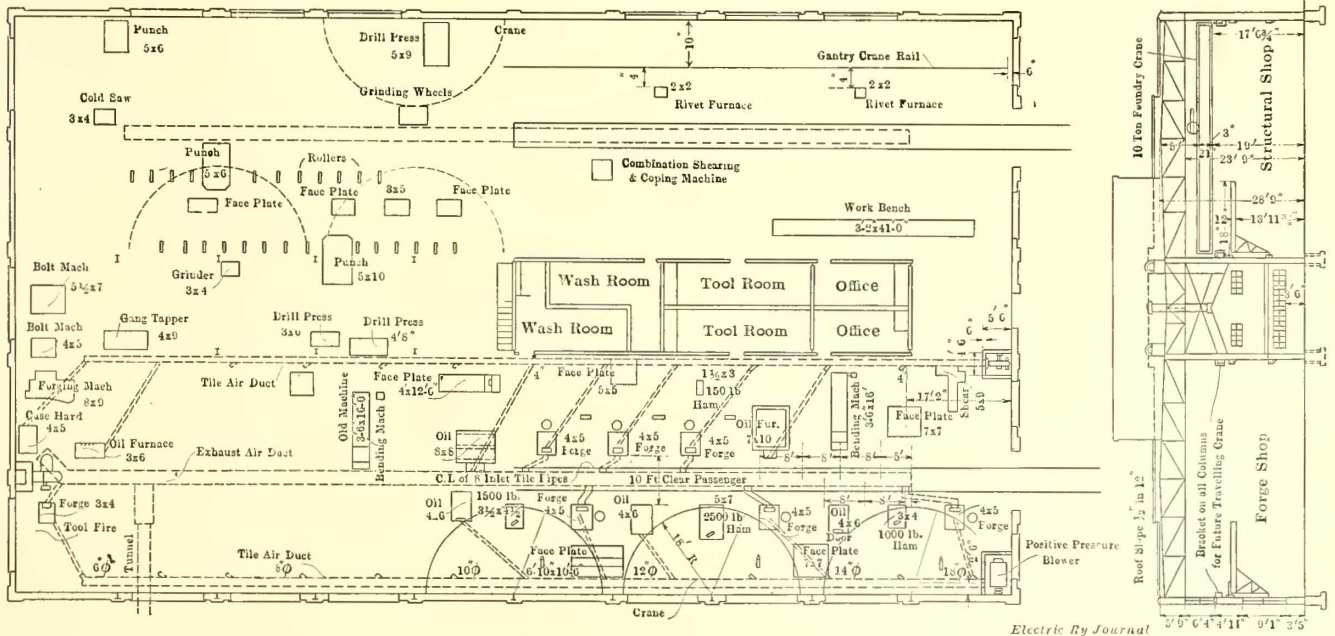


Twin City Shop Improvements—General Layout Showing Location of New Shops

eventually comprise six of 10,000-gal. capacity each for car oil, turpentine and gasoline; four of 2000-gal. capacity for kerosene, engine oil and compressor oil; six of 500-gal. capacity for benzine, signal oil, engine oil, car oil and automobile oil, and eight of 250-gal. capacity for brake oil,

CAR DESIGN

There are but two types of car which are standard with the company. One is known as the older type and is 8 ft. 6 in. wide, with wood underframe. The other is 9 ft. 1 in. wide with steel underframe. The latter is lighter, stronger



Twin City Shop Improvements—Plan and Cross-Section of Forge and Structural Shop

germicide, alcohol, lard oil and castor oil. Directly over the tanks are power and hand pumps with cast-iron catch basins. Bins for several car loads of waste are also located in this pump room.

and has more area of glass in window sash. Since manufacturing was begun there has been a constant effort to reduce car weight. The last car turned out, 46 ft. 8 in. x 9 ft. 1 in., weighed, complete with storm windows, sand in

boxes, water in heating system and coal in bin, 42,100 lb. actual scale weight. The type built eighteen months earlier weighed 46,200 lb., and that of a few years earlier 48,000 lb. The suburban type built eight years ago weighed 59,000 lb. These weights apply to cars seating forty-eight passengers, the standard seating capacity for all cars on the Twin City lines.

The lightening process has been carried on in all parts of the car and equipment. Wheels were reduced to 425 lb. for the 34-in. size, and these are scrapped as light as 310 lb. with a diameter of 31 in. Twenty-five pounds has been added recently as a concession to the manufacturers. Axles have been brought down to a minimum safe size with allowance for wear. A 2-in. hole from end to end eliminates 62 lb. of useless weight. Brake rigging and trucks have been lightened by the use of better steel and forgings, thus permitting smaller parts to be used. The greatest saving here was obtained by doing more machine work on castings. These have to be made larger than necessary for strength on account of foundry limitations, and 25 per cent or more can be machined off in many cases without danger. It was found also that steel bolsters could not be cast straight and uniform. These were therefore planed off with a saving of 150 lb. All parts of the bolster were at the same time made perfectly true. In the body all wood-work was made 1/16 in. thinner, and the steel underframes were lightened to the limit of safety. Even the grab-handles on the seat backs were trimmed down.

CAR CLEANING AND RENOVATING

In regular maintenance, cars are now washed outside, and floors are swept daily with a careful wiping throughout. At nine-day intervals the floors are scrubbed. Every seventy days there is a thorough cleaning and hidden corners receive special attention. A thorough overhauling of the car body occurs every eighteen months for cars in heavy service and every four to five years for those in light service. During this process, which costs about \$260 per car, new mastic flooring is placed on the platforms, the inside floors are patched or relaid, the seats are removed and refinished or replaced with new ones, new curtains, cushion covers, steps and gates are supplied if they are at all worn, and bell and battery boxes, push buttons and other fixtures are replaced. By being trimmed true and then having strips glued on all of the worn surfaces the sashes are made practically new. For window curtains, woolen terry has been found most satisfactory in the long run in spite of its high price.

Renovating the car exteriors includes a complete refinishing inside and out. Paint is burned off irregular surfaces and thoroughly smoothed off elsewhere. A new finish is then applied, the work requiring the car to be about fourteen days in the paint shop. When it leaves the shop with its fresh bright coat of light chrome yellow and aluminum bronze striping the car in appearance as well as in fact is as good as new. On an average thirty cars are kept in the main paint shop undergoing a thorough refinishing, while four more have the finishing touches added in an adjoining shop. This number keeps the force well occupied. All of the painting is done by piece work.

PAINT SHOP

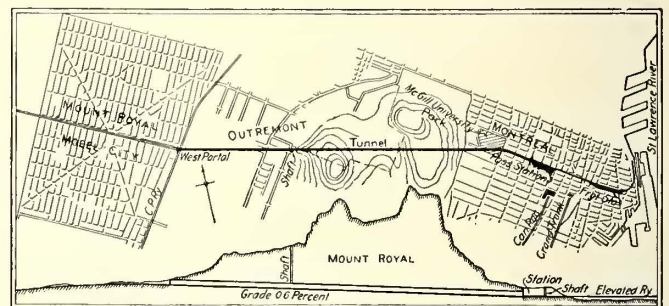
The paint shop, while not new, is a model of its kind. It is 300 ft. by 126 ft. wide and contains six tracks. One side, with a wide gallery, accommodates the carrying, sash finishing, glazing and other detail departments. Between and outside the tracks on the main floor are painting scaffolds of a type invented by G. L. Wilson, engineer maintenance of way, some years ago, and these have been found very convenient in practical operation. Nine-foot lengths of 4-in. wrought-iron pipes are set 10 ft. apart and 2½ ft. deep in cylindrical concrete foundations, 20 in. in diameter and 2 ft. 10 in. long. On the pipes are mounted cast-iron sleeves from which project brackets with extension sections. The sleeves are clamped to the standards by means of

set screws. The brackets and planks spanning them are counterweighted by weights inside the pipes connected with the brackets by chains passing over pulleys mounted in housings on the top of the standards. This arrangement permits a quick adjustment of the scaffolding and leaves the floor practically clear. It is substantial enough to eliminate danger to the workmen from breakdown.

The paint shop is lighted partly by incandescent lamps in wall sockets placed directly on the concrete columns a few feet from the floor. The conduits are molded in the column so that no wiring is visible, and each lamp is protected by two strap-iron arches crossed at right angles.

ELECTRIFICATION OF MONTREAL TUNNEL AND TERMINAL

The adoption of 2400 volts direct current for the Canadian Northern Railway's tunnel and terminal at Montreal has been definitely decided upon, and an order has just been placed for seven electric locomotives, eight multiple-unit motor car equipments and complete substation apparatus. The terminal electrification will consist of 10 miles of double track between the passenger and freight terminals in Montreal and the Cartierville yards beyond the town of Mount Royal, where the incoming and outgoing trains will change from steam to electric locomotives and vice versa. The multiple-unit trains will give the



Map Showing Terminal and Tunnel of Canadian Northern Railway to Be Electrified

suburban town of Mount Royal and the country beyond a quick and frequent service to the city. Montreal will be the eastern terminal of the Canadian Northern Railway, the new transcontinental line.

The locomotives will weigh 80 tons each, all weight being on the drivers. They will be equipped with two four-wheel trucks articulated together, with four motors geared to the drivers through twin gears. The motors will be of the commutating-pole type wound for 1200 volts and insulated for 2400 volts, operating two in permanent series. The control will be multiple-unit series-parallel, the current for the contactors being furnished by a motor-generator set. The motors for the multiple-unit four-motor car equipments are rated at 125 hp, 1200 volts each. The control is in general similar to that of the locomotives.

The substation will be located at the west portal of the tunnel, where power will be purchased at three-phase, sixty cycles, 11,000 volts. Each motor-generator set will be rated at 1500 kw at 2400 volts with a five-minute overload capacity of 200 per cent. This set will consist of two commutating-pole generators each wound for 1200 volts and insulated for 2400 volts in permanent series, and on the same shaft with and driven by a 2100-kw, 11,000-volt synchronous motor. The station will be designed for an ultimate capacity of 4500 kw at normal rating, or three of these sets. At present only two will be installed.

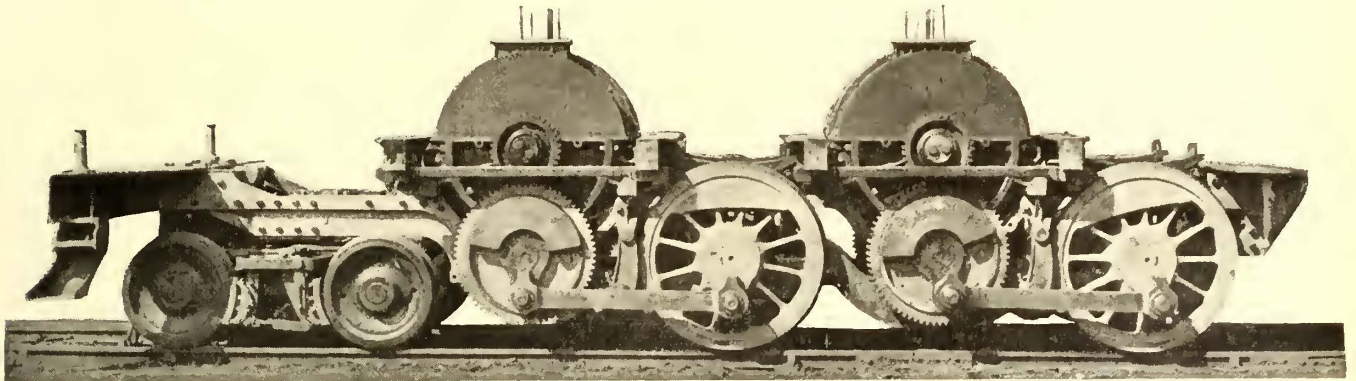
All of the apparatus will be manufactured by the General Electric Company. The design and installation of the apparatus will be in charge of W. C. Lancaster, electrical and mechanical engineer of MacKenzie, Mann & Company, Ltd.

New Single-Phase Motor and Phase Converter for Locomotive Service

The Article Describes an Experimental Type of Articulated Locomotive with Single-Phase Commutator Motors and Also a Device for Converting High-Voltage Single-Phase Current to Polyphase Current

It is a matter of common knowledge that for some time past the General Electric Company has been conducting experiments at Schenectady to determine the commercial feasibility of a novel form of articulated locomotive equipped with four 400-hp series-repulsion twelve-pole motors. These motors are similar in design to those which

Fig. 1, which shows a two-pole motor. The brushes are located in the middle of the zone of the inducing winding, and the armature, therefore, is the secondary of a transformer of which the inducing winding is the primary. The two stator windings and the armature winding are permanently connected in series.

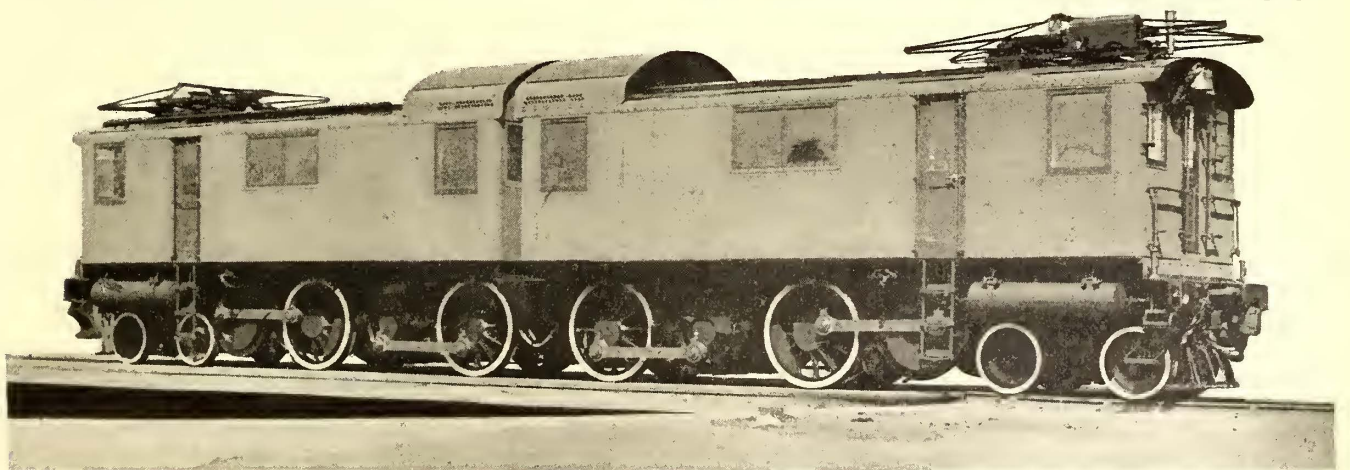


Experimental Single-Phase Locomotive with Cab Removed

have been in operation in motor-car service for the past two years on the New Canaan branch of the New York, New Haven & Hartford Railroad.

In this experimental locomotive the motors are mounted on the truck frame over jack shafts to which they are geared at both ends. Cranks on the jack shafts are connected to the driving wheels by means of connecting rods, each motor having its own pair of drivers. Each section of the locomotive has a four-wheel pony truck which carries half the weight of one motor as well as a share of the cab weight.

This arrangement permits the motor to be started as a repulsion motor under the transformer action of the inducing winding and with the brushes short-circuited. The inducing winding has twice the number of turns of the armature so that the current which the controller must handle will be correspondingly less than the armature current. In order to make clear the operation of starting and running, the accompanying diagrams showing the connections used in the locomotive circuits will be of interest. Fig. 2 shows diagrammatically the connections in the starting position with the armature short-circuited. Fig. 3 is



Experimental Single-Phase Locomotive of General Electric Company

The principle of this type of motor was described by E. F. W. Alexanderson in a paper presented before the American Institute of Electrical Engineers in January, 1908. The special features are a drum-type distributed stator winding consisting of two parts, the exciting winding and the inducing winding, and the arrangement of these in series with provision for short-circuiting the armature at starting. The arrangement of the windings is shown diagrammatically in

a connection diagram and should be studied with reference to the contactor chart given in Fig. 4. The exciting fields of the two motors forming a locomotive unit are shown connected permanently in parallel and the armatures permanently in series, but this does not alter the general principle. With the transfer switch in the position shown, the contactors are manipulated by the master controller to give first low voltage with starting resistance, next to cut out

the resistance, then to increase the voltage in two steps to full value, all with the armature short-circuited. The transfer switch is next shifted to the running position, removing the short-circuit from the armature. The contactors then gradually raise the voltage on the armature and exciting circuit, the inducing winding being connected across part of the transformer winding and supplying a part of the power to the armature by induction.

There are no resistance

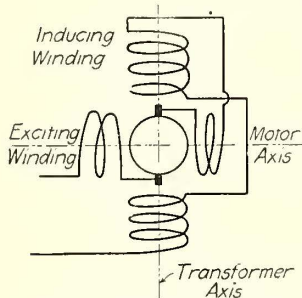


Fig. 1—Series-Repulsion Motor

Step	Contactors										
	1	2	3	4	5	6	7	8	9	10	11
1st											
2nd		●				●	●	●	●	●	●
3rd				●	●	●	●	●	●	●	●
4th	●	●				●	●	●	●	●	●

F—Forward R—Reverse

Fig. 4—Contactor Diagram

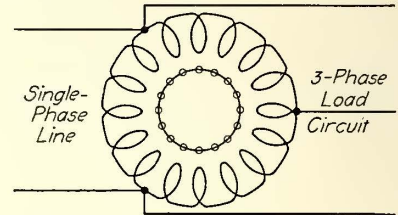


Fig. 5—Simple Phase Converter

leads between commutator bars and armature winding. The short-circuit currents in the coils are kept down by the expedient of using a short-pitch winding, the coil pitch being approximately the same as the width of the inducing winding.

Thus when short-circuited the sides of the coils are in flux of the same kind and the coils do not link with the field flux. This method of preventing the production of transformer currents in the short-circuited coils is said to be entirely satisfactory. The short-pitch winding also plays another important part in the commutation, for, by selecting the proper pitch, the flux distribution can be controlled so that the short-circuited coil will be located in a good reversing field.

NEW APPLICATIONS OF THE PHASE CONVERTER

In the *ELECTRIC RAILWAY JOURNAL* for Aug. 23, 1913, a reference was made to the Westinghouse contract with the Norfolk & Western Railroad. The adoption of induction motors with phase-splitting devices for this line has drawn fresh attention to the subject of phase converters, which up to this time has possessed only academic interest. The contract mentioned indicates that the Westinghouse Company has been studying the subject quietly for a long time and the same is true of the General Electric Company.

ern contract the phase converter assumes a new rank in the electrical machinery field and for the next few years must make rapid progress.

The split-phase locomotive equipment comprises a number of polyphase induction motors which are inherently of the constant-speed type, a phase-converter and any system of control of the motors which would be used in a poly-phase system. The only features added are the phase converter and its controller, a very simple piece of apparatus.

In a paper delivered at the 1911 convention of the Amer-

ican Institute of Electrical Engineers, Mr. Alexanderson described some experiments with a small phase converter, suggesting that it might yet be of considerable commercial importance. Even with the 25-kw equipment employed in the tests the efficiency of conversion was nearly 90 per cent, although the power factor was low. The experiments, however, were so satisfactory that preparations were made immediately for carrying them out on a larger scale and in heavy electric traction work, as hereinafter described.

PRINCIPLES OF THE PHASE CONVERTER

Any polyphase motor can be operated as a single-phase motor by connecting one phase to the line and giving the rotor a start. The latter will then run at a speed somewhat less than its polyphase speed, and at no load its speed will be practically synchronous. From all of the primary windings, including those not connected to the line, poly-phase current can be taken off. (See Fig. 5.) In this case the alternating flux produced by the line current is cut by the conductors of the rotating secondary, which may be either squirrel-cage or phase-wound. The resulting second-

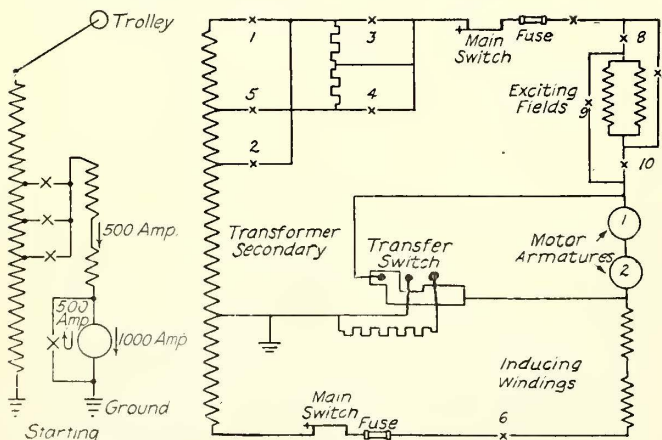
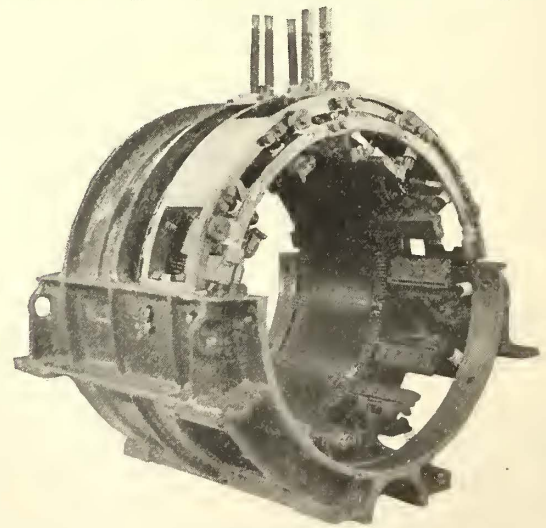


Fig. 3—Diagrammatic Arrangement of Connections

Fig. 2—Starting Diagram



Magnet Frame of Single-Phase Commutator Motor with Armature Removed

Both of these manufacturers realized that the problems of alternating-current traction had not yet been completely solved and that some kind of auxiliary apparatus might be necessary. Abroad the permutator, with synchronously rotating brushes, has been seriously proposed for traction purposes but it has not attracted much attention in this country. Presumably the phase converter is receiving attention abroad also. By virtue of the Norfolk & West-

ary current in turn produces a magnetizing force out of phase both in time and space with the flux which produced it and having such a direction that, when combined with the first flux, a rotating field is produced. This rotating field cuts the primary windings not connected to the line and generates emf in them. Thus in a simple manner is produced a converter for changing single into polyphase current.

When no current is drawn in the three-phase circuit the phase voltages are equal and balanced in phase position. When the three-phase circuit is loaded the simple converter described is not commercially satisfactory as the phase voltages are badly unbalanced.

As developed by the General Electric Company the phase converter is substantially as shown in Fig. 7, which, for simplicity, represents a two-phase machine. This arrange-

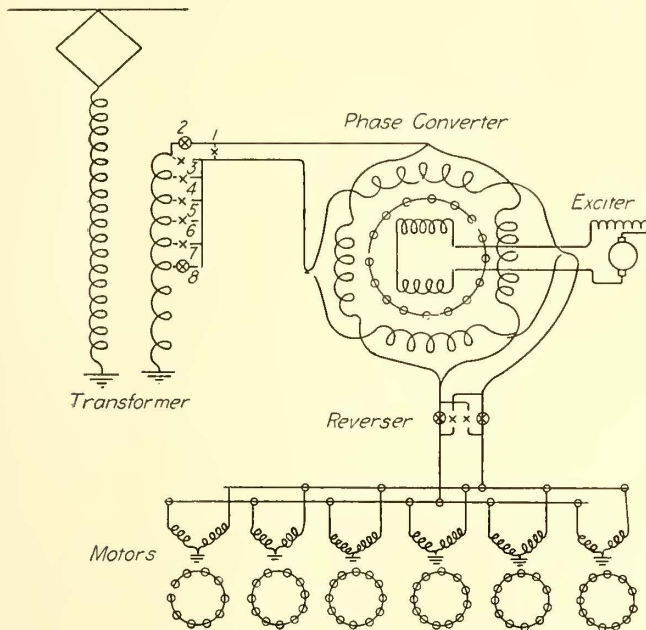


Fig. 6—G. E. Phase Converter Connections

ment differs in these essentials from that shown in Fig. 5. The line phase of the converter is connected in series with one phase of the motor and the second phase of the converter in series with the other phase of the motor. This arrangement reduces the phase displacement between emfs. By means of an auto-transformer or, as shown in Fig. 6, extra turns on the secondary of the main transformer, a part of the line emf is introduced into the second phase to correct for phase displacement and reduction of the induced emf. An exciting winding is placed on the rotor of the converter in addition to the squirrel cage and is furnished with synchronous exciting current from a small exciter. This permits the elimination of the exciting current from the main windings and greatly improves the power factor. Referring to Fig. 6, it will be noted that the trolley voltage is reduced by means of a transformer. This will, in general, be necessary, as it will not be economical to insulate motors for the line potentials which will usually be employed, that is to say, 10,000 volts or more. The secondary of the transformer is provided with numerous taps to vary the applied voltage, and thus the motor speed, and for supplying the compensating voltage in the second phase. The motors are connected permanently in parallel with a reversing switch in the leads connecting them with the converter. The operation of the converter will be clearer after a study of Fig. 8, which is a vector diagram of the whole circuit shown diagrammatically in Fig. 7 on the next page.

EMF RELATIONS

In Fig. 8 the horizontal line OO' represents the line volts V_L , between A and B in Fig. 7. This voltage is consumed in the converter counter emf E_{ca} (Fig. 8), the motor emf

E_{ma} , and in the impedance drops in converter and motor.

By induction an emf E_{cb} is generated in the second phase of the converter, in time quadrature with E_{ca} because the windings are in space quadrature. A part of the line voltage, V_{tb} (not shown), is introduced into phase b and the vector sum of it and E_{cb} , indicated by V_{mb} , is delivered to phase b of the motor. By the addition of V_{tb} , which is of course in phase with V_L , V_{mb} is brought in practical quadrature and equality with V_{ma} as desired. Finally a part of V_{mb} is used in overcoming the motor impedance leaving as the motor counter emf E_{mb} .

CURRENT RELATIONS

By the connection of the phase- a windings of the converter and motor in series, the former becomes a series transformer the secondary of which produces a current practically equal to and in time quadrature with the primary current. This kind of a series transformer differs from the stationary type only in this quadrature relation of the currents. The quadrature relation, as already suggested, is due to the production of the secondary current

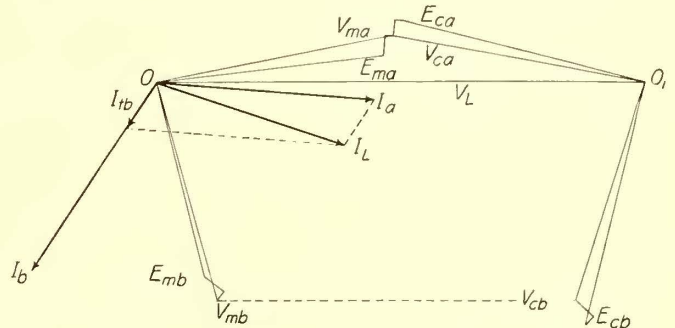
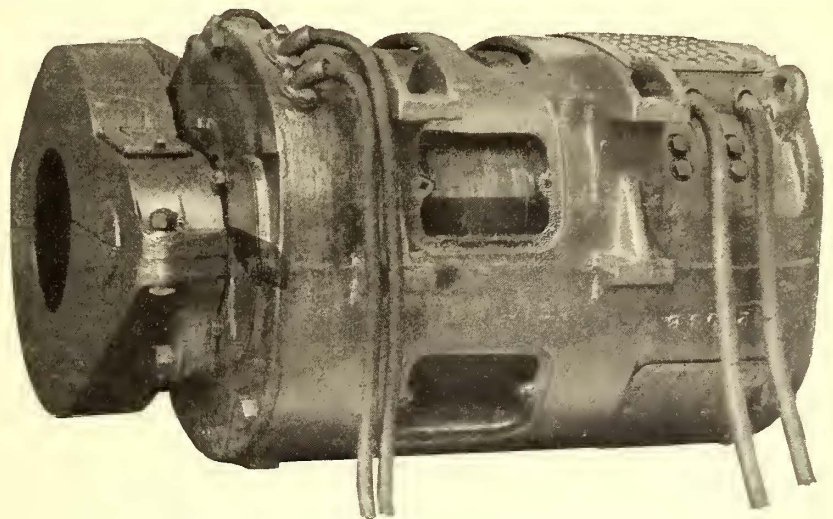


Fig. 8—Vector Diagram of Converter Motor Circuit

by the motion of the secondary conductors through the primary flux. The flux is approximately in time quadrature with the primary current, and the secondary current approximately in time phase with the flux is produced by motion through it.

Referring then to Fig. 8, we note that a current I_a is drawn through phase a , its value and phase position depending upon the load and the impedance of the circuit. There



Exterior View of G. E. A-613 Railway Motor

is also drawn through the auto-transformer a current, I_{tb} , due to the connection of part of its turns in phase b . Its relation to I_b , the current in phase b , is determined by the proportion of turns included in phase b . The line current is the vector sum of I_a and I_{tb} .

The current in phase b , being the secondary current in a series transformer, is proportional to the primary current and with the same number of turns in each winding the

two should be equal. Moreover, as explained, they should be in time quadrature in this case and would be so but for the presence of impedance and magnetizing current. The effect of impedance can be eliminated by the auto-transformer voltage. The synchronous excitation eliminates the latter, the theory being as follows: In an ordinary sta-

I_b which would be in time quadrature with exact neutralization of magnetizing component. As, in the case shown in Fig. 8, I_a and I_b are more than 90 deg. apart it is evident that the converter is "over-excited." A study of Figs. 8 and 11 shows that the result of all of the three corrective devices is to produce a good phase balance and a high power factor.

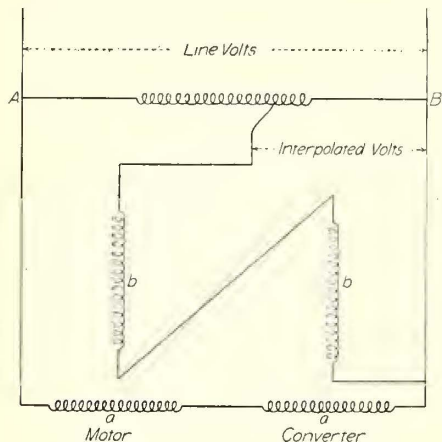


Fig. 7—Simplified Converter Motor Circuit

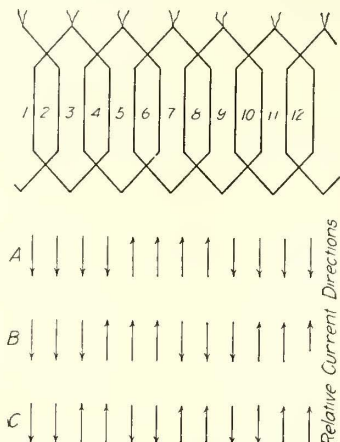


Fig. 10—Diagram of Pole-Changing-Connections

SPLIT-PHASE LOCOMOTIVE

As stated before, the General Electric Company some two years ago constructed an experimental locomotive to try out the phase converter on a larger scale. An experimental locomotive was rigged up as shown in Fig. 9. In the center of the equipment is seen a 200-hp motor arranged as a phase converter. This had a squirrel-cage rotor and was tested with and without an exciting winding. The exciter, belted to the converter, is seen in the foreground and the transformers behind the converter.

One axle of this locomotive was equipped with a motor of about 250-hp capacity having a temporary steel cylindrical rotor containing no winding. While this was a makeshift the skin effect in the steel at starting, when the secondary current has line frequency, undoubtedly was of great assistance in producing good starting torque.

tionary transformer we know that the primary and secondary currents cannot be exactly equal and opposite or there would be no magnetization of the core. The phase displacement is, therefore, just enough less than 180 deg. to produce a resultant sufficient to set up the required flux. In a two-phase converter the same argument applies to the quadrature relation. With equal currents in quadrature there would be no magnetizing current. The phase displacement then automatically adjusts itself to some value less than 90 deg. to produce the required magnetizing component. In the case of the stationary transformer, if an extra winding carrying quadrature magnetizing current were introduced the phase displacement could have the ideal value of 180 deg., or if the extra current were increased above the necessary value the phase displacement would be more than 180 deg. Obviously the flux could not be in-

doubtedly was of great assistance in producing good starting torque.

With this crude locomotive a number of satisfactory tests were made under very severe conditions. It was accelerated while the trolley contact was frequently interrupted, without any evil effect. As the phase converter runs light it loses little speed when the supply current is interrupted even for a half minute or so. Its rotor momentum is considerable and there is no resistance except friction and windage, the excitation failing with the power supply. A still more severe test was the application of full trolley voltage with the locomotive at standstill, the converter running at greatly reduced speed, and with the controller at full-speed position. Under these extraordinary circumstances the converter picked up rapidly and the motor developed sufficient torque to slip the wheels. As a climax

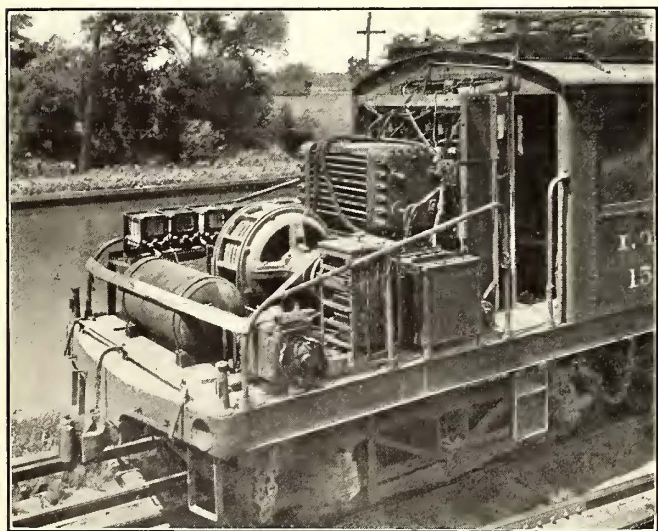


Fig. 9—View of Apparatus on Experimental Split-Phase Locomotive

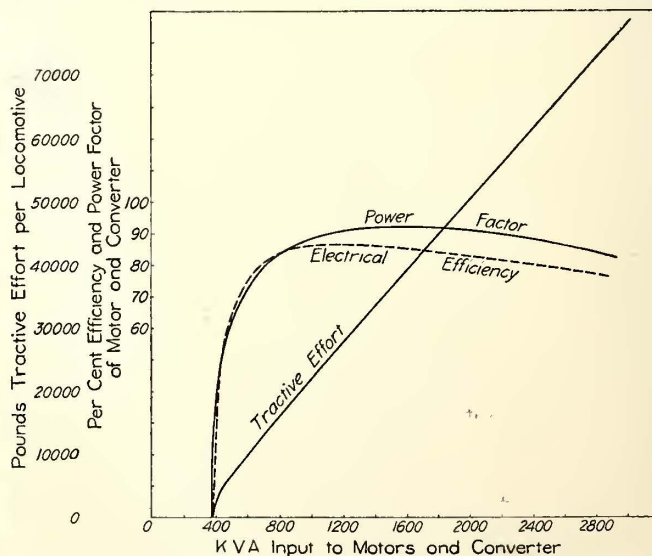


Fig. 11—Typical Characteristic Curves of Split-Phase Locomotive

creased or the counter emf would be greater than the applied emf. The primary and secondary currents must, then, automatically produce a demagnetizing component to keep the flux at its proper value. Just so, in the General Electric phase converter an extra winding on the secondary produces any desired phase displacement between I_a and

the trolley was lowered for a minute with the locomotive at full speed forward, the controller was set for reverse and the trolley returned to position. The motor promptly developed full torque in a reverse direction, slipping the wheels as before.

These tests were so satisfactory that the company pro-

ceeded to develop a 1600-hp converter and designed a locomotive now under construction having six motors of 300 hp each and intended to produce a 45,000-lb. tractive effort at 15 m.p.h. and one of 30,000 lb. at 22 m.p.h. Fig 10 shows in a general way the arrangement of the equipment.

The company is developing some interesting methods for simplifying the speed control. Among these is the use of the pole-changing scheme patented Dec. 25, 1906. The principle of this plan is shown in Fig. 10, which represents a part of a simple winding. The coils of one phase are connected in three groups which can be connected so that the currents flow as shown at *A*, *B* and *C*. When they flow down in conductors 1, 2, 3 and 4 and up in 5, 6, 7 and 8 they produce the minimum number of poles. The intermediate number is secured by reversal of current in 4, 7 and 8, etc., and the maximum number by the reversal of 4, 6, 7, etc., from the *A* connection. On account of the simplicity of other parts of the equipment, the complexity of the controller connections for pole changing will undoubtedly be warranted.

On the basis of experimental data now in hand the company's engineers have been able to compute the characteristics of the new equipment as given in Fig. 11. The efficiency and power factor are both high and remain so over a wide range of output.

TRACK CONSTRUCTION ON NARROW RIGHT-OF-WAY

Some interesting interurban double-track construction is now being done by the J. G. White Engineering Company, New York, on the Morris Railroad, an interurban electric railway about 3 miles in length between Morristown and Madison, N. J. The new line parallels the main line of the Delaware, Lackawanna & Western Railroad practically throughout its entire length, the right-of-way of the new line being immediately adjacent to that of the Lackawanna Railroad.

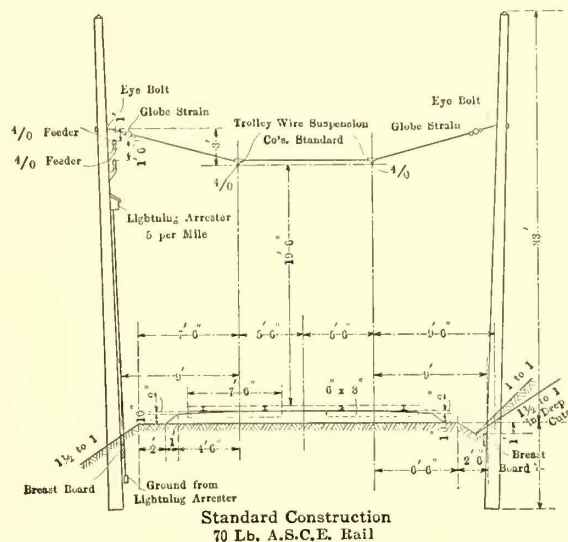
The grading is generally light, but excavation and fill at each end of the line are comparatively heavy, and in order to expedite the work a steam shovel has been put into operation in the largest of the cuts. The light grading is being done mostly by wagon haul, as the haul is too long to utilize either slush or wheel scrapers to any great extent. Although the line is not through city or village property, the right-of-way has been unusually expensive, lying as it does through some of the finest country places and estates in New Jersey.

A single-track railroad was at first intended, but later it was decided to construct a double track. It seemed at first that this could be done only by the construction of retaining walls at a great additional cost or by the purchase of additional right-of-way at about the same expenditure of money and with perhaps a year's delay in time. A careful study of the situation, however, resulted in the adoption of a special cross-section for the double-track roadbed in cuts and fills where the width was limited. The interesting feature in these cross-sections is that one of the tracks is at a higher elevation than the other.

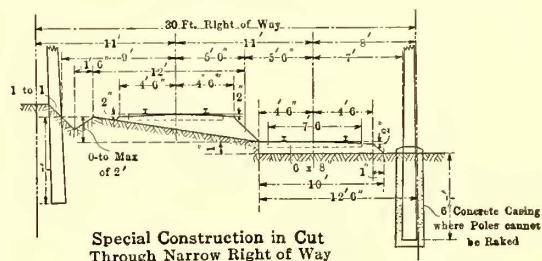
The first illustration shows a standard roadbed cross-section with tracks at the same elevations, and the two lower drawings show the construction through cuts and fills where the same distance, 11 ft., is maintained between track centers. In the cross-section of shallow cut illustrated a slope of 1 to 1 has been retained, but the higher elevation of the track on the side toward the cut has permitted a very much shallower cut at this point than would otherwise have to be the case. The slopes are 1 to 1 in shallow cuts and 1½ to 1 in deep cuts and fills. At one of the fills where the right-of-way is only 40 ft. in width the roadbed also has an incline in cross-section, but is not stepped, thus reducing the height of the fill on the lower side and keeping the slope within

fence line. In all cases, of course, the track on tangent has level cross-section, being leveled up by the ballast.

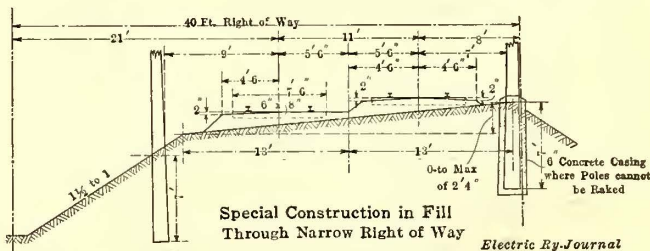
As the entire roadbed grading is in gravelly material that drains readily and is not subject to upheaval by frost,



Standard Construction
70 Lb. A.S.C.E. Rail



Special Construction in Cut
Through Narrow Right of Way



Special Construction in Fill
Through Narrow Right of Way

Electric Ry. Journal

Track Construction on Narrow Right-of-Way, Morris Railroad

it is thought that the fact that the ballast will be of varying thickness on the cross-section of the roadbed will not materially increase the difficulty of maintaining good track.

The eleventh annual convention of the Colorado Electric Light, Power & Railway Association was held at the Hotel Colorado in Glenwood Springs, Col., Sept. 25 to 27, inclusive. The convention opened with a few remarks from President W. N. Clark, of Canon City. Following him, W. H. Bullock, of Denver, read a paper entitled "Industrial Motor Appliances." An interesting demonstration of the "lung-motor" given by E. S. Tyler, of Chicago, terminated the first session. At the Friday morning session B. C. J. Wheatlake, of Denver, read the first paper, which was entitled "Lightning Arresters." Charles Neely, of Cripple Creek, read a short paper on "Joint Pole Usage." R. E. Campbell, of Cleveland, Ohio, delivered the first paper of the afternoon session. His topic was on "The Relation of the Incandescent Lamp to Lighting Service." Other papers were read as follows: "The Central Station in the Small Town," by H. L. Titus, of Sterling; "The Use of Single-Phase Motors from the Central Station Standpoint," by W. A. Layman, of St. Louis, Mo.

Measuring Currents in Underground Structures

The Writer Describes with Examples a Practical Method for Measuring the Resistance of Parts of Underground Pipes, Rails, Bridges, Busbars, Etc., for the Purpose of Measuring the Currents in Them with a Millivoltmeter

BY CARL HERING

The purpose of this article is to describe the details of a method for measuring the resistance of parts of underground pipes while a variable current is flowing through them, thereby enabling the currents in them to be then measured reliably with a millivoltmeter. It is applicable to out-of-door measurements on country roads, with portable apparatus, and is free from any doubtful assumptions. It is also applicable to rails, busbars, shunts or joints in them, with or without direct or alternating currents flowing through them; also to laboratory testing in cases in which a circuit cannot be opened and in which the current flowing is unknown or variable.

In a paper on "Measuring Stray Currents in Underground Pipes," read before the American Institute of Electrical Engineers in June, 1912, the present writer described a basic method of measuring the currents flowing in underground pipes or similar partly accessible circuits which do not admit of being opened; also a number of modifications of it. In the present article one of these modifications, which seems to be best suited for such work, is described

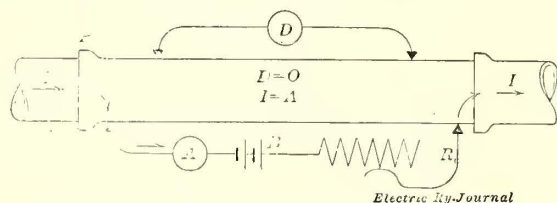


Fig. 1—Simple Method for Constant Currents

more in detail, including the necessary formulas, recommendations, practical hints and experience with it, etc.

FUNDAMENTAL FORM

The fundamental principle of this set of methods is shown in Fig. 1, taken from the former paper.

P is an exposed part of an underground pipe, or a busbar or other portion of any closed circuit of unknown resistances through which an unknown current is passing, the circuit of which cannot be opened to insert an ammeter. Let A be an ammeter, B a source of current like a portable storage battery, and R an adjustable resistance, their circuit being connected as a shunt to the part of the pipe to be tested, the polarity of the battery being such as to act as a negative booster to suck the current out of the pipe into this shunt. Let D be a suitable millivoltmeter. Then by adjusting the resistance R until D reads zero all the pipe current will have been sucked out into the shunt circuit, hence through the ammeter where it can then be measured. By then opening the shunt circuit and reading D , the millivolt drop for that current can be measured and from these two the resistance between the taps D can readily be determined. This, however, assumes that the current remains constant for these two readings, which are necessarily successive, and with the rapidly varying currents in pipes and busbars this assumption is not always safe; hence the following modification of the method is preferable as it involves no such assumptions, although, on the other hand, it is not quite so simple.

MODIFIED FORM

It is shown in Fig. 2, which is identical with Fig. 1 except that an additional instrument V is connected beyond the part embraced by the shunt, its function being to give deflections which are at all times proportional to the pipe

current. A somewhat longer length of exposed pipe is therefore desirable. This additional length may include to advantage a joint so as to increase its resistance, hence to shorten the length, provided, however, that the resistance of the joint can be trusted to remain constant during the test. The resistance to be measured is the part R , embraced by D ; the other resistance r , embraced by V , also becomes known without requiring any additional readings.

The measurement of both resistance and current then consists in taking two pairs of readings, the first without the shunt current and the second with it. Preferably groups of readings are taken to get a better average value, the number of readings of each group depending upon the accuracy desired and to a great extent upon the rapidity of variations of the current in the pipe. Two observers are required as each pair of readings must be taken simultaneously.

APPARATUS

The apparatus required consists of the following: a sensitive, reliable, well-calibrated millivoltmeter, D , prefer-

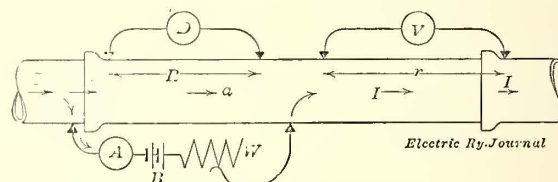


Fig. 2—Modified Method for Varying Currents

ably with a middle zero; a second instrument, V , of about the same range, also preferably with a middle zero, which need not necessarily read correctly in millivolts but should give deflections which are proportionate to the millivolts (hence a portable galvanometer with a proportionate scale would do, but it is then simplest first to get its constance once for all by connecting it in parallel with D and taking a few pairs of readings to determine $K = D/V'$ and then substituting KV' for V in all the formulas, in all of which V must be in millivolts; of course, the most convenient instrument is an exact duplicate of the millivoltmeter D); also an ammeter, A ; a portable battery, B , capable of giving relatively large constant currents for periods of ten to fifteen minutes, a storage battery being the best; an adjustable resistance, W , capable of carrying that battery current, and six clamps for attaching the leads to the pipes. The ranges of the millivoltmeters, ammeter, battery currents and resistance depend greatly upon the size of the pipe, the smallness of the pipe current, the length which can be uncovered and the desired accuracy of the measurements, and must therefore be predetermined by the one who is to make the specific tests. Some actual figures will be given below.

READINGS

The first pair of readings to be made are the deflections of D and V taken simultaneously while the shunt circuit with the battery is open; that is to say, the simultaneous deflections of both millivoltmeters due to the pipe current alone. These same readings may afterward be used also for calculating the currents flowing in the pipe at those moments, hence it is desirable to include the maximum and minimum deflections if possible, also reversals, approximately normal values, or any others that are of interest;

and, of course, it is preferable to take the readings when the needles are momentarily at rest.

Should the pipe current be too small, the instruments not sufficiently sensitive or the pipe lengths too short to give deflections as large as would be desired to give good readings, the battery circuit may be temporarily connected to the two extreme ends of the exposed pipe so as to embrace both voltmeters, but with its polarity reversed so that the battery current is added to that already in the pipe. The larger this additional current the better, for the instruments need then be less sensitive, or the two parts R and r may then be shorter, or both. It also diminishes the fluctuations relatively, as a larger portion of the total current will then be constant. It is not necessary in this part of the test to know what this extra current is, nor that it be constant. It may, in fact, be continually varied with a carbon plate rheostat so as to neutralize, as much as possible, the fluctuations of the pipe current. If, however, a battery current is thus added, then the deflections of D and V cannot, of course, be used afterward for calculating the pipe currents, as was stated above; but if this battery current is also measured in the ammeter at the times the millivoltmeters are being read, it could be subtracted from the total which is determined later on, the rest being then the pipe current. But this may not always be safe because it might happen that some of this battery current flows through the rest of the pipe, which is not under test, hence not through R and r . This would almost certainly be the case if the pipe were otherwise free from current or nearly so, or if the ground around the buried pipe were very wet. It is therefore advisable, when a battery current is thus added, to take new readings later on for determining the pipe currents alone.

If convenient to do so, it is preferable to choose the resistances R and r to be as nearly alike as practicable and to have the instruments D and V identical.

After taking a number of pairs of simultaneous readings of D and V , divide each D by its mate V , giving the ratio n , which ought to be the same for each pair of readings, and is preferably as near unity as practicable; that is:

$$D/V = n \text{ (a constant).}$$

Under ordinary conditions an average of the values of n from ten to twenty pairs of readings will suffice.

Having now obtained a good value for this ratio n , connect the battery circuit as shown in Fig. 2, being careful not to disturb the connections of D and V ; hence this test should follow the other immediately. Let the polarity of the battery now be such that its current diminishes the current through R , as in the diagram. If A is the battery current in amperes, I the original pipe current and a the current through R , then

$$I = A + a,$$

the algebraic signs of the values of these currents being considered plus when they have the directions indicated in the drawing. If any of them have the opposite direction, the negative sign must be given to their numerical values; this is of very great importance.

This battery current may best be adjusted to some whole number of amperes for convenience in the subsequent calculations in which it occurs as a divisor. With a suitable storage battery and a liberal rheostat this current may be adjusted before the next set of readings are taken and should then remain constant during the ten to fifteen minutes required for those readings. It then saves one observer and greatly reduces the subsequent calculations. If this battery current is not constant, an observer should try to keep it so with the rheostat, or if not possible, then to read it simultaneously with the millivoltmeter readings. When thus connected, pairs of simultaneous readings should again be taken of D and V , noting the value of the battery current A , being careful to note the signs of all three, as some may be negative. A set of ten to twenty pairs of readings will probably be ample for a good average.

The best value of this battery current is again the largest that the ranges of the instruments and battery will permit. If larger than the pipe current, it will naturally reverse the current through R , hence make the deflections of D negative, which sign, of course, must be carefully noted. A large battery current makes the difference between the readings D and V greater, and this is very desirable in this test, which, unlike the former, is a test for differences and not for ratios. Hence it is best to increase this current until the needle of D reads high up in the negative part of the scale, while V reads its lowest on the positive side.

CALCULATIONS

Having now determined the ratio n from the first test and the simultaneous values of D , V and A from the second, the resistances R and r in milliohms are calculated from the following formulas in which D and V of this second test are in millivolts and A is in amperes:

$$R = \frac{nV - D}{A}$$

and

$$r = \frac{nV - D}{nA} = \frac{R}{n}$$

The meaning of the quantity nV in these formulas is that this would be the deflection if an instrument identical with D had been placed at V and embraced exactly the same resistance R as is embraced by D . In other words, it reduces the deflections of V to the same conditions as those of D ; hence they can be subtracted and their difference $nV - D$ then represents exactly the deflection due to the added constant current A . The variable unknown pipe current is therefore entirely eliminated from the calculations, which is the theory on which this method is based.

If the current A is kept constant during a set of readings, as is easily done and is very advisable to do, then this difference $nV - D$, should also be a constant for that set of readings. Hence these differences can be averaged before dividing by A , thereby simplifying the calculations.

In these formulas great care must, of course, be taken with the signs of the deflections and that of the current A . When the deflections of D are to the negative side of zero they must be inserted in the formula as negative quantities; hence in that case the numerator becomes $nV - (-D) = nV + D$, that is, their numerical sums. Or if both V and D are negative, then numerically it is $D - nV$. Or if the current A is in the opposite direction from that in the diagram, hence is added to that through R , then it must have the negative sign in the formula. If the calculated value of the resistance turns out to be negative, then some mistake has been made with the signs of A , D or V .

A good rule to avoid confusion as to the signs and directions of currents is to connect D and V so that their deflections are to the positive side (or chiefly so, if they occasionally reverse) when there is no battery current. If the deflections of D are then lessened or reversed, when the battery current is applied around D , then the current A is positive and the directions of the currents are those in Fig. 2.

Having thus determined once for all the resistance R in the milliohms, the currents in the pipe in amperes are thereafter readily determined, as usual, by dividing the drops D in millivolts by R in milliohms when the shunt circuit is open, as it was in the first test for determining n , those values being therefore available for the current measurements as was described above. Hence

$$I = \frac{D}{R}$$

As this calculation must be made many times, it is, of course, simpler to use the conductivity K in kilo-ohms (the reciprocal of R) instead of R ; hence

$$I = KD.$$

The meaning of K is that it is the "amperes per millivolt" flowing through that particular resistance. Although it really expresses a conductivity, it is better known by the latter self-explanatory term.

REMARKS

When the resistance of a piece of pipe has thus been carefully and reliably determined, it is often of use in the future to bring out a pair of permanent leads from these ends of that piece to or near to the surface of the ground before filling in the hole, as the currents can then at any future time be measured with a millivoltmeter without again unearthing and recalibrating the pipe. Of course, care must then be taken to mark one free end with a knot, or else one cannot determine the direction of the current. And when such permanent leads are attached it is best to have them include the sum of $R + r$ together with the small piece between them, the resistance of which would be calculated (if it does not include a joint) from the specific resistances per foot obtained from R and r . This will give larger deflections or detect smaller currents, or require less sensitive millivoltmeters. It is advisable also in such cases to varnish or otherwise insulate the calibrated part of the pipe, as it is assumed that no current enters or leaves this section to or from the ground. By marking the points on the pipe its deterioration could be determined at some later date by a subsequent resistance measurement of the same piece.

By including a joint in one of the two resistances R or r the resistance of that joint could be readily determined from the measurements. It is advisable, however, in that case to have R and r on the same length of pipe, therefore having the joint at the extreme end of one of them so as not to include part of another length, as it is found that the resistances per foot of different lengths of presumably the same size and kind of pipe may vary quite considerably and hence a result obtained by the difference between R and r might then be very erroneous. The writer has found in this way that screwed joints of buried gas pipe may have an appreciably higher resistance than an equal length of pipe, notwithstanding the large amount of metal in the sleeve.

In uncovering pipes for this test care must be taken to have no leakage of current to or from the ground between the two extreme connections during the test, otherwise the formulas do not apply correctly.

If the readings of V are in millivolts, then, having determined the corresponding resistance r , those readings may be used to calculate the current in the line of pipe, whether the shunt current is applied around D or not and whether A is positive or negative, provided the resistance of the rest of the circuit of the pipe current is great compared with the resistance of the piece under test. If it is not, and especially if the pipe current is small and the battery current relatively large, errors may enter, and in such cases it is preferable to use only the readings of D without a battery current for determining the pipe current, as these are free from this assumption.

BEST CONDITIONS

The best conditions for making the tests are as follows: Make the two uncovered pipe lengths as long as practicable, especially when permanent leads are to be attached to the measured parts and brought to the surface for measurements of the currents with ordinary millivoltmeters at future times after the holes have been filled in. For the resistance measurement alone, as distinguished from the measurement of currents, the disadvantages of shortness of these parts or of large diameters of pipes can be counteracted by using large battery currents.

Make R and r as nearly alike as practicable so that their ratio n will be near to unity. The error in the first test is then the least. When the pipe current in the first test is not sufficient to give nearly full scale readings, then add

enough battery current to both in series to make the deflections as large as practicable.

In the second test connect the battery circuit so as to reverse the normal deflection of D and make the current great enough to give a nearly full scale deflection of D in that reversed direction, when V is nearly zero. The difference between V and D will then be the greatest, hence the error will be least. It will save trouble and calculations to have the two instruments D and V exactly alike and to adjust the battery current to an exact number of amperes as it enters the calculation as a divisor.

DEDUCTION OF THE FORMULAS

Although the formulas are virtually self-evident, their deduction is given here for completeness.

The letters used in them are those in Fig. 2 and not those in Fig. 1. In the first test for obtaining the ratio n the two readings D and V must both be in millivolts, R and r are in milliohms and the currents are in amperes; hence in the first test, in which A equals zero, $D = IR$, and $V = Ir$; hence $D/V = R/r = n$; or

$$D = nV \text{ and } R = nr;$$

hence by making R and r as nearly equal as practicable n becomes nearly unity, which is its best value.

The relation of the three currents in amperes is always

$$I = A + a,$$

the direction shown in the diagram being considered positive. If any of them are reversed their numerical value must have the negative sign.

In the second test $D = aR$ and $V = Ir = (A + a)r$, but D and V now no longer have the ratio n which they had in the first test.

Combining these two equations to eliminate a and replacing r by R/n gives

$$R = \frac{nV - D}{A}$$

and as $r = R/n$

$$r = \frac{nV - D}{nA}$$

If it is practicable to make $R = r$ by adjusting the taps of D or V along the pipe until the readings are alike in the first test, then $n = 1$ and

$$R = r = \frac{V - D}{A}$$

These formulas are, of course, correct whether A be greater or less than zero, or whether A , D or V be positive or negative, provided care is taken to give all the numerical quantities their correct sign. This is very important, for otherwise the results will lead to absurdities.

ACTUAL RESULTS

The following numerical data from an actual test will serve to give a general idea of the ranges, deflections, relative values, lengths of pipes, etc.

The measurements were made on underground gas pipes of $1\frac{1}{2}$ in. to $3\frac{1}{2}$ in. outside diameters. The two identical millivoltmeters had a full scale deflection of 2.5 millivolts to either side of a middle zero. Each division represented 0.05 millivolt and it could be read to 0.01 millivolt. The storage battery, weighing about 25 lb., could give a current of about 50 amp. It consisted of three cells (a 6-volt sparking battery), of which, however, only one was necessary. The battery currents used on these small pipes were 2, 3 and 4 amp. More would have been better, but a break in the rheostat interfered. They were adjusted to read exactly these values and were absolutely constant. In some of the cases there was too little current flowing through the pipes to give large enough deflections for obtaining good values for the ratio n in the first part of the test, and in those cases the battery circuit was connected to the extreme ends and in such a direction as to add its current to that in the pipe. A few amperes were sufficient; more would have been better. At other times the pipe current alone was great enough to throw the needles off

the scale, therefore requiring the observers to be ready to break the circuits quickly. The pipe currents changed rapidly and sometimes over wide ranges. The readings had to be made "on call" whenever the needles were sufficiently steady. About ten good readings were enough to give good averages, which did not differ more than a few per cent from the extreme.

The lengths of the pipes exposed for the test were about 15 ft., thus giving about 7-ft. lengths for each of the two parts to be measured, including 6 in. between and 3 in. at each end for properly distributing the battery current over the whole cross-section. The deflections averaged less than half of the full scale, hence the battery currents might better have been made greater, which in the present case was prevented by a break in the rheostat. Although the two lengths under test were always made equal to each other, so as to have the ratios n as nearly as possible equal to unity, yet it was found that the resistances were never equal, differing generally from 3 per cent to 10 per cent and in one case the resistance of one length was more than double that of

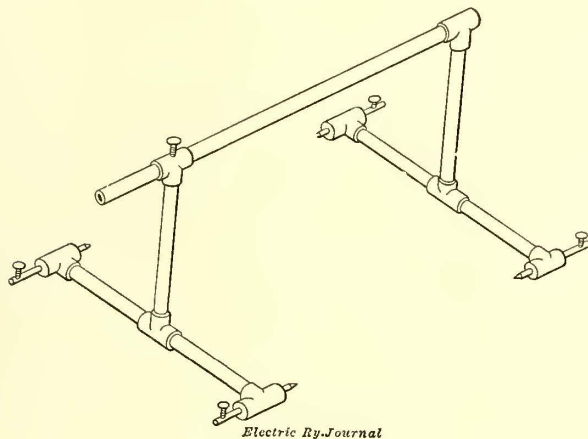


Fig. 3—Convenient Form of Clamp for the Contacts

the other. This shows how incorrect it is to assume equal resistances for equal lengths of presumably the same pipe, as is usually done. In this very abnormal case there was a joint in the 6 in. between the two parts, hence two different pieces of pipe of the same outside diameter were being measured, while in the other cases the two parts were mostly of the same piece, though sometimes including a joint. The resistances per foot of pipe of the same outside diameter but in different holes also differed greatly.

The actual resistances per foot of the pipes also differed quite greatly from those published in tables with the intention of being assumed in measuring the current flowing by measuring the millivolt drop over a given length, as is usually done. These tables give the resistance of a wrought-iron gas pipe $3\frac{1}{2}$ in. outside diameter as 0.0240 milliohm per foot, while the actual measured resistance of different pieces varied from 0.0140 to 0.0361 milliohm. This shows very strikingly what great errors can be made by the usual method of assuming the resistances instead of measuring them in place.

With the instruments used, assuming that one can read down to one-fifth of a division, and with lengths of 7 ft. each, it would be possible to measure anything above about 0.012 amp in a gas pipe of $1\frac{5}{8}$ -in., 0.017 amp in one of 2-in. and 0.04 amp in one of 3-in. outside diameter. And assuming the currents to be steady enough to be measured, and that the reading could be made to one-fifth of a division, a current could be measured to 1 per cent accuracy if there was more than 1.2, 1.7 and 4 amp respectively in the pipes just mentioned, assuming the resistance measurements to have been exact. This is far greater accuracy than is needed in such pipe measurements, hence the method is more than sufficiently accurate.

ESTIMATE FOR A 16-IN. WATER PIPE

The following estimate, showing the conditions required for applying this method to a 16-in. cast-iron water pipe, may be of interest:

With pipes having 12 ft. between joints it would be permissible to uncover about 18 ft. of pipe without danger of loosening a joint. One of the two joints should then be at one extreme end, with room enough beyond it to make one of the battery connections. This would leave $8\frac{1}{2}$ ft. clear for R and without a joint; r would be $7\frac{1}{2}$ ft. long and would include a joint which would probably bring its resistance up to R . This leaves 6 in. at each end and 1 ft. between the two parts for the battery connections, the current being led into the pipe at at least two points diametrically opposite to each other by suitable clamps, so as to distribute it more evenly over the whole cross-section.

Assuming the resistivity of such a pipe to be about 0.01 milliohm per foot, the $8\frac{1}{2}$ ft. would have 0.085 milliohm, hence the current would be about 12 amp per millivolt. With these millivoltmeters a current as small as 0.12 amp could therefore still be detected, and anything above that could be measured. A current of 12 amp (if steady enough) could be read to an accuracy of 1 per cent.

If there was no current in the pipe, a battery current of a little less than 30 amp through both lengths would give a full scale deflection of these millivoltmeters in the first test, and a like battery current in the second test through only one part would give the maximum readings which these instruments would allow when the pipe current is zero. Such a current is easily handled as far as the leads and connections are concerned and can readily be obtained from a portable one-cell storage battery, the voltage of which is ample. The accuracy of a reading of 2.5 millivolts would be better than $\frac{1}{2}$ per cent if the currents were constant.

It will be seen, therefore, that the method is more than sufficiently accurate even for such large thick pipes, using these portable millivoltmeters with a comparatively small battery and leads. The clamp connections for such a current would not involve difficulties. A convenient form of clamp was shown in the Institute paper previously mentioned and is reproduced as Fig. 3.

ENTERTAINMENTS AT ATLANTIC CITY

The entertainment program for the Atlantic City convention of the American Electric Railway Association, which is to be held during the coming week, has been announced by Henry G. Pearce, chairman of the entertainment committee, American Electric Railway Manufacturers' Association. The orchestra of William Fenrich will give concerts in the lobby of the Convention Pier on Monday, Tuesday, Wednesday and Thursday at 11 a. m. and 3 p. m. and on Friday at 11 a. m. only. The principal other musical and social events of the week will be the annual reception and dance in the ballroom on the Convention Pier at 9 p. m. Monday; informal dancing in the ballroom on the Convention Pier at 9 p. m. on Tuesday; informal entertainment at Steeplechase Pier, opposite Haddon Hall, at 9 p. m. Wednesday, and a promenade concert and ball in the ballroom on the Convention Pier at 9 p. m. Thursday. Other entertainments will comprise a ladies' auction bridge tournament on the afternoons of Tuesday and Wednesday and a qualifying round on Monday for the golf tournament on Thursday. Further particulars of the various entertainments will be published in the daily editions of the *ELECTRIC RAILWAY JOURNAL* to be issued in Atlantic City during the convention.

It has been decided by the Montreal (Que.) Tramways to obtain rulings before the highest courts if necessary in order to test the extent of the company's powers over passengers who refuse to comply with the anti-smoking regulations.

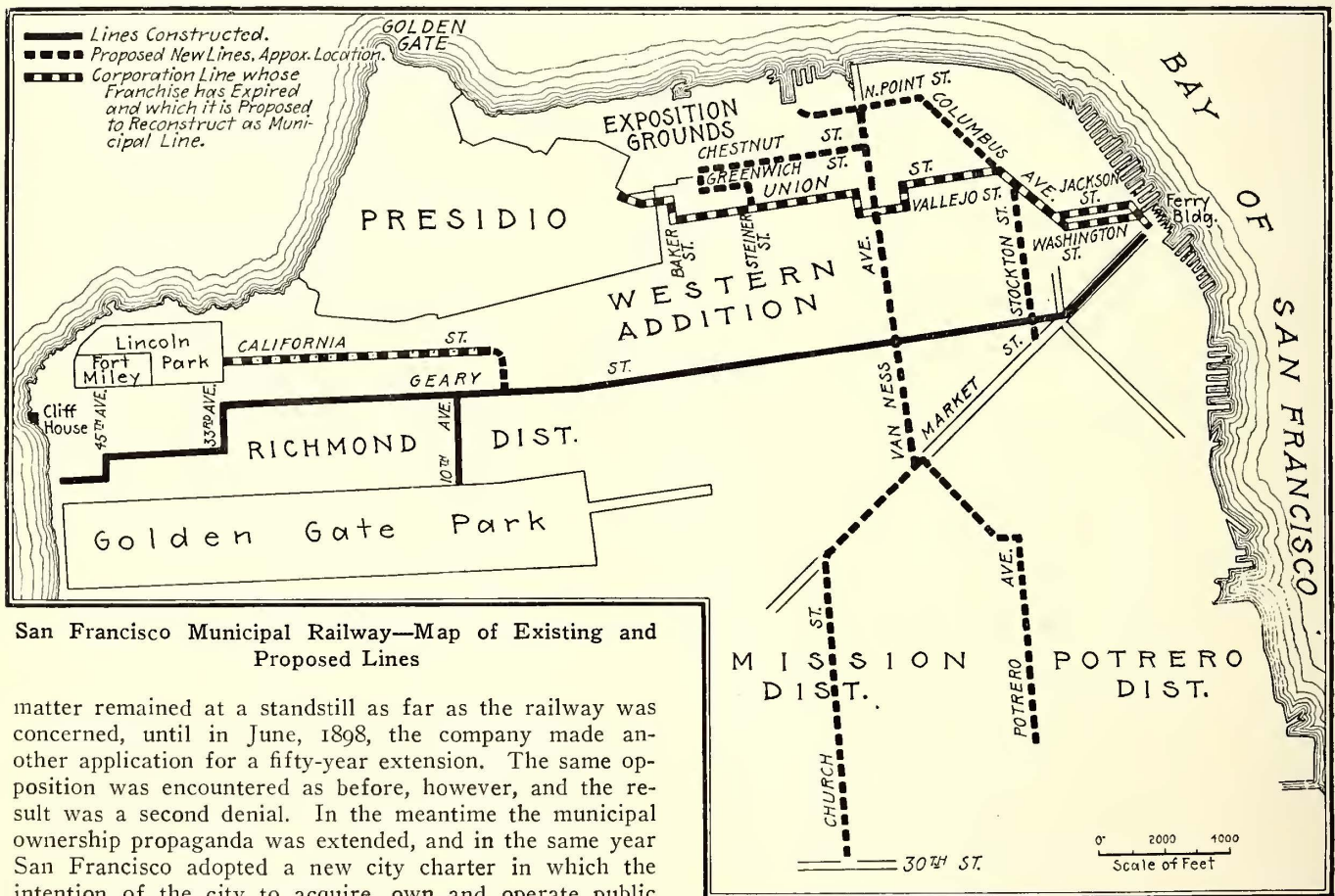
San Francisco Municipal Railway

The First Plans Were Destroyed in the Fire of 1906—About 7.6 Miles of Double Track Are Now in Operation—Official Statement of the Cost of Construction and the Operating Statement Are Published

Although municipal ownership of public utilities in San Francisco has become an accomplished fact only within the last few months, yet for more than a decade the idea had its strong advocates in that city. The proposition first came up as early as 1896, in connection with the effort of the Geary Street, Park & Ocean Railway to secure a fifty-year extension to its franchise on Geary Street, which was to expire in 1903. The Board of Supervisors called for bids for a renewal of the franchise, but on Aug. 3, 1896, several district improvement clubs opposed to further private ownership of the line secured an injunction from the Superior Court, and prevented the Board of Supervisors from opening the bids received. For some time the

1903, but at this time the proposition again failed to carry.

On Nov. 6, 1903, the franchise of the Geary Street, Park & Ocean Railway expired. On the advice of the city attorney no written agreement was entered into between the city and the railway, but the latter merely paid 5 per cent of its gross earnings into the city treasury in return for permission to run its cars. This arrangement lasted until May, 1905, when the Board of Supervisors declared its intention of rebuilding the road without recourse to a bond issue. For this purpose \$350,000 with which to begin the proposed work was appropriated the following month from the city budget. Plans and speci-



San Francisco Municipal Railway—Map of Existing and Proposed Lines

matter remained at a standstill as far as the railway was concerned, until in June, 1898, the company made another application for a fifty-year extension. The same opposition was encountered as before, however, and the result was a second denial. In the meantime the municipal ownership propaganda was extended, and in the same year San Francisco adopted a new city charter in which the intention of the city to acquire, own and operate public utilities was expressly declared.

One of the first moves on the part of the advocates of municipal ownership, subsequent to the second refusal of the city to extend the franchise of the Geary Street, Park & Ocean Railway, was to propose a bond issue to secure funds for the reconstruction of this line by the city. At this time the company operated cable cars on Geary Street from Market Street to Fifth Avenue, and thence along Fifth Avenue to Golden Gate Park. It was proposed to convert this line into an electric road and extend it to the ocean beach. The proposition was submitted to the voters of the city on Dec. 2, 1902, but the number of voters favoring the bond issue fell short of the necessary two-thirds. Shortly after this, in February, 1903, the railway company made its third application for a new fifty-year franchise and was again defeated. This result prepared the way for a second bond election on Oct. 8,

fications were made by the city engineer, construction contracts were being prepared, and all was in readiness for actual construction work when the earthquake and fire of 1906 devastated the business section of San Francisco. All records, plans and estimates were completely destroyed and negotiations were temporarily abandoned.

For the next eighteen months the residents were too busy clearing their property, rebuilding their homes and providing for the destitute refugees to be able to take up the question of reconstructing the railway. Eventually, however, the proposition was again advanced, but a second appropriation of \$325,000 for rebuilding a portion of the road was declared illegal by the Superior Court. A proposal to issue bonds to the extent of \$2,000,000 for the new line was submitted to the voters on June, 24, 1909, and fell short of the necessary two-thirds vote by 421.

Another election was called for Dec. 30, 1909, however, and two municipal railway bond issues were submitted to the people. One provided for \$1,900,000 to construct an electric line on Geary Street from Market Street to the ocean; the other was to furnish \$120,000 with which to construct the line down Market Street from Geary Street to the ferries, or a total of \$2,020,000. Both propositions carried by a vote of about three for the bonds to one against.

To bring about a popular vote in favor of municipal ownership, therefore, four municipal railway special elections were held. According to an interview with Auditor Thomas F. Boyle, published in *Town Talk* of Feb. 22, 1913, figures made up by Registrar Zcmansky show the following costs for the special elections: Dec. 2, 1902, about \$23,000; Oct. 8, 1903, about \$25,000; June 24, 1909, \$13,461, and Dec. 30, 1909, \$30,444, or a total of about \$91,905.

The election on Dec. 29, 1909, having proved favorable to municipal ownership, the Board of Supervisors in the following February formally passed an ordinance authorizing the sale of the bond issues. Horace G. Platt, president of the Geary Street, Park & Ocean Railway, immediately brought suit in the Superior Court to restrain the city officials from selling the bonds, on the grounds that the city had exceeded its legitimate rights in authorizing the issues. The court decided against the railway and held that the bonds were valid in every respect. This decision was affirmed by the Supreme Court on June 25, 1910, and in July the first bids for the purchase of the bonds were received.

Of the total of \$2,020,000 bonds authorized for sale, the following issues have been made: July 1, 1910, to June 30, 1911, \$1,100,000; July 1, 1911 to June 30, 1912, \$800,000, and July 1, 1912, to June 30, 1913, \$69,000, making a total amount authorized and outstanding of \$1,969,000. There remains at present an amount of \$51,000 authorized but unissued. These bonds are \$1,000 par value, bear 4½ per cent interest, and mature yearly from 1915 to 1934, at the rate of \$101,000 per annum. The \$1,969,000 of bonds sold up to July 1, 1913, for the construction of the railway have realized a premium of \$2,341, making the total amount available for construction work \$1,971,341.

After the bond sales began in July, 1910, plans and specifications for roadbed construction and overhead equipment were prepared by the city engineer, and actual construction work commenced in the summer of 1911. Up to the present time 7.6 miles of double track have been completed and are in operation. Forty-three new cars have been purchased, and a reinforced concrete carhouse has been built and fully equipped. At an election held on Aug. 26, 1913, an additional bond issue of \$3,500,000 was voted for the construction of new lines on Van Ness Avenue, Stockton Street, Eleventh Street and Potrero Avenue and Church Street, for the reconstruction of the Fifth Street and California Street line and the taking over of the Union Street line, whose franchise expires in December, 1913. This new bond issue was described in the *ELECTRIC RAILWAY JOURNAL* of Aug. 30, 1913, page 348.

TRACK CONSTRUCTION

When the city took over the Geary Street road no allowance was made for old rails, etc., but the railway was allowed to remove any such property that it desired. All the construction work done by the city was under the supervision of the city engineer. Track work was begun by day labor, but this was not found economical, and the greater portion was performed under contract by P. H. Mahoney, general contractor. The time allowance was 180 calendar days, with provisions for a bonus of \$250 per day for finishing in less than the allotted time, the total bonus being limited to \$15,000. The actual elapsed time from start to finish was 139 days, giving a bonus of \$10,250, but inasmuch as the contractor claimed that he was

held up by unavoidable delays, he was allowed the maximum sum.

The greater portion of the road work was done on one track at a time, the remainder of the street being kept open to vehicle traffic. In the down-town district the contractor was allowed to close the entire street in order to facilitate rapid work. The cable tracks formerly in use on Geary Street were removed by first taking up the pavement outside the rails, cutting the bolt heads and pulling the track rails, then breaking the slot rails and cable conduit with a 2-ton drop-hammer piledriver mounted on skids. A derrick followed the piledriver and lifted out the broken steel and blocks of concrete. The concrete was broken to crusher size with hammer and gads, crushed in a movable crusher operated by a 36-hp gasoline engine and then used for ballast.

After the cable conduit trench was cleared out, additional excavation was required at the sides of the track. A portion of the excavated material was required to fill the trench up to the subgrade. The balance was shoveled directly into wagons and hauled to a dump. On the subgrade was placed a layer of crushed rock, or old concrete crushed as previously described, about 6 in. thick. Sand was washed into the voids of the rock by flushing with water. The surface was then rolled with a 5-ton steam road roller to a level 17½ in. below the grade of the finished track, allowing 2 in. for tamping to grade. The grade work having been thus completed, ties were laid, rails were put in place on the tie plates, the joints bolted up temporarily, and the rails spiked to gage.

The next step was the raising of the laid track to the finished grade, and the tamping of ballasts in under the ties. The joint plates were removed, the rails bonded, the joint plates replaced and fastened permanently, and the tie rods put in place. The lining and surfacing gang then adjusted the track to perfect line and grade. The space between the ties was next filled with ballast or concrete, the rail joint nuts retightened, and the pavement replaced. The construction is now complete with the exception of a section of the lower Market Street line, which it is estimated can be completed for \$25,000 and equipped for \$15,000.

EQUIPMENT AND POWER

The equipment of the municipal line consists of forty-three cars, 47 ft. 1 in. long and 8 ft. 6 in. wide. These cars can comfortably accommodate 110 passengers each, and during the first few days of operation as many as 145 persons per car were carried. They are of the prepayment California type, having a closed section in the center and open sections at both ends. Their design conforms closely to the Chicago standard.

Power for operating the line is supplied by the Pacific Gas & Electric Company at 1 cent per kw-hr., delivered on the trolley wire as d.c. at 600 volts. It is converted by the Pacific Gas & Electric Company in two of that company's substations, each of which is provided with one 1000-kw and one 500-kw machine. A motor generator set was purchased in order to use the 600-volt d.c. off the trolley wire for carhouse lighting at 110 volts and for the running of shop equipment at 220 volts.

TRAFFIC

Since the opening of the municipal line the traffic has steadily increased, and cars now run during the rush hours on a two-minute headway.

When the municipal line was first put in operation no transfer arrangements between the United Railroads of San Francisco and itself had been arranged. Within the last few months, however, an agreement has been entered into between the private and municipal lines whereby the two electric railways will pay equally for the reconstruction of the outer tracks on Market Street, from Sansome Street to the Ferry Depot, and whereby transfers will be exchanged between the two companies' lines at certain intersections.

COST OF CONSTRUCTION

The following is an official statement of the cost of the road, as compiled from the report to the Board of Public Works of Leonard Levy, head bookkeeper of the board, and in charge of the accounts of the Municipal Railway. This report has not as yet been printed, but will be included in the next annual report of the board. The figures are given to the nearest even dollars.

RECEIPTS FROM BOND SALES	
Total bonds sold	\$1,969,000
Premiums on bonds	2,341
Total amount available from bonds sold.....	\$1,971,341
EXPENDITURES, INCLUDING LIABILITIES INCURRED	
Purchase and delivery of rails.....	\$122,331
Purchase and delivery of redwood cross ties.....	26,149
Rail joints, tie rods and plates, bonds, spikes and fastenings....	37,785
Curves, switches and track specials.....	56,669
Track construction and paving.....	509,673
Tubular steel trolley poles and overhead wires.....	60,467
Conduit and power conductors.....	94,968
Construction of carhouse.....	234,689
Motor generator set.....	3,117
Purchase of cars.....	341,931
Extra parts and equipment.....	2,596
Lubricating oil house.....	1,000
Plans, specifications, etc.....	32,418
Salaries of engineer and superintendent.....	2,449
Purchase of land, litigation and miscellaneous.....	118,227
Amount due (estimated) for completion of lower Market Street line and equipment.....	40,000
Total	\$1,684,469
Less miscellaneous credits.....	4,214
Total cost	\$1,680,255
Balance of bond issue unexpended.....	291,086
Bonds unsold.....	51,000
Total in bond issue unexpended.....	\$342,086

It will be noticed that the report of Mr. Levy does not contain any reference to the \$350,000 spent for plans prepared prior to the fire of 1906, nor to the cost of the four special elections, amounting approximately to \$91,905. The item of \$118,227 for purchase of land, etc., includes \$112,263 for expenditures by the Board of Supervisors for lands, \$2,293 for miscellaneous expenditures by the board, \$500 for the expense of the city attorney's trip to Washington, \$2,000 for litigation, and \$1,171 for B. J. Arnold's report on cars.

The sum of the \$1,171 for the Arnold report, \$2,449 for salaries of engineer and superintendent, and \$32,418 for plans, specifications, etc., is \$35,984. In other words, according to the report, the charges for all engineering and superintendence were only 2.1 per cent of the total amount expended.

OPERATING REPORT

The receipts of the Geary Street Municipal Railway from Dec. 28, 1912, to June 30, 1913, inclusive, were \$134,924; the expenditures (demands audited) were \$73,252, leaving excess receipts of the period of \$61,672. The analysis of the amount of \$73,252 for demands audited, showing the operation of the road during the accounting period, follows:

Way and Structures:		
Maintenance of Way:		
10. Miscellaneous roadway and track expenses.....	\$8.64	
11. Cleaning and sanding tracks.....	1,867.35	
23. Overhead trolleys.....	23.65	
25. Carhouses	3.95	
		\$1,903.59
Equipment:		
29. Superintendence of equipment.....	\$750.00	
Maintenance of Equipment:		
32. Passenger cars.....	2,241.70	
36. Electrical equipment of cars.....	160.43	
38. Shop machinery and tools.....	5.74	
39. Shop expenses.....	5.13	
		3,163.00
Conducting Transportation:		
42. Superintendence of transportation.....	\$3,971.55	
56. Power purchased.....	18,850.57	
60. Conductors and motormen, etc.....	5,271.25	
60-A. Conductors	14,817.80	
60-B. Motormen	14,742.25	
62. Miscellaneous car service employees.....	390.00	
63. Miscellaneous car service expenses.....	280.91	
63-A. Tickets and transfers.....	213.85	
63-B. Lubricants and waste.....	67.07	
63-C. Special agents and fare registers.....	65.00	
63-D. Incandescent lamps.....	109.15	
63-E. Miscellaneous80	
66. Carhouse employes.....	5,197.56	
67. Carhouse expenses.....	175.29	
		63,853.05

General and Miscellaneous:

73. Salaries and expenses general officers.....	\$2,499.91	
74. Salaries and expenses general office.....	231.35	
75. General office supplies and expenses.....	117.99	
79. Miscellaneous general expenses.....	13.45	
82. Injuries and damages.....	99.40	
83. Insurance (indemnity bonds).....	277.50	
84. Stationery and printing.....	473.08	
85. Store expenses.....	150.00	
		\$3,862.68
Undistributed stores account (stock on hand).....		469.01
		\$73,252.32

The statement of receipts and expenditures for the fiscal period is as follows:

Excess of receipts over expenditures.....	\$61,672.62
Credit (from demands audited) account stores in stock.....	469.01
Gross excess.....	\$62,141.63
Total interest estimated to be charged off operation to June 30..	29,584.04
Surplus over audited expenses and interest charges, from which all depreciation, sinking fund, mythical taxes, insurance, services not charged, etc., may be deducted.....	\$32,557.59

The item of \$29,584 for interest in the foregoing statement was estimated by the bookkeeper of the Board of Works for the period from Dec. 28, 1912, to June 30, 1913, inclusive—185 days. This interest was not calculated on the base of the total cost of \$1,680,255 for a period of six months; it is figured for such portions of the road and equipment as were in use at a given time and only for the periods during which they were in use. In actually working out the estimated interest, the estimated total net expenditures in account, as of the first and fifteenth of each month, were used, thereby creating an equitable (mean average) charge against net income in accordance with decisions No. 29 and No. 53 of the Interstate Commerce Commission.

Section 41 of the Interstate Commerce Commission rulings provides that: "Interest on bonds and other securities including equipment bonds or car trust notes, paid or accrued during construction and before the line is opened for operation, is chargeable to the interest account under general expenditures for road and equipment." No actual computation has as yet been made by the city for the interest during construction in accordance with this ruling of the commission.

The operating statement, as shown, contains under the heading of "general and miscellaneous" an item of \$278 for "insurance" (indemnity bonds). This has reference to the sum paid by the city for indemnity for theft by platform men. According to the report no provision has been made for fire insurance to cover the carhouse, worth \$234,689, the cars, worth \$341,931, and other plant and property assets. No taxes or depreciation or sinking fund provisions have been taken into the accounting for the six months' period.

WAGES

Under an ordinance that has been effective in San Francisco for the last two years, the minimum wage for anyone engaged on municipal work is fixed at \$3 for an eight-hour day. This applies to platform men employed by the municipal railway, as well as to laborers employed by contractors engaged on city work.

OPINION OF MAYOR

No attempt will be made here to analyze this report, but Mayor James Rolph, Jr., has authorized a statement to this effect: "I am extremely well satisfied with the financial showing made by the road, and instead of a gold brick, as its opponents called the project, I consider it a veritable gold mine."

That 53.8 per cent, or 103,566 of the fatalities charged to United States railways in twenty-three years, 1890 to 1912 inclusive, were caused by trespassing is the statement sent out by the Bureau of Railway News and Statistics. "So long as legislators," the bureau continues, "commissions and critics rivet their attention on steel cars, the tale of railroad fatalities will grow along the line of the greatest percentage of causes."

Annual Convention of Municipal Tramways Association

At This Meeting Papers Were Presented on Platform Fare Collection, Paving Charges and Omnibus Competition

The twelfth annual conference of the Municipal Tramways Association of Great Britain was held at Sheffield on Sept. 24, 25 and 26. The proceedings were in charge of A. R. Fearnley, president of the association and general manager of the Sheffield Tramways. The delegates were welcomed by the Lord Mayor of the city at the council chamber of the town hall, which had been placed at their disposal for the conference.

IMPROVEMENTS IN TRAMWAY OPERATION

The first order of regular business was an address by President Fearnley on "Improvements in Tramway Operation." Nineteen applications had been made by municipalities since the last conference for provisional orders to permit them to extend their trolley lines or to add motor bus or trackless trolley routes. The general tendency throughout the country was toward the improvement of running time. Sheffield and many other cities had spent large sums for the rehabilitation of equipment and the installation of commutating-pole motors. The mechanical types of rail joints were rapidly becoming obsolete and welded joints of electrical, thermit or cast type were being adopted in their stead. The isolation of tramway power houses from the other municipal stations in the same district was now being abandoned. He hoped that before the end of the year arrangements would be completed in Sheffield whereby all the power plants would be interconnected, particularly to help out on the railway peak loads. The Sheffield tramways committee had ordered ten buses, which had been in service since February, 1913, on four routes. The fifth route was to be opened during October. The vehicles had proved reliable in service and had run more than 100,000 miles to date. If reasonable use could be made of the vehicles during the winter months, there was no doubt that next summer a much larger number of buses would be required.

ADVANTAGES AND DISADVANTAGES OF PLATFORM FARE COLLECTION

Alderman S. Flint, chairman Leicester Corporation tramways committee, then read a paper on "Advantages and Disadvantages of Platform Fare Collection." The Leicester tramways center in the heart of the city, which makes it possible to charge universal penny fares on all the lines. Early in 1913 the pay-as-you-enter system was inaugurated on a section bearing the heaviest traffic. The conductor collected the fares as the passengers boarded the car and, except in the case of transfer and workmen's tickets, all tickets were put into a box on leaving. The color and letters on the tickets enabled the conductor to detect at a glance whether a passenger was over-riding his zone. Six varieties of tickets were used for the different through and cross lines on the system and twelve on the prepayment section. Among the results of prepayment operation were the entire elimination of platform accidents, and better schedules. One of the early complaints against the system was that passengers on the upper deck had to leave their seats before reaching their destination, but this had been remedied by permitting them to leave by either stairway. To meet other complaints, accommodation had been made for baggage, and the staircases had been widened.

Complete financial comparisons could not yet be made but undoubtedly there had been an increase in the receipts on the trial section, probably in excess of the average over the whole system.

In the discussion on Mr. Flint's paper, J. A. Smith,

Aberdeen, said that the experience with the prepayment system on one route in that city was entirely satisfactory. The number of passengers who required change was only 5 per cent. The system had effected a saving in time of one minute per trip, namely, 34.2 minutes as against 35.1 minutes. The receipts had increased by more than \$115 per week. In reply to a question by A. L. C. Fell, London County Council Tramways, Alderman Flint expressed his belief that the prepayment system would enable nineteen cars to do the work of twenty. F. R. Smith, also of Leicester, added that, besides the royalty of \$100 per car, the cost of rebuilding the platforms had amounted to \$150 to \$160 per car.

J. M. McElroy, Manchester, said that in the United States prepayment had practically eliminated all boarding and alighting accidents, the most prolific cause for damages in the past. He approved of the system where a universal fare obtained but doubted its applicability to large towns with many overlapping fares.

THE UNFAIR BURDEN OF TRACK PAVING

At the Wednesday afternoon session, William C. Fenton, Sheffield, read a paper on "The Maintenance of Paving on Tramway Track as Affected by Section 28 of the Tramways Act, 1870." This act provides that promoters shall at their own expense maintain in such manner as the road authorities shall direct that portion of the road between the tramways, and in every case so much of the road as extends 18 in. beyond the rails on each side of the tramway. Mr. Fenton pointed out the unfairness of this act to-day, inasmuch as it relates to animal traction and, of course, should not apply to electrically operated railways. The paper was apropos of the question of the free use of the streets by motor buses.

C. F. Spencer, Halifax, said that the tramways had to pay practically the whole cost of the upkeep of the streets, while other users paid nothing. He thought it would be equitable, however, if the tramways paid for maintenance between the tracks and 9 in. on each side.

W. J. Squires, London County Council, expressed the belief that, given equal treatment, the tramways would hold their own against buses for all time.

W. Smith-Sayville, borough engineer, Darwin, said that since the advent of heavy motor traffic the maintenance of roads had cost his borough \$4,400 per mile as against \$1,700 previously.

URBAN PASSENGER TRANSPORT

On Thursday morning J. B. Hamilton, general manager Leeds Corporation Tramways, presented a paper on "Urban Passenger Transport." He said that the motor bus had seven times the number of fatal accidents per vehicle per annum, and twice as many injuries per million passengers as compared with tramways. Its obstructive street condition in fine weather was as two buses to one car, and in inclement weather as four buses to one, while the cost to the municipality of providing transit by motor bus was double the amount per seat provided by electric tramways. He also presented statements showing the results of tramway operation in twenty-seven towns of more than 150,000 population, with an annual revenue of \$33,848,000, as compared with the assumed results for transport effected by means of motor buses. On the basis of 80 per cent efficiency for the bus in comparison with cars, the operation of 146,810,902 car miles and the transport of 1,580,514,058 passengers in these towns would require 4995 buses in place

of 3996 cars. The annual operating cost per bus seat would be \$225, as compared with \$115 per car seat, and the total loss from the substitution of buses for cars would be approximately \$4,570,000 a year.

The great development of buses in London had been due to such exceptional conditions as very smooth streets with few grades and the present impossibility of rail transit along the main highways. No authoritative figures had been issued by the London bus companies on the cost of operation, although the accounts of the General Omnibus Company showed a figure of 19.52 cents per mile. It was probable, however, that the company did not want to inform the public of the exact cost of operation. In the case of municipalities, the figures of which are usually available, he quoted the cost of operation as follows: Keighley, 32 cents; Halifax, 25.4 cents, and Eastbourne, 28.78 cents per mile. The Halifax vehicles were of the most modern type. After much examination of figures he had come to the conclusion that 20 cents per mile would be a reasonable figure for all costs of operation, interest upon investment and sinking fund allowance as specified by Parliament for tramways. These figures, however, took no account of the larger margin of spare buses which would be required as against tramcars. In conclusion, Mr. Hamilton made some reference to trackless trolleys. He said that their total cost of operation under ordinary conditions was at least 20 per cent to 25 per cent less per car mile than that of motor buses, and that they were equal in flexibility to the motor buses for the ordinary roadway width, namely, 30 ft. to 35 ft. Trackless trolley systems were now in use in eight different districts in England and several others were under construction.

ELECTION OF OFFICERS

At the annual business meeting, which was held on Friday morning, the following officers were elected for the ensuing year: President, Alderman H. Linsley, chairman Salford tramways committee; vice-president, P. Fisher, general manager Dundee Corporation Tramways; auditor, W. J. McCombe, general manager Hull Corporation Tramways. Members of council, A. L. C. Fell, chief officer London County Council Tramways; J. B. Hamilton, general manager Leeds City Tramways; G. W. Holford, general manager Salford Corporation Tramways; J. H. Rodgers, chairman Newcastle-on-Tyne tramways committee. C. J. Spencer, general manager Bradford Corporation Tramways, was re-elected honorary secretary.

CALIFORNIA REPORT ON INDUCTIVE INTERFERENCE

The committee of engineers representing the electric wire interests in the State of California, authorized by the California State Railroad Commission in December, 1912, to investigate the subject of inductive interference between power and communication lines and to make recommendations for commission rulings intended to prevent undue interference, has reported progress up to Sept. 1, 1913. The organization of this committee was mentioned in the *ELECTRIC RAILWAY JOURNAL* for March 15, 1913.

Since the first of the year a field force of from five to eight experimenters and computers has been engaged in collecting and computing data under instructions from the committee. The field force is equipped with a large amount of apparatus, including an oscillograph having three vibrators, noise standards, an impedance bridge, complete equipment for harmonic analyses and instruments of various kinds, the total aggregating in value approximately \$9,000. Equipment is provided for harmonic analyses by either or both of two methods. The first involves the use of the oscillograph and the second of what is termed the resonant shunt.

The parallels on which this work has now been completed are four in number, all of which involve one telephone line. This is the main coast line trunk lead of the Pacific

Telephone & Telegraph Company between San Francisco and Los Angeles. These parallels cover a distance of approximately 120 miles. The telephone lead consists in the main of ten copper physical circuits, part of which are loaded and some of which are made up into phantoms. The high-tension portions of these exposures are as follows:

First—A 57,000-volt, three-phase line of the Sierra & San Francisco Power Company, approximately 20 miles long, between San José and Gilroy. Second—A portion of the same line, approximately 8 miles long, running into Salinas. Third—A 22,000-volt, three-phase line of the Coast Counties Gas & Electric Company, approximately 16 miles long, between Morganhill and Sargents, and overlapping the above-mentioned line of the Sierra & San Francisco Power Company from Morganhill to Gilroy for a distance of approximately 10 miles. Fourth—A 33,000-volt, three-phase line of the Coast Valleys Gas & Electric Company, approximately 40 miles long, between Salinas and King City. All of these lines are operated at sixty cycles.

In all cases the telephone pole line is on one side of the public highway and the power line or lines on the other side, with average separation of approximately 60 ft. The power lines of the two separate companies, overlapping as mentioned above, are erected one above the other.

The system of the Sierra & San Francisco Power Company is operated with a solidly grounded neutral, while that of the Coast Counties Gas & Electric Company is operated without a grounded neutral. This makes it possible to obtain a certain number of comparative data between grounded and ungrounded systems, although the comparison will be limited by the fact that the two systems have different electrical and mechanical characteristics. Thorough investigations have been made of residual and balanced currents and voltages in the power system, of the shielding effects of other wires on the telephone lead, of the existing transposition systems in both the power and telephone lines and of the relative locations of the power and telephone transpositions; also of the effects of modifications of these transposition schemes. The effects of the power lines on Western Union telegraph wires and the signal circuits of the Southern Pacific Company have been included in the investigation.

The joint committee has a membership of fifteen engineers, part of whom represent the power interests, part the communication interests in the State of California and part the State Railroad Commission. The necessary funds for the work have been voluntarily contributed by the power and communication interests in the State. A large amount of the apparatus used has been loaned by the Pacific Telephone & Telegraph Company, some has been purchased by the committee, and a relatively small amount, consisting of current and potential transformers, oil switches, etc., has been loaned by the power companies. The study has developed into an investigation of much greater scope and complications than was originally anticipated. Although eight active months have already been spent on this work, the investigation has not as yet been made on a sufficiently large number of exposures of different characteristics to allow any general conclusions.

While the complications of the problem now appear to those carrying on the work so great as to make extremely difficult the drafting of general remedial measures which shall not be onerous on the interests involved and shall not be subject to so many exceptions and alternatives as to make them ineffective, the committee expects that this work can be made to serve as a basis of rulings which will be helpful not only to the communication interests but also to the power interests in standardization of construction and operating methods and the reduction of interruptions to service. Members of the committee also feel that, more important than the above, the work will enable the Railroad Commission to make rulings which will in future reduce harmful agitation, legislation and litigation.

STATISTICS OF ELECTRIC RAILWAY COMPANIES

The accompanying table, giving the miles of track, cars and capitalization of electric railway companies, is similar to the corresponding table which has been published annually by the ELECTRIC RAILWAY JOURNAL for a number of years. The statistics are based primarily on the reports

contained in the *McGraw Electric Railway Manual* for 1913. As the full statistics of all companies, however, are not published in the *McGraw Electric Railway Manual*, it was necessary to make estimates for the remaining companies, which are the smaller properties of the country. The statistics relating to the smaller properties, of course, represent a small part of the total for all companies.

STATE	NUM- BER OF RY. COM- PANIES.	MILES OF TRACK.	CARS.	CAPITAL STOCK		FUNDED DEBT		TOTAL STOCKS AND BONDS	
				AUTHORIZED.	OUTSTANDING.	AUTHORIZED.	OUTSTANDING.	AUTHORIZED.	OUTSTANDING.
NEW ENGLAND STATES:									
Connecticut.....	12	1,340.01	2,964	\$83,117,400	\$61,748,300	\$80,256,000	\$59,946,000	\$16,373,400	\$121,694,300
Maine.....	16	523.71	771	16,728,400	16,471,700	29,298,975	15,711,325	46,027,375	32,183,025
Massachusetts.....	58	3,554.27	10,673	112,300,850	111,278,500	111,072,500	82,733,000	223,373,350	194,011,500
New Hampshire.....	19	278.02	370	6,611,900	4,359,400	4,461,200	3,895,000	11,073,100	8,254,400
Rhode Island.....	6	447.14	1,284	37,596,200	22,129,300	17,789,900	16,513,900	55,386,100	39,243,200
Vermont.....	9	104.25	127	2,920,000	2,549,600	2,700,000	2,668,000	5,620,000	5,217,600
Total.....	120	6,247.40	16,189	\$259,274,750	\$219,136,800	\$245,578,575	\$181,467,225	\$504,853,325	\$400,604,025
EASTERN STATES:									
Delaware.....	4	86.66	157	\$11,087,400	\$9,047,400	\$6,909,400	\$5,078,500	\$17,996,800	\$14,125,900
Dist. of Columbia	6	322.21	1,546	90,383,500	31,085,500	46,215,400	36,491,200	136,598,900	67,576,700
Maryland.....	13	724.44	2,028	49,850,000	22,679,000	90,477,000	71,807,500	140,327,000	94,486,500
New Jersey.....	33	1,480.64	2,966	107,700,276	86,002,640	123,462,585	101,093,685	231,162,861	187,096,325
New York.....	135	4,879.86	16,418	588,827,100	417,666,500	1,067,337,626	591,632,476	1,656,164,726	1,009,298,976
Pennsylvania.....	172	4,619.15	9,492	364,229,338	300,014,700	373,047,100	234,249,060	737,276,438	534,263,760
Virginia.....	17	463.71	904	33,951,500	25,913,250	50,038,100	31,998,800	83,989,600	57,912,050
West Virginia....	16	373.03	537	22,260,000	16,966,400	59,867,100	17,954,100	82,127,100	34,920,500
Total.....	396	12,951.70	34,048	\$1,268,289,114	\$909,375,390	\$1,817,354,311	\$1,090,305,321	\$3,085,643,425	\$1,999,680,711
CENTRAL STATES:									
Illinois.....	72	3,378.59	8,189	\$249,956,000	\$157,486,300	\$384,388,000	\$272,742,700	\$634,344,000	\$430,229,000
Indiana.....	46	2,377.75	2,267	114,194,500	90,009,760	157,600,200	92,436,630	271,794,700	182,446,390
Iowa.....	34	763.14	1,515	51,430,000	40,418,535	88,157,000	39,622,800	139,587,000	80,041,335
Kentucky.....	10	459.36	966	28,837,500	23,269,400	51,377,000	23,357,400	80,214,500	46,626,800
Michigan.....	26	1,532.42	2,763	53,533,000	47,129,900	129,408,000	74,537,000	182,941,000	121,666,900
Minnesota.....	9	545.07	1,127	55,625,000	50,150,850	40,205,600	29,555,000	95,830,600	79,705,850
Missouri.....	19	1,162.49	2,843	134,448,800	84,336,480	163,358,100	116,974,200	297,806,900	201,310,680
Ohio.....	82	4,137.32	6,358	255,728,000	197,177,500	263,422,000	132,975,740	519,150,000	330,153,240
Wisconsin.....	23	732.91	1,047	67,533,000	24,503,200	197,251,500	43,518,900	264,784,500	68,022,100
Total.....	321	15,089.10	27,075	\$1,011,285,800	\$714,481,925	\$1,457,167,400	\$825,720,370	\$2,468,453,200	\$1,540,202,295
SOUTHERN STATES:									
Alabama.....	13	334.60	625	\$58,327,000	\$35,957,000	\$84,825,000	\$29,890,000	\$143,152,000	\$65,847,000
Arkansas.....	10	123.19	299	25,840,000	12,792,700	29,681,000	12,124,500	55,621,000	24,917,200
Florida.....	8	147.71	255	6,220,000	5,605,600	11,000,000	4,513,000	17,200,000	10,118,600
Georgia.....	15	405.25	712	61,774,600	58,274,100	108,750,000	33,682,000	170,524,600	91,956,100
Louisiana.....	8	265.86	722	53,497,800	31,995,000	97,269,000	34,970,100	150,766,800	66,965,100
Mississippi.....	10	108.30	172	11,500,000	6,932,670	16,400,000	6,743,500	27,900,000	13,676,170
North Carolina....	14	196.07	238	29,500,000	23,802,800	25,525,000	11,656,750	55,025,000	35,459,550
South Carolina....	8	193.72	243	20,700,000	15,436,350	19,605,000	11,349,000	40,305,000	26,785,350
Tennessee.....	10	369.80	876	20,650,000	19,943,000	70,650,000	28,335,000	91,300,000	48,278,000
Total.....	96	2,144.50	4,142	\$288,009,400	\$210,739,220	\$463,705,000	\$173,263,850	\$751,714,400	\$384,003,070
WESTERN STATES:									
Arizona.....	4	56.10	40	\$3,665,000	\$3,273,000	\$1,200,000	\$1,200,000	\$4,865,000	\$4,473,000
California.....	45	2,496.70	5,365	798,178,500	641,443,200	648,800,800	169,789,500	1,446,979,300	811,232,700
Colorado.....	15	439.45	757	54,000,000	23,429,300	73,968,000	31,953,400	127,968,000	55,382,700
Idaho.....	1	85.00	55	30,000,000	30,000,000	5,750,000	1,457,000	35,750,000	31,457,000
Kansas.....	16	289.95	356	9,600,000	6,974,000	11,513,000	6,635,000	21,113,000	13,609,000
Montana.....	7	155.86	155	3,844,600	3,275,515	2,524,000	1,944,000	6,368,600	5,219,515
Nebraska.....	4	240.72	556	22,032,000	12,594,450	15,891,600	11,677,900	37,923,600	24,272,350
Nevada.....	2	10.75	12	2,000,000	1,042,000	1,000,000	135,000	3,000,000	1,177,000
New Mexico.....	2	10.50	11	550,000	410,000	160,000	160,000	710,000	570,000
North Dakota....	3	23.50	60	450,000	444,775	314,555	214,555	764,555	659,330
Oklahoma.....	15	246.27	290	22,120,000	8,504,350	25,650,000	7,194,000	47,770,000	15,698,350
Oregon.....	8	499.32	1,309	63,510,000	42,640,000	161,837,000	48,408,000	225,347,000	91,048,000
South Dakota....	3	20.00	30	1,000,000	586,690	500,000	200,000	1,500,000	780,690
Texas.....	32	717.09	1,133	46,585,000	38,321,175	51,897,000	30,694,000	98,482,000	69,015,175
Utah.....	5	260.25	349	12,400,000	7,583,400	22,185,000	7,145,900	34,585,000	14,729,300
Washington.....	18	1,038.31	1,993	105,566,300	70,944,900	122,200,000	50,993,500	227,766,300	121,938,400
Wyoming.....	2	21.50	21	75,000	75,000	20,000	20,000	95,000	95,000
Total.....	182	6,611.27	12,492	\$1,175,576,400	\$891,541,755	\$1,145,410,955	\$369,821,755	\$2,320,987,355	\$1,261,363,510
All States.....	1,115	43,043.97	93,946	\$4,002,435,464	\$2,945,275,090	\$5,129,216,241	\$2,640,578,521	\$9,131,651,705	\$5,585,853,611

The statistics were compiled generally in accordance with the plan that has been followed in previous years in the compilation of the table. This plan was described in the issue of the *ELECTRIC RAILWAY JOURNAL* for Dec. 12, 1912, page 1156. The average date of the returns from which the table on page 691 was compiled was Jan. 1, 1913.

DINNER TO RETIRING SECRETARY DONECKER

A complimentary dinner was extended on the evening of Oct. 9 at the Hotel Astor to H. C. Donecker, who resigned recently as secretary and treasurer of the American Electric Railway Association to accept the position of assistant general manager of the Public Service Railway of Newark. The hosts on the occasion were more than one hundred warm friends, mostly from electric railway circles in New York, whom he made during his service as secretary and treasurer of the association. The dinner was a spontaneous expression of Mr. Donecker's popularity in the field which he has ably served during his administration of the affairs of the association and showed the strong hold which he has on the members of the industry.

W. H. Sawyer, of Ford, Bacon & Davis, New York, acted as toastmaster, and among those who spoke after the repast were Past-president Thomas N. McCarter and President Gen. George H. Harries, of the association; Frank Hedley, W. O. Wood, W. L. Conwell and Charles C. Peirce. Messrs. McCarter and Harries, speaking for the association, bore testimony to the high value of the work which Mr. Donecker had performed for the organization. Mr. McCarter said that his own connection with the association had coincided for a longer time than that of any other person with Mr. Donecker's connection with the association, and for this reason he was able to speak with especial knowledge of the service which Mr. Donecker had performed for the field. After the remarks of the gentlemen mentioned Mr. Donecker made an appropriate reply in which he expressed his appreciation of the compliments which had been extended to him by his hosts, as well as of the courtesies which he had enjoyed while he occupied the office of secretary and treasurer.

While Mr. Donecker's service as secretary and treasurer of the association dates from his election in February, 1910, he has been connected with the association since January, 1908, when he was appointed office manager. His previous experience had been along electric railway lines so that he was able to bring to the task a wide knowledge of electric railway conditions as well as of association work. The office of secretary of an association is often a perfunctory one, but Mr. Donecker made it important. He entered into the undertaking with unflagging zeal, a tremendous capacity for the work and a mind trained for the systematic consideration of topics relating to all branches of the electric railway field. Those who have had occasion to seek the assistance of the association in the solution of their problems have always found him not only ready to assist, but in nearly every case with all of the information needed already in hand, and where this was not immediately available but could be obtained it was secured promptly. This fact, coupled with Mr. Donecker's universal courtesy, gave significance to the testimonial dinner to him last Thursday night.

The ninth annual convention of the Empire State Gas & Electric Association was held in the Engineering Societies Building, New York, on Oct. 2. A new feature which contributed greatly to the success of this meeting was the participation of Martin S. Decker, chairman of the New York Public Service Commission, Second District, who spoke on "Public Service by Private Corporations," and Milo R. Maltbie, member of the First District Commission, who spoke on "The Advantages of Public Utilities." James T. Hutchings, of Rochester, was elected president.

ADDITIONS TO THE A.E.R.A. CONVENTION PROGRAM

Since the publication of the convention program in the *ELECTRIC RAILWAY JOURNAL* for Sept. 6 several changes have been made, and these are listed in the subjoined paragraphs.

To the American Association program there have been added: An address on "The Cleveland Situation—Its Economies as Developed in the Arbitration Decision of June 19, 1913," by C. N. Duffy, vice-president The Milwaukee Electric Railway & Light Company; an address on "Franchise Values," by William M. Wherry, of Wherry & Mygatt, New York, who will take the place of Frank Bergen. Both addresses will be delivered on Tuesday. William D. Kerr will deliver an address on "A Model Public Utility Law" at the Thursday session. The title of A. D. B. Van Zandt's paper, to be read on Wednesday, has been changed to "Progress in Publicity."

At the joint session of the Accountants' and Transportation & Traffic Associations on Wednesday T. A. Emery, of Ford, Bacon & Davis, will deliver an address on "Statistical Unit Used in Analysis of Electric Railway Accounts."

At the joint session of the Accountants' and Engineering Associations on Wednesday J. Vipond Davies, chief engineer Hudson & Manhattan Railroad, will deliver an address on "Engineering Accounting," and William McClellan, electrical engineer Public Service Commission, First District, New York, will deliver one on "Life of Railway Physical Property."

At the meeting of the Transportation & Traffic Association on Thursday Dr. W. P. Rucker, assistant surgeon-general United States Bureau of Public Health, Washington, will deliver an address on "Regulations on Sanitation as Relating to Public Carriers."

A RAILWAY EXHIBIT AT PITTSBURGH

The Pittsburgh Railways Company has been conducting a novel exhibit at the Pittsburgh Exposition for the purpose of demonstrating to the people of that city the efforts which have been made by the company along lines of improved service, increased comfort for passengers and safety and reliability of operation. The exhibit included old and new types of cars, controllers, motors, rails, track construction and paving, many of these having exceptional historical interest.

One of the most unusual of the features of the exhibit is the use of a moving picture outfit to show a series of scenes along the surface car lines of the city, the machine being set up overhead at one side of the booth as shown in one of the accompanying illustrations. One of the scenes shown is entitled "A Two-Minute Delay." It shows a woman entering a car and holding up all those behind her at the fare box. She first opens a grip, from which she takes a handbag, and from this handbag she takes a small purse, and from the purse she extracts a large bill which takes the conductor considerable time to change. She then drops in her fare and adds to the delay by restoring all her various receptacles to their original positions before moving on.

In another picture are shown a number of men, each of whom is sitting in the middle of a seat in the car and reading a newspaper. A woman stops at each of these cross seats in an effort to find a place for herself. When she reaches the front cross seat a gentleman two seats back, who is not reading a paper, jumps up and tenders her his place. He then steps forward and knocks the newspaper out of the hands of the man who occupies the entire front cross seat and, sitting down on the edge of this seat, gives the man a violent shove to send him over toward the side of the car and thereby make room for himself on the seat. A second scene of this picture shows a woman entering the car and a number of men sitting about 6 in. apart on the longitudinal seat. After looking at the men and hesitating

a number of times she arrives at the forward portion of the car and sits down hastily on top of two of these men, causing them to move over. She then sits down in the space so provided.

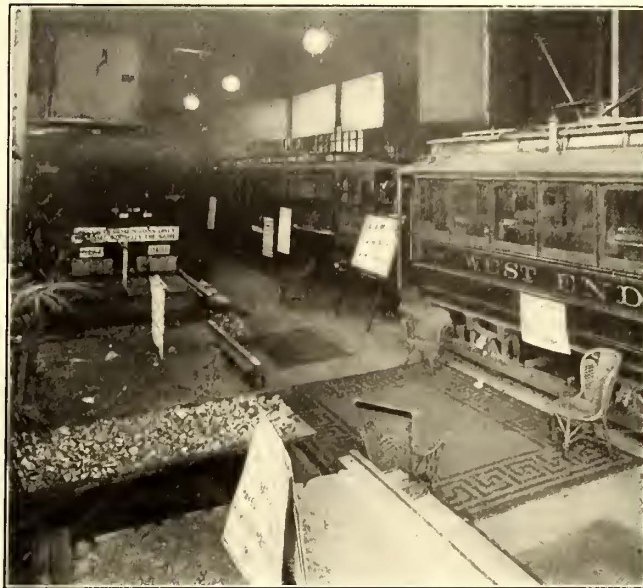
On a picture under the heading of "Accidents Due to Carelessness," a man is shown running from behind one car and being struck by a car going in the opposite direction on the other track. Another scene is of a woman getting off a summer car before it stops, stepping off backward and getting a dangerous fall. Another is of a man running after a moving car and falling, an emergency wagon coming to take him away to the hospital.

Other pictures of educational value show how one-way traffic increases the capacity of the street, how two-way traffic decreases it, and how a busy street may be blocked during the evening rush period by standing automobiles lined up at the side of the street awaiting their owners. In a scene showing "empties" going to the city for the evening rush it is explained that these cars stand in the car-house twenty hours each day and haul a load only one way. In other scenes are shown the Pittsburgh low-floor car and the Pittsburgh double-deck car at stands, receiving and discharging passengers. Still another shows the use of an electric crane for handling special work, ties, etc., at a very important corner where two main arteries of traffic cross each other. At this point the old tracks and special work had to be removed, the grade lowered about 2 ft. and new rails and special work put in between the hours of midnight Saturday and 5 a. m. Monday, on account of the leveling of a hill in the business district of Pittsburgh.

Among the interesting signs accompanying the exhibit is one placed over three types of track stating that the cost per mile of double track has increased 1000 per cent in twenty-five years, the horse-car track costing \$7,862, the first electric track \$27,616 and the present track \$89,760. Another sign placed over the exhibit of different types of motors reads: "Fifteen types of motors used in Pittsburgh.

candles and oil lamps; seating capacity, sixteen passengers. The fare up hill was 10 cents and the fare down hill was 5 cents." Signs over one of the new steel trail cars read as follows:

"A street-car ride is the one thing in Pittsburgh cheaper to-day than ever before. True, it still costs 5 cents, but how



Pittsburgh Exhibit—View Showing Old-Style Car, Samples of Track Construction and Moving Picture Cabinet

long was the average ride ten years ago and how long is the average ride now? A 5-cent fare in hilly Pittsburgh amounts to only one-half as much per passenger mile as a 5-cent fare in most level cities."

The well-known low-floor car of the Pittsburgh Railways



Pittsburgh Exhibit—View Showing Steel Trail Car and Various Types of Motors and Controllers

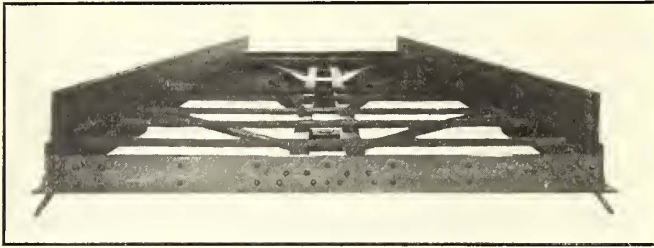
Fourteen obsolete types could not be found. Can you think of any other business requiring a change in the type of its equipment twenty-nine times in twenty-five years?"

Over an old-time horse car was a sign reading: "How we rode twenty-five years ago and forgot to kick. Method of heating, straw to knees; method of lighting, tallow

was included in the exhibit, and on it were signs reading: "Fifty new motor cars are ordered like this except that they will have cross seats and front door exits. These will be the lightest single-deck motor cars ever built per seated passenger. Take a look at the Pittsburgh Railways Company's baby controller inside and note the seating space saved."

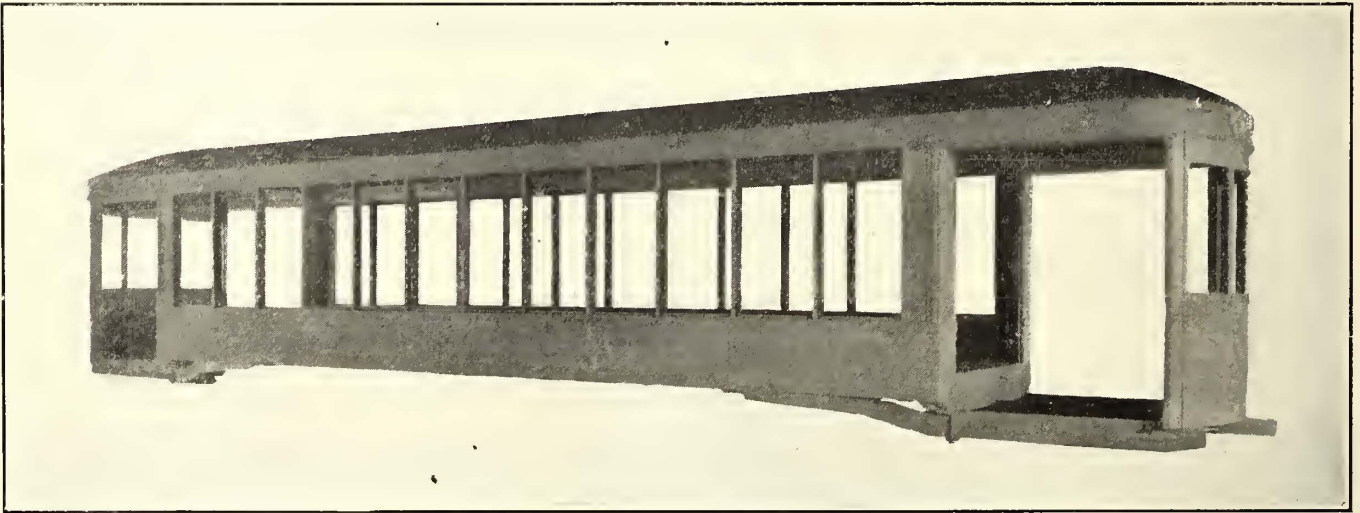
CONVERTIBLE CAR WITH STEEL UNDERFRAME

J. M. Jones' Sons Company, Watervliet, N. Y., announces a new convertible car which it asserts has all the advantages and none of the disadvantages of the bench-type open car and when used for winter service



Underframe of Semi-Convertible Car

has all the advantages of the closed car. The main feature of this new car is the window sash. By the use of special newly designed fixtures these sashes can be



View of Side Framing Showing Platform Framing

restored to place as securely as those of a permanently closed car. Furthermore, as the sides are attached and removed from the outer side of the car body any handy man at the carhouse can remove or restore all used on one car in fifteen to thirty minutes. The sashes are interchangeable, will not rattle and are held securely to prevent the entrance of air. The design of the pillars is such that when the sash is removed the runs for the curtains will prevent the rain from beating in during summer showers. The sashes for forty cars of this type would not require any more storage space than that required for one car body of the same dimensions.

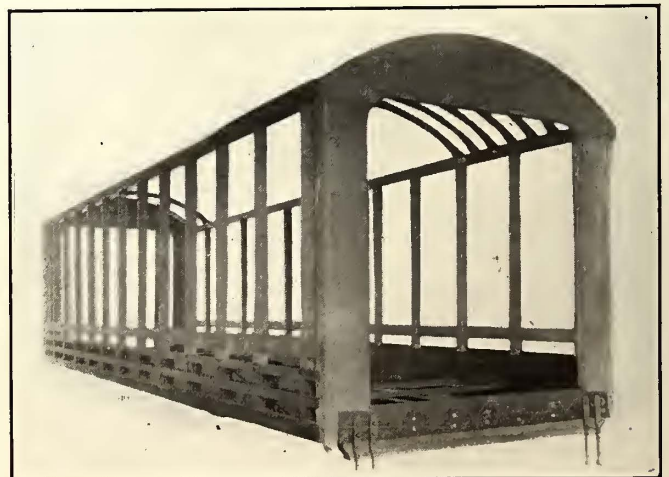
The construction of the car body allows for a very low water table, namely, about on a line with the top of the seat cushion. When used as a summer car the open space from the top of the water table to the bottom of the side top is about 4 in. more than is allowed for the old type of open car. As the space below the water table is permanently closed to the floor, the car is made more desirable both in summer and winter. The car is designed for twelve sashes on each side of the body, each sash being in one piece for two panes of glass. Curtains are provided to run below the top of the water table to prevent the rain from beating in during the summer, and the same curtains are used for winter service. Screens are provided to prevent accidents to the passengers and to protect the glass from breakage. The floor plan calls for twenty transverse and four longitudinal

corner seats, seating forty-eight persons in all. No end partitions are required when the car is constructed with vestibuled platforms. The roof, platforms and the interior finish may be of any type ordered.

The underframe is of the all-steel type. The side sills are composed of steel plates with an angle riveted to the bottom edge to support the wood sill which carries the side and corner posts. The two I-beam center sills run through open bolsters and are securely riveted to the end sill channels. The crossings are I-beams and angles. The three I-beam crossings in the center of the car bottom are bent so as to go under the center-sill I-beams and are riveted to the center beams and side plates. The angle crossings for motor traps, if any, are fastened in place like the beams. The floor of the car is double. The vestibule and sides and ends of the car body are sheathed with steel.

The general dimensions are as follows: Length over the body, 32 ft.; length over the buffers, 46 ft. 4 in.; width at bottom, 8 ft. 2 in.; extreme width, 8 ft. 5 in.; center to center side posts, 2 ft. 6 in., and height from the underside of the sill to the top of the trolley boards, 9 ft. 1 in.

A car body of these dimensions with 2-in. wall space on each side will give 7 ft. 10 in. clear space inside width. This allows for a 35-in. seat each side and a



General View of Side Framing of Semi-Convertible Car

24-in. aisle at knee height and a 28-in. aisle at hip height. With a body 8 ft. 6 in. wide outside and 2-in. wall space, the cross seats could be 36 in. long on each side with a 26-in. aisle at knee height and a 30-in. aisle at hip height.

The platform distances are as follows: From ground to step, 15 in.; from step to platform, 14 in., and from platform to body, 10 in.

The attention given by the builder to eliminate all unnecessary weight without sacrificing strength is indicated by the fact that this car body weighs, without seating, only 14,500 lb. The accompanying illustrations show the steel underframe, the skeleton of the body framing, showing construction without end partitions and with no roof or platforms, and finally the body with arch roof and platforms ready for color.

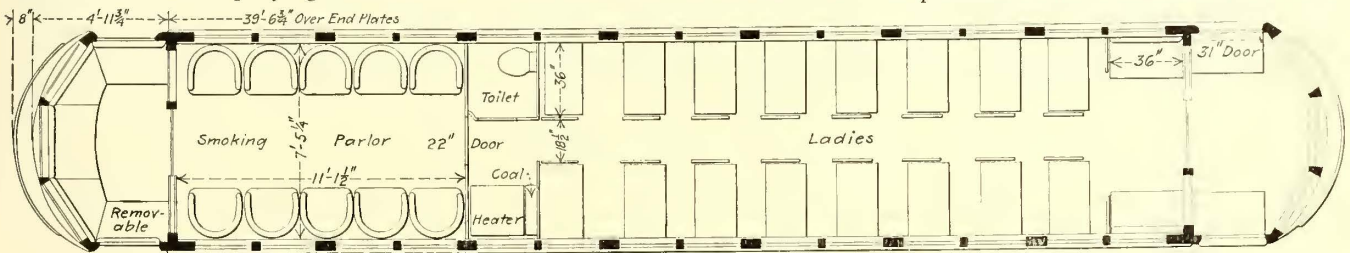
AN UNUSUAL TWO-CAR TRAIN

The Northwestern Pennsylvania Railway has recently received from the Niles Car & Manufacturing Company the parlor car and combination smoker and baggage coach shown in the accompanying illustrations. These cars will

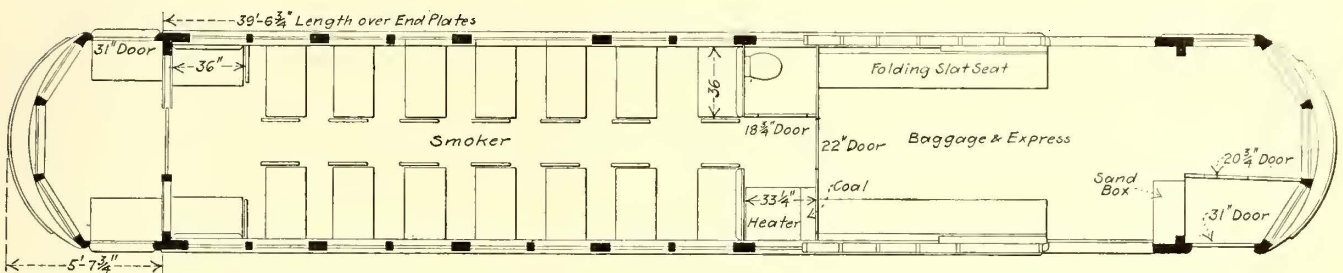
Both cars are mounted on Baldwin A-type trucks and are equipped with Westinghouse No. 306 motors, HL control and A.M.M. air brakes.

While a center-entrance train is not altogether new, there is some novelty in the car plans, which were designed by C. M. Hatch, general manager of the railway. The baggage and express section of the combination car is furnished with a sliding door of 4-ft. opening on each side and with folding slat seats. The motorman's cab, which is placed at the right-hand side, is provided with a 20 3/4-in. inside swing door and a 31-in. swing door to cover the front entrance to the car. A space between the smokers' compartment and the baggage compartment is reserved for the heater, the toilet room and lockers for the crew, card tables, etc. The passengers' platform at the rear is provided with a 31-in. swing door on each side.

The second car of the train has a front platform which is similar to the rear platform of the combination car. The



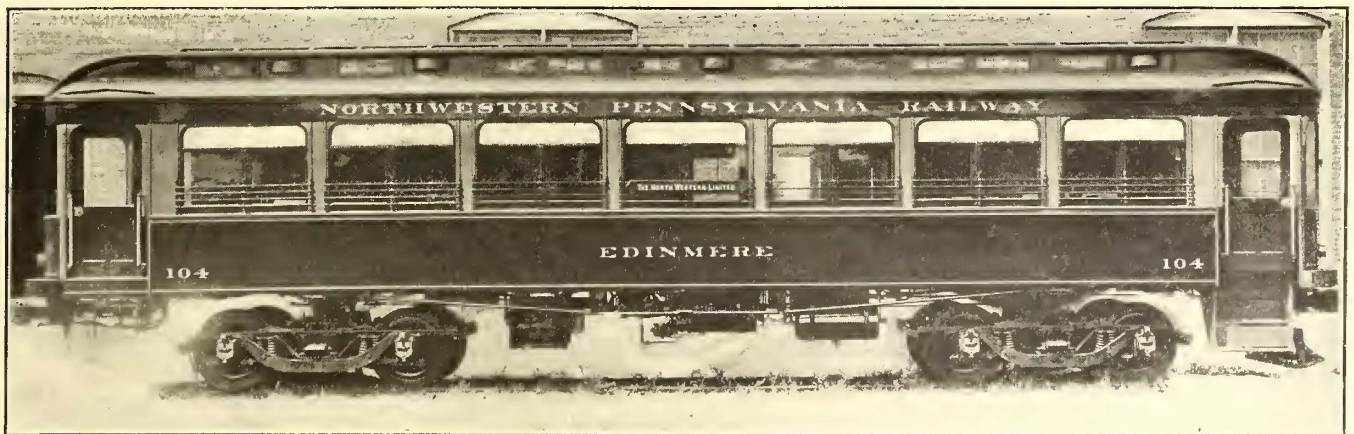
Plan and Seating Arrangement of Parlor Car for Northwestern Pennsylvania Railway



Plan and Seating Arrangement of Combination Smoker and Baggage Coach for Northwestern Pennsylvania Railway

be operated as a train for limited service between Erie and Meadville, Pa. The arrangement is unusual in that the two cars will operate with passenger entrance in the center of the train only. The combination car will be placed at the front end of the train. Each car is 50 ft. 10 1/4 in. long over the buffers, 49 ft. 6 1/4 in. long over the vestibules, 39 ft.

rest of the car, however, is divided by partitions with center doors into a section with cross seats designated as the ladies' compartment, a section with individual chairs called the parlor compartment and finally a smokers' section de luxe at the rear. The seats in this smaller smoking compartment are removable in case it is desired to use the platform for



General View of Parlor Car for Northwestern Pennsylvania Railway

6 3/4 in. long over the end plates, 9 ft. 4 in. high from sill to top of roof, 8 ft. 6 in. wide over all and 8 ft. 2 in. wide over the sills. The distance between the center line of the bolsters is 27 ft. 9 in. and the wheelbase is 6 ft. 6 in.

operation. All seats are upholstered in crimson plush. An extra fare will be charged passengers for the use of the parlor compartment and the smoking section which adjoins it.

STEEL CARS FOR CALIFORNIA TRAIN OPERATION

The Oakland, Antioch & Eastern Railway, of San Francisco, has recently placed in service eight suburban steel cars manufactured by the Hall-Scott Motor Car Company, San Francisco. At present the cars are used in an all-steel electric train running between Oakland and Sac-

The car is equipped with radial drawbars and with shock-absorbing spring cage supports, secured directly to the underframing of the car. The floor is double, with deadening felt between. The first course is of select kiln-dried fir, laid diagonally, and the second course is of select pine, laid lengthwise. The main passenger and smoking room compartments are finished in West Coast mahogany.



General View of Steel Car for Oakland, Antioch & Eastern Railway

ramento, drawn by a Baldwin-Westinghouse electric locomotive of 2000-hp capacity. The principal dimensions of each car follow: length over the bumpers, 58 ft. 1 in.; width over the sides, in the clear, 10 ft. 3 in.; width inside, in the clear, 9 ft. 4 $\frac{3}{4}$ in.; height from track to top of roof, 13 ft.; length of main passenger compartment, 27 ft.; length of smoking compartment, 21 ft.; width of aisle, 2 ft. 8 $\frac{3}{4}$ in., and length of vestibules, 4 ft. 6 in. Each car seats sixty passengers. The weight of the body is 30,000 lb.

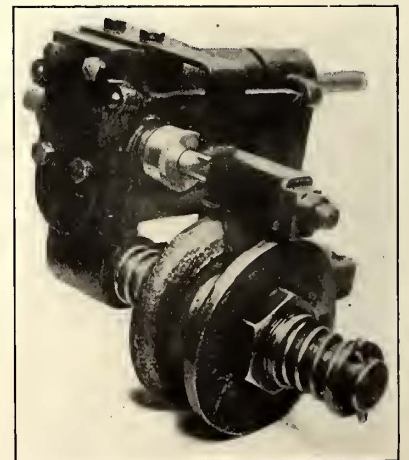
All cars are of steel throughout, except that the interior trim is of mahogany. The outside and end sills of the bottom framing are of 7-in. channels; the sub-frame sills, running under the entire length of car, are of 7-in. I-beams. The cross-framing consists of 5-in. channels, resting on and securely fastened by means of steel angles to the two I-beams. The bottom framing is braced with

The windows in the main passenger compartment have the upper part stationary and the lower parts to raise. Fourteen Globe ventilators are installed on the roof with openings into the passenger compartments and into the lavatory provided at each end of the car. The hardware throughout is of polished brass. The seats, accommodating two passengers each, are upholstered in plush, and of the walkover type. The vestibules, fully inclosed, have outside doors and step traps. A motorman's compartment is located on the right-hand side at each end of the car. The windows in these compartments are made to drop into pockets.

A NEW FLANGE OILER

An attachment for oiling the flanges of car wheels has recently been placed upon the market by the National Appliances Company, of Spokane, Wash. This differs from the devices which have been generally used for this purpose in that oiling contactors are applied to or removed from the flanges at will of the motorman, thus permitting the applications of oil to be made only where they are needed.

The oiling wheel is attached to a small plunger casting, which in turn is supported on a bracket bolted to the frame of the truck so that the oiling wheel is directly in front of the flange of the car wheel, the movement of the plunger permitting the oiler to be moved up against the flange or away from it. Air is piped to the machine through a three-way valve in front of the motorman.



New Flange Oiler

There is a 12-gal. tank for the oil in the front end of the car connected to the pipe running down to the machine, with a check-valve between the tank and the pipe, and the pipe is consequently kept full of oil. When the car comes to a curve the motorman turns the air into the pipe above the oil, which acts on the plunger and forces the oiling wheel up to the flange. As



Interior View of Steel Car for Oakland, Antioch & Eastern Railway

$\frac{3}{8}$ -in. x 3-in. steel strips, which are secured to the outside sills. The body framing consists of 3-in. channels, resting on top of the outside sills and fastened by double steel angles. The car siding is of No. 10 gage sheet steel riveted to the outside sills, side posts and top plates. The roof is of No. 12 gage sheet steel, rolled to shape, and the joints are covered with steel battens.

the plunger casting moves it opens a small port that lets the oil out on both sides of a feeder which is located between the two parts of the oiling wheel, and thus both sides of the flange are oiled. There is a needle feed located between the port and the feeder to adjust the flow of oil as desired. After the car has gone around the curve the motorman releases the air that is on the column of oil and a pair of coil springs bring the plunger casting back from the flange, closing off the oil port in the barrel of the machine.

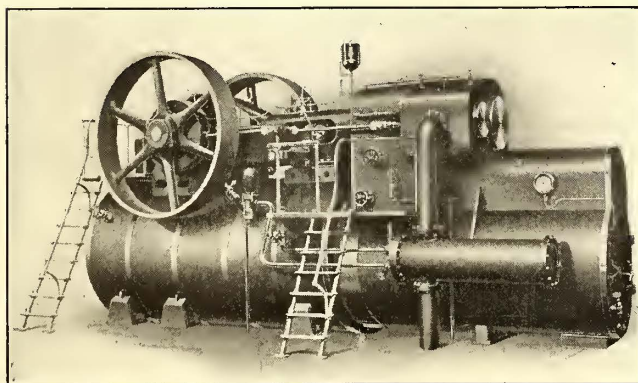
The small oiling wheel can be adjusted to fit flanges of any design, as it is in two sections and threaded on a brass bushing with jam nuts on both sides to hold it together. The feeder can also be adjusted to fit in between the halves of the oiling wheel, and provision is made for both to move laterally in accordance with the side play of the car wheel. The oiling wheel is cut away on the under side so that it does not come in contact with the point of the flange but delivers the oil near the wheel tread, and as the flange transfers the oil to the rail at the point of side contact no oil gets on the tread of the rail.

A NEW SELF-CONTAINED PRIME MOVER

A self-contained prime mover, including engine and boiler complete, has recently been placed upon the market to supply the long-existing need for a really economical steam-driven unit in small sizes. This is the so-called "Buckeye-mobile" built by the Buckeye Engine Company, Salem, Ohio. It is manufactured in sizes between 75 brake-hp and 600 brake-hp and for all capacities a unit coal consumption ranging between 1 lb. and 2 lb. per hp-hr. is attained, depending upon the quality of coal and whether the unit is run condensing or non-condensing.

The field of usefulness for the new machine on electric railways is obviously in outlying districts of towns where direct current is generated and the trolley is fed directly from the generators.

The intermittent load upon the average interurban substation, involving a low daily load factor for transmission lines, transformers and rotaries, also appears to be well suited to a compact and highly economical prime mover in place of the substation equipment, because the low coal consumption of the engine permits one man to do the firing as well as to attend to the other work of operation. That the new machine is commercially competitive with existing prime movers is shown by the price, which is approximately \$55 per hp, including all equip-



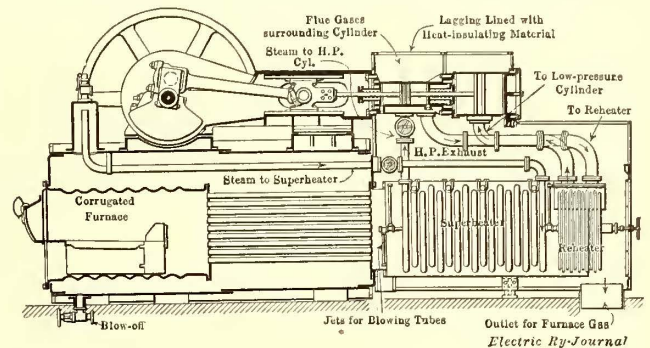
Self-Contained Unit—General View Showing Auxiliary Equipment

ment except the generator, for the ordinary sizes and ranges below \$50 for the larger machines.

The new unit consists of a compound engine mounted on an internally fired boiler, the engine cylinders being inclosed in the smoke box, which also contains a superheater, a reheater and all high-pressure piping and valves as well as the intermediate piping. A special casing compels

the hot gases as they leave the boiler tubes to traverse the superheater and reheater before emerging into the smoke box proper on their way to the stack.

The engine drives a feed pump which supplies the boiler through a tubular heater in the exhaust line. The engine exhausts into a suitable condenser equipped with an air pump also directly driven from the main engine, al-



Self-Contained Unit—Longitudinal Section Showing Arrangement of Machinery

though when a supply of water for condensing purposes is not available the unit is operated non-condensing.

The boiler is of the internal corrugated furnace fire-tube type. The furnace tubes and tube sheets constitute the entire active heating surface; therefore deterioration and need of repairs are confined to these parts which are attached to the boiler shell by studs and nuts, so that they are readily removable for inspection and cleaning. Sediment collects in the bottom of the boiler (the coolest part) and can be readily blown off. A steam pressure of 225 lb. per square inch is carried.

The initial superheater consists of a single coil of seamless steel tubing. The steam passes through it in a direction counter to that of the hot gases, and the flexibility of the coil prevents any expansion strains in the high-pressure valves or fittings. The steam on its way from the high-pressure cylinder to the low-pressure cylinder passes through a secondary superheater or reheater built up of a large number of small tubes expanded into heaters. The superheater and reheater are suspended from rollers on an overhead track which allows perfect freedom for expansion of piping and also affords easy means of removal from the smoke box should occasion ever require it. A steam jet soot blower effectually removes the soot and dust from boiler tubes, superheater and reheater. This jet may be used as frequently as desired since its operation interferes in no way with the action of the fire. Superheated steam is used for blowing the tubes.

The engine is of the tandem-compound center-crank type and is of extremely simple and rugged construction. The bedplate is rigidly bolted at its main bearing end to a saddle which spans about one-third of the boiler's circumference. The guide barrel end rests on a smaller saddle and is free to slide thereon, thus relieving the bedplate from the effects of boiler expansion.

The extraordinarily low steam consumption of about 9.5 lb. per indicated hp condensing and 13 lb. non-condensing which is attained by these engines is inherently due to the practical elimination of radiation and cylinder condensation. As the engine is mounted over the boiler, all live-steam piping may be surrounded by the flue gases, and for the same reason the cylinders are jacketed by the same hot medium. The use of a high superheat both for the high-pressure steam and for the steam leaving the receiver, or reheater, is another element of economy, and the effectiveness of these means for transferring heat from the flue gas to the steam is shown by stack temperatures which have been found to range between 450 deg. and 500 deg.

News of Electric Railways

Plans for Philadelphia Rapid Transit System Explained to the Councils

A. Merritt Taylor, director of the Department of Transit of the city of Philadelphia, appeared before the joint committee on finance and street railways of the Councils of that city on Oct. 1 and explained his recent report on the transit situation. He presented figures in regard to the cost and the net return to be expected from the operation of the various elevated and subway lines advocated in his report. In this connection he said that the Frankford elevated line would return approximately 8 per cent upon the investment. In his report the director recommended that this line and the Darby line be built and operated by the Philadelphia Rapid Transit Company under an agreement that their ultimate ownership would be vested in the city. The Broad Street line is to be built by the city and equipped and operated by the Philadelphia Rapid Transit Company. In discussing the transit situation Mr. Taylor said in part:

"The recommended transit facilities will not be possible until 1920 at least, and, according to our present population, it is apparent that the congestion at that time will be great, but the rapid transit lines recommended for immediate construction in conjunction with surface subway lines will relieve congestion and reduce the running time between widely separated points, as, for instance:

"From Frankford to Market Street, from forty-four minutes to twenty-two minutes.

"Frankford to Darby, from eighty-nine minutes to fifty minutes.

"Germantown to City Hall, from forty-six minutes to thirty minutes.

"Ninth and Luzerne Streets to City Hall, from thirty-five minutes to twenty minutes.

"To construct the elevated extension from the Market Street subway at Front and Arch Streets to Frankford, as recommended, would require no additional outlay of capital for the construction of a subway through the delivery district, as the trains will be routed via the present Market Street line. This line carries a large volume of east-bound traffic in the morning and the cars return west-bound light. The same condition, only reversed, obtains in the evening.

"By running the trains of the Market Street elevated line through to Frankford they would be made to do double work, saving unnecessary investment. This means that a large portion of the investment necessary for the Frankford elevated line has already been made.

"The Philadelphia Rapid Transit Company should build and operate the Darby and Frankford elevated lines, as logically they are additions to the Market Street elevated system. The city's interests in the two lines should be conserved, however, under an agreement whereby ultimate ownership would revert to the city, and, further, whereby profits in excess of a reasonable return upon the company's investment should go to the city annually to relieve the costs of the construction of the Broad Street subway.

"The construction of the Broad Street subway is imperative, as it is the logical route for the main north and south line. This line would tap North Philadelphia station, Germantown, via transfer lines, as well as make accessible vast areas of waste land.

"I have recommended that the subway terminate at Broad and Pike Streets, and that two elevated lines branch therefrom to the northwest and the northeast. These two elevated structures would thereby serve twice the area that could be served if the subway were continued up Broad Street beyond Pike.

"The cost of the Broad Street subway with loops and branches as recommended will be \$34,682,000, plus equipment, worth \$7,393,000, a total of \$42,075,000. It will earn approximately 3.2 per cent upon the total cost in the third year of operation.

"The Frankford elevated line will cost about \$6,510,000, plus equipment, worth \$2,402,000, a total of \$8,912,000. It will earn approximately 8 per cent on the cost in the fourth year of operation.

"The cost of the Darby line with equipment will be \$6,591,000 and it will earn 4 per cent in the fourth year of operation. The average return on all will be 4.1 per cent. The average return on the subway will be 3.2 per cent and on the elevated lines 6.4 per cent.

"The Broad Street subway is as badly needed as the two elevated lines. Although the rate of return is lower because of higher cost of subway construction, in the end it will be as profitable as the Darby or Frankford elevated lines. It is essential for the uniform development of the city that the work on the lines recommended be done at the same time.

"I have recommended that the city build the Broad Street subway because the work cannot be done without municipal aid. I have recommended that the elevated lines be built, equipped and operated by the Philadelphia Rapid Transit Company under guarded restrictions and with a return of earnings above a reasonable amount upon the investment. The city's liability is, therefore, reduced to the cost of the subway delivery loops and branches and the sinking fund charges and interest on the bonds. These amounts would be as follows:

Interest at 4 per cent.....	\$1,384,880
Sinking fund at 4 per cent.....	865,550
Total	\$2,250,430

"If the constitutional amendment enabling the city to issue thirty-year bonds, instead of fifty-year bonds, is adopted, the sinking fund requirement will be reduced to 1 per cent, thus reducing the total to \$1,731,100.

"Against the city's liability under the present law of \$2,250,000 the municipality has the following offsets:

"The revenue, net, produced by the Frankford and Darby lines in excess of the operators' return; net revenue of the Broad Street subway in excess of return for operators' equipment; the subsidy granted the city by the State in aid of transit development in the amount of 1 mill of the present personal property tax—upward of \$660,000 per annum, which will increase annually.

"On April 1, 1914, the transit department will be prepared to take bids and award contracts for the construction of sewers and other sub-surface structures which are in the line of the subway delivery loop. No contracts should be let until after the way is clear to continue the work and until judicial decisions have established the city's borrowing capacity either at the present rate or an increased rate.

"The passage of a resolution by Councils fixing the routes in a general way, subject to such changes as may be determined upon by Councils, from time to time, and adopting the general recommendations, subject to future councilmanic control, will establish the general policy of the city and enable the transit department to proceed officially with the work of design and in the necessary negotiations with the Philadelphia Rapid Transit Company."

Chicago Surface Railways Outline Proposed Plan of Merger

At a meeting of the local transportation committee of the Chicago City Council held on Oct. 4, 1913, the surface railways, represented by L. A. Busby, president of the Chicago City Railway and the Calumet & South Chicago Railway, and W. W. Gurley, general counsel of the Chicago Railways, presented a proposed plan for unified operation of the surface lines. This tentative plan of merger was prepared at the request of the local transportation committee and is the result of numerous conferences between the surface railway management. In explanation of this tentative plan Mr. Busby stated that in the negotiations prior to the presentation of this report the representatives of the surface railways agreed to retain the principles embodied in the 1907 settlement ordinances. These were well understood and have as a whole been satisfactory to both the city and the surface railways. In view of this it was thought inadvisable to submit any radical departure from the substance and principles embodied in the old ordinance.

Following this preliminary statement, the committee proceeded to read the proposed plan clause by clause, approving some without much discussion and referring others to committees composed of the Board of Supervising Engineers, the railway companies' engineers, the city electrician, the commissioner of public works and the health commissioner. In addition to the local transportation committee, the city was represented by Bion J. Arnold, chairman of the Board of Supervising Engineers, Chicago Traction; George Weston, chief engineer of the board; L. H. Davidson, secretary of the board, and Ray Palmer, city electrician.

The plan submitted for unified operation by the representatives of the surface railways is as follows:

1. All the surface line companies in the city shall enter into an operating agreement which shall become effective as soon as approved by the City Council. This agreement, among other things, shall provide for the following:

(a) Unified operation of all surface street railways in the city, with the same effect as regards service to the public as though all the lines were owned and operated by one company.

(b) Through routing of all cars so far as the local service balances. This will eliminate all switch-backs and most of the present looping of cars in the down-town district and will increase the down-town surface terminal facilities approximately 30 per cent.

(c) Purchase by the companies of a sufficient number of additional cars to utilize during the rush hours the additional track facilities in the down-town district made available by such through routing. This will increase the rush-hour down-town transportation facilities fully 30 per cent.

(d) More rapid transit, by means of through service cars, from one division of the city to another, owing to the relief of congestion in the down-town district.

(e) A 5-cent fare throughout the entire city on surface lines. This will give a 5-cent fare in lieu of the present 10-cent fare in the Calumet district south of Seventy-ninth Street.

2. The operating agreement shall be subject to all the terms, requirements and conditions of the 1907 ordinance and subsequent ordinances, except in so far as these ordinances are modified or supplemented by the plan for unified operation.

3. The basis of accounting which has been in effect for the past six years under the 1907 ordinance, with reference to the renewal, maintenance and other funds, payment of fines and any other questions of accounting, shall be continued as heretofore. Any further questions of accounting not covered by the express terms of the ordinance shall be determined by the Board of Supervising Engineers.

4. Provision for the investment in first mortgage bonds of the several companies of such an amount of their several and respective renewal funds as shall be approved by the Board of Supervising Engineers, bonds to be taken at the market price but not to exceed par.

5. Authority to the companies to lease, on terms to be approved by the Board of Supervising Engineers, any real estate now owned but not necessary to the operation of the properties. This will enable the companies and the city to derive an income from certain property of this kind which cannot now be sold to advantage.

6. Existing tracks having an estimated life of five years or more may, with the approval of the Board of Supervising Engineers, be rehabilitated, instead of being scrapped, as required by the present ordinances, when new pavement is laid on the street.

7. Cleaning and sweeping right-of-way occupied by tracks of the companies, including the removal of snow, shall be assumed by the city and the companies shall pay the city monthly the cost of such work, the method of determining the cost to be specified in the merger ordinance.

8. Reasonable provision shall be made in the merger ordinance for the correction of electrolysis, in lieu of the present electrolysis ordinance.

9. During the past five years the Calumet company has not earned 5 per cent on the city purchase price, but it has now reached the point where its earnings next year will be in excess of 5 per cent on that amount. The Calumet ordinance provides that this shortage shall be paid out of future earnings before any division with the city. Under unified

operation the Calumet company will waive its 10-cent fare and will cease to be operated as a separate company, and it will, therefore, be necessary to make some equitable provision to take care of this shortage.

10. Where it becomes necessary to remove new or rehabilitated tracks from the streets in order to construct or replace sewers or water mains, the cost of such work shall be charged to capital account, and where practicable in the construction of new sewers or water mains they should be so placed in the streets as not to cause the removal of street railway tracks.

11. Provision should be made for a reasonable variation in the temperature of cars under extreme weather conditions.

12. Provision should be made requiring corporations and persons making openings in or tunneling under the tracks of the companies to deposit with the city or with the company, before proceeding with the work, an amount sufficient to cover the cost of repairing the track and paving.

13. Such other provisions, if any, as may be advisable or beneficial to the service, based on the results of six years' operation under the 1907 ordinances.

As the various clauses of the proposed plan were read Mr. Busby was requested to explain them in detail. In amplifying Clause (a), Section 1, Mr. Busby stated that under unified operation as contemplated by these plans all down-town terminals now under separate ownership would be utilized by both companies. Under the existing system of operation the terminals were not being operated up to their highest efficiency and a comprehensive scheme of through routing would obviate the difficulties now obtaining in switch-back movements and looping in the downtown district. The manner of handling the gross income from the unified railways was amplified by a statement that all the earnings of all the companies would go into a common fund. After operating expenses were deducted the net would be divided on the 55 and 45 per cent basis now effective in the old settlement ordinances. Many economies would be effected in the operating organization as the new plan proposes that the whole system shall be operated by a single management. Under the present system of operation it has been difficult to divide the earnings from through-route cars. On some of the through routes it was desirable to divide the earnings on a territorial basis, but on others the same result would be obtained if the gross earnings of each through route were turned into the company furnishing the crew and equipment.

Under Section 3 it was suggested that the city comptroller be included as an arbiter in questions of accounting, in addition to the Board of Supervising Engineers. This was acceptable to the representatives of the railways. In explanation of Section 5, Mr. Gurley, of the Chicago Railways, stated that his company owned considerable real estate not now being used for railroad purposes which under the present ordinance could not be improved owing to the limits necessary in a lease to outside parties. The railway company could not sell this property at a profitable figure because of its unimproved condition. The committee saw no objection to the provisions of this section. The property would be improved and be on a profitable basis in case the city took it over at the expiration of the franchise period. At the suggestion of the local transportation committee the city comptroller will be made a party to all leases of real estate made under this authority, and it was proposed that the time should not be limited by the life of the franchise.

Section 7, which refers to cleaning and sweeping the right-of-way occupied by the tracks of the surface railways, was explained by Mr. Busby. He stated that at the present time, although the 1907 ordinance required that the city railways clean their own right-of-way, the arrangement was not satisfactory either to the board of public works or the railways. The board of public works has consequently been authorized to do the work. Under this arrangement there has been considerable difficulty in making settlements. According to the proposed arrangement it is contemplated that the city will do the work on some pre-arranged basis or unit cost and bill the railway company.

It appeared according to Section 8 of the proposed merger plans that the railways were asking for re-consideration of the electrolysis ordinance passed by the Chicago

City Council about a year ago. It was held that this subject was too technical for the committee to handle, and it was referred to the Board of Supervising Engineers, the railway companies' engineers, the city electrician and the commissioner of public works for recommendations.

Section 9, relating to the Calumet & South Chicago Railway Company's ordinance and a provision in it as regards the method of adjusting the net earnings, also was referred to the Board of Supervising Engineers and the city comptroller. Mr. Busby stated that at the close of the present year the shortage in net earnings will be approximately \$250,000. Under the old ordinance it was provided that this shortage be paid out of the future earnings of the company before any division was made with the city. He stated further that he felt sure that the Calumet company would show a profit this year and in future years, but that some provision should be made in the proposed ordinance to set aside the shortage accumulated up to this time. Bion J. Arnold suggested that it would be better to pay this sum from the city's traction fund rather than allow it to be charged against capital account. Both the committee and the railway companies' representatives agreed that this might be the best way to adjust the difference, particularly since the proposed plan included the waiving of a 10-cent fare in the Calumet district south of Seventy-ninth Street.

In amplifying Section 11 Mr. Busby stated that at the present time the settlement ordinance required that all cars be heated to at least 50 deg. Fahr. at all times. He stated further that the construction of the car, as well as the method of operation with the double-end design, made this temperature a physical impossibility when the outside temperature was less than 10 deg. Fahr. above zero. While the railways had paid the city only \$2,000 in fines owing to failure to comply with the heating clause in the old ordinance, the amount was small because the city authorities had been reasonable. The sub-committee referred the provisions of this clause to the commissioner of public health.

The Boston Arbitration Hearings

The board of arbitration sitting in the Boston Elevated Railway wage and working conditions investigation resumed its hearings on Sept. 29. John D. Connelly, a member of the company's emergency force, testified as to working conditions in the field. He stated that the company has recently supplied emergency crews with a vertical lamp bank of five units for protection against approaching cars, the lamps being connected between the rail and the trolley at a height of 2½ ft. to 4 ft. above the ground. Another recent protective measure is the sending out of a ground man with a red lantern for a distance of 150 ft. from the tower wagon in the direction of traffic to warn oncoming cars. The witness presented an examination paper which he had passed several years ago as a head emergency lineman and the questions were discussed at length. Practically all dealt with the handling of feeder switches on the surface and subway lines under various conditions. Regarding wages, the witness said that teamsters and ground men are each paid 24½ cents per hour, and that on night work a man receives nine hours' pay for eight hours' service. Emergency linemen are paid \$2.10 per night, on a straight rate of 26¼ cents per hour.

J. Henry Neal, general auditor, recalled, stated that employees are paid on the piece-work basis in the armature shop, machine shop and at the Bartlett Street car shops of the company. There are about 1200 jobs on a piece-work basis, including 200 to 300 on control systems. Mr. Neal estimated that the company's managerial expenses have increased from \$182,000 in 1898 to \$280,000 per annum in 1913. The salary list includes merely persons paid by the month. The witness said that in his opinion the managerial expense should increase proportionately to the increase in revenue. The company's permanent investment has grown from \$25,000,000 to \$105,000,000 in the last fifteen years, and the passenger revenue has increased from \$8,067,587 to \$16,289,910 for the same period. The classifications of the Interstate Commerce Commission are closely followed in tabulating operating and administrative expenses.

In answer to inquiries it was brought out that head wiremen now receive \$3.47 for nine hours' work per day, whereas in June, 1912, the pay was \$3.15 and the working hours

were ten per day. Five years ago the pay was \$2.87. A boy starting in as a helper at \$1 per day should become a wireman in about six years.

Testimony was introduced at the session on Sept. 29 in explanation of the apprentice course offered by the company in co-operation with the Boston Young Men's Christian Association's Electrical Engineering Institute. The hours of labor and rates of pay for these apprentices follow:

	Wages
First year:	
Six months' pit work in car house, fifty-four hours per week.....	\$6.00
Six months' work in armature shop, fifty-one hours per week.....	6.00
Second year:	
Twelve months' work in machine shop, fifty-one hours per week....	7.50
Third year:	
Six months' work in drafting room, forty-five hours per week.....	9.00
Fourth year:	
Six months' work on transmission lines.....	10.50
Six months' work on transmission lines and overhead work, fifty and one-half hours per week.....	10.50
Six months' work in electrical engineering department, forty-five hours per week.....	10.50

In order to be eligible to the course, the application of the apprentice must be approved by parent or guardian, with proper witnesses; the applicant must have passed the entrance examination to the institute and must agree to work 4650 hours in the course as laid out. The program may be changed at the company's option. Apprentices are granted a week's vacation at Christmas and two weeks' vacation in the summer without pay. The company reserves the right to suspend work wholly or in part at any time, to dismiss the student at any time without notice and to establish thereby his dismissal from the institute itself. The student is required to purchase any tools needed in his work, and he has a chance to share in the premium or bonus wherever one is offered for piece work. Ultimately the student must resign or accept a regular position in the company's ranks.

Schedules of wages paid in the department of wires and conduits were presented at the hearing. Representative items follow: Foreman of underground and overhead feeders, 52½ cents per hour; foreman of trolley line maintenance, night work, and foreman of this work with pole maintenance added, day service, 52½ cents per hour; foreman of light wiring, 50 cents per hour; sub-foremen, interior and exterior wiring, 38 to 41 cents; inspectors, 40 to 41 cents; head linemen, 36 to 38 cents; head teamsters, 23.7 cents; cable splicers, 40 to 48½ cents; head linemen, emergency crews, \$24 per week; spare linemen, emergency crews, \$22 per week; linemen, emergency cars, \$22 per week; groundmen and teamsters' helpers, 24 to 24½ cents per hour; groundmen, emergency crews, \$16 per week; foreman department stables, 26.3 cents per hour. Stockroom attendants work one Sunday a month and receive twelve hours' pay for eleven hours' work, the regular compensation being \$14 per week.

H. M. Steward, chief engineer of maintenance of way, stated that in the road department the hours are nine per weekday with the exception of Saturdays, when eight hours' work is required. Regular night work is performed on an eight-hour basis and is compensated on the basis of "time plus one-eighth." Emergency crews are on duty twelve hours per shift and seven days per week, with two days' leave of absence per month with pay. Foremen receive twelve days' vacations, inspectors twelve days, head teamsters twelve days and sub-foremen six days. Mr. Steward described the duties of trackmen and pavers, the former receiving \$2.25 per day and the latter \$3.75 when engaged in paving. A trackman's work is similar to that of a laborer, but, in addition, the employee thus rated must know how to drive spikes, put on plates and joints and install rail bonds. A sub-trackman's work is about the same, except that he is rarely required to handle the various labor-saving machines used in the road department. Recommendations as to the employment of men and as to increases are made by division trackmasters to the chief engineer, and by him referred to the chief of maintenance. On account of the pressure to conduct his department's affairs as economically as possible, the witness stated that he had been unable to give any protracted consideration to the question of individual wages, but that he had made some study of conditions and wages on other transportation systems. At present the rating of sub-trackman has little significance, it being merely a chance to give the laborer a

step upward in passing into the upper class. The witness said that he had general charge of track and roadway maintenance upon all the surface, elevated and subway lines of the company, including the maintenance of signals on the rapid transit lines, and that consequently he was obliged to depend largely upon his subordinate officials in considering the advancement of employees in the ranks. The hearing was then adjourned until Oct. 1.

Storm Floods New York Subway

An extremely severe storm in the East on Oct. 1 disrupted traffic on the transit lines in Greater New York and interfered with steam railroad traffic. From the time the storm began at 7:13 a. m. until it ended at 6:35 p. m., a fall of 4.68 in. was recorded officially. Between 1:30 and 2:30 o'clock in the afternoon the rainfall was 2.23 in. This was greater than any other rainfall recorded by the Weather Bureau. During this hour the sewers were taxed beyond their capacity and the excess water poured into cellars and into the subway. At one period during the storm 1 in. of water fell in fifteen minutes, while at another time 2 in. fell in forty-five minutes. Water began to run into the subway just below Fiftieth Street early in the afternoon and at 3:45 o'clock it was necessary to stop sending trains through the flooded section. Southbound trains were turned back at Seventy-second Street and northbound trains were sent back downtown at the Grand Central Station. A few minutes after trains stopped running to Fiftieth Street the water became so deep at the Seventy-second Street station that it was necessary to discontinue the trains at that point and trains were switched north at Ninety-sixth Street. The Interborough Rapid Transit Company began at once to pump the water out and passengers were instructed in regard to the conditions before they bought tickets. The stopping of trains running between Forty-second Street and Ninety-sixth Street resulted in an overflow to the elevated railway lines and increased greatly the congestion of traffic at both the Brooklyn Bridge and the Williamsburg Bridge. In fact, the congestion at the Brooklyn Bridge became so great at the height of the regular peak load that many persons walked the bridge and boarded cars in Brooklyn. The Long Island Railroad and the Brooklyn Rapid Transit Company also suffered severely on some of their lines from the damage by the storm.

Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Company, issued a statement in which he asserted that the sewers of the city were not large enough to carry off the water.

Compromise Proposed in Akron

At a meeting of a special committee of the Chamber of Commerce, the City Council and the officers of the Northern Ohio Traction & Light Company at Akron on Oct. 2 an agreement was reached that will probably result in a settlement of the differences between the city and the company in regard to the construction of extensions. The terms of the agreement were worked out by the special committee of citizens, consisting of F. A. Seiberling, president of the Goodyear Tire & Rubber Company; C. B. Raymond, secretary of the Goodrich Rubber Company; S. F. Zilox, of the Commercial Printing Company; J. Edward Good, president of the Chamber of Commerce, and V. S. Stevens, secretary of the same body, together with Councilman Shaw. Conferences were held with the officers of the company from time to time, and when the terms were finally completed the committee felt that they would be satisfactory to both the city and the company. The agreement contains the following provisions:

1. The Northern Ohio Traction & Light Company will surrender all its rights under its present franchise when a new twenty-five-year franchise with satisfactory terms is accepted by the city and ratified, if necessary, by a referendum vote.

2. The company will agree to build 6 miles of extensions, 3 miles in 1914 and 3 miles in 1915, all in 1914 if possible. In addition the company is to build 1 mile of extensions for each increase of 5000 in the population of the city, the location of such extensions to be settled by arbitration in case the city and company fail to agree. This will take

care of the question of further extensions in the future.

3. The city is to have the right of supervision over the service and may prescribe reasonable rules and regulations for operation of the cars.

4. The company is to agree to sell twenty-seven tickets for \$1, but the rates of 5 cents for a cash fare and six tickets for 25 cents are to be continued.

5. The city is to have the right at the expiration of five-year periods, commencing with the expiration of fifteen years from the time the new franchise takes effect, to purchase and take over the property of the company, with the exception of power stations, substations and commercial lighting and power distribution systems, under methods provided by the state laws, but no franchise or good will shall be included in the purchase price. The provision is made that the company shall at all times have the right to use and operate over so much of the tracks and equipment in the city as may be necessary for the operation of its interurban service upon terms to be agreed upon and provided in the ordinance.

6. Proper forfeiture and penalty clauses are to be provided in case of the non-performance of the provisions of the contract.

7. Provision is to be made through which the company shall pay a fair proportionate share of the city's part in the separation of railroad grade crossings wherever the street railway tracks cross steam roads.

8. The new franchise is to continue for a period of twenty-five years, provided the city does not purchase the property within either fifteen or twenty years.

9. Matters in litigation, the water rights in the Cuyahoga River and the Mill Street viaduct case, now pending in the Ohio Supreme Court, are to be settled through the payment to the company by the city of \$300,000, which will operate as a cancellation of the judgment and full discharge of all liability incurred in building the dam at Kent on the part of the company.

An alternate proposition was made to build the extensions mentioned above, without any extension of the franchise except giving the right to lay the additional track. This was accompanied by the same condition as to the settlement of the litigation as the first proposition.

City Solicitor Jonathan Taylor and A. B. du Pont were instructed to prepare an ordinance based upon the conditions in the first proposition and have it ready, if possible, for consideration by Council on Oct. 6.

Committees of Directors to Report on Operations of the New Haven Railroad

At a special meeting of the directors of the New York, New Haven & Hartford Railroad on Oct. 3 a resolution was adopted to create committees of the directors to examine and report in detail upon the suggestions and recommendations of the Interstate Commerce Commission, to report and recommend to the board what action in their judgment is best in the interest of the company, of the employees and of the bondholders and shareholders, the report to be made not later than Dec. 1. Seven committees were appointed to consider minutely the specific recommendations of the Interstate Commerce Commission, which investigated the New England situation. The committees were appointed to take up, investigate and discuss the following:

1. Connecticut trolley situation.
2. Rhode Island trolley situation.
3. Steamship situation.
4. Relations of the New Haven railroad and the Boston & Albany Railroad.
5. Relations of the New Haven railroad and the Boston & Maine Railroad.
6. The Western Massachusetts trolley situation.

A committee composed of Howard Elliott, Thomas DeWitt Cuyler and A. T. Hadley was appointed to wait upon the Interstate Commerce Commission and the Attorney-General and lay before them the resolutions adopted by the directors and to outline to the government officers the plan the directors are now working under in order to respond to the recommendations made by various public authorities. The personnel of the committees in the order given above follows:

1. Samuel Rea, John L. Billard, Charles F. Brooker, James

S. Hemingway, William Rockefeller, A. T. Hadley and Howard Elliott.

2. D. Newton Barney, Robert W. Taft, Edward Milligan, Edward Milner, T. DeWitt Cuyler, Howard Elliott and Vice-president Buckland.

3. A. Heaton Robertson, Henry K. McHarg, J. T. Pratt, George F. Baker, Francis T. Maxwell, Howard Elliott and Vice-president Gardner.

4. W. Murray Crane, Theodore N. Vail, Alexander Cochran, William Skinner, James S. Elton and J. W. Hustis.

5. Charles F. Brooker, W. Murray Crane, Lawrence Minot, Frederick F. Brewster and J. H. Hustis.

6. Charles F. Brooker, William Skinner, Theodore N. Vail, Alexander Cochran, Arthur T. Hadley and Howard Elliott.

Each of the committees will select its own chairman. The committees on the Connecticut Company and the Rhode Island Company will confer with the public service or public utilities commissions of the states and a representative of the committee on trolley affairs of the New England conference. The western Massachusetts trolley committee will confer with the Massachusetts Public Service Commission and with George M. Woodruff of the New England conference committee on trolley affairs.

In announcing the resolution and the appointment of committees, Howard Elliott, president of the New York, New Haven & Hartford Railroad, explained that the directors have not been unmindful of the commission's suggestions and recommendations and have fully realized the importance of those suggestions, but making large changes in the structure of any organization is necessarily a slow and delicate process, which should be done so far as possible without demoralizing the forces. Until organization changes were fairly started, the directors did not feel that they could give that careful attention to the recommendations of Mr. Prouty, of the Interstate Commerce Commission, that their importance deserves.

Arbitration Hearings Resumed in Detroit

The arbitration of the differences between the Detroit (Mich.) United Railway and its men was resumed in the Circuit Court rooms at Detroit on Sept. 29, after an adjournment of several weeks. The day was spent largely in comparing the training, duties and responsibilities of railway engineers with those of motormen. William Reidy, instructor of motormen for the company, said that the men are generally passed after training them from seven to ten days. He was a locomotive engineer before entering the employ of the Detroit United Railway and testified as to the time required in commencing at the bottom and building up to the position of engineer of a fast passenger train. F. W. Brooks, general manager of the company, who also has had experience in steam railroad work, testified.

E. H. Ives, schedule expert, testified that 70 per cent of the men were included in the thirteen-hour limit for a work-day. Harry Bullen, general superintendent, said that since the first of the year 119 men who had formerly held positions as motormen and conductors had applied for reinstatement in the same capacity. This statement was made in rebuttal of testimony to the effect that many men leave the company's employ because their earnings are insufficient or their work too hard.

The following day was devoted largely to schedules. Mr. Bullen contended that neither the arbitrators nor the men could make the schedules. In the last analysis the question whether cars shall be run frequently or infrequently depends upon the patronage. Mr. Bullen contended that the ordinance which provides for a twelve-hour day for the men, with a half hour extra for a trip, could not be complied with strictly because of the demands of the people for adequate service.

Mr. Brooks presented lists of the men employed the last sixteen days in January and July, together with maximum and minimum wages paid them. The payroll figures showed that the highest paid men drew \$55.95 for those periods of time and that the lowest paid received \$36.32.

William Stimson, a member of the wage committee of the local branch of the union, testified on Oct. 1 that the men are not receiving sufficient wages for their work to live comfortably. He gave the high cost of living and the

high rents in Detroit as the reasons. Stanley Anderson, president of the local union, testified along the same lines.

The merit system was discussed at some length. Mr. Bullen said that some system of punishing infraction of the rules had to be used. Mr. Brooks stated that he would rest his case with the understanding that he might introduce other testimony after the men had submitted their testimony.

On Oct. 2 W. D. Mahon presented a list of cities in which street railway men are paid more than in Detroit.

Plans to Complete Detroit, Lansing & Grand Rapids Railway

At Grand Rapids, Mich., on Sept. 29, Andrew Fyfe, formerly State Senator and until recently United States surveyor of customs, stated that he, with Eastern associates, had purchased all the interests of Dr. Oliver H. Lau, Detroit, in the Detroit, Lansing & Grand Rapids Railway and the interests of certain other stockholders.

For about two years the work of making preliminary surveys on the proposed line between Detroit and Grand Rapids, by way of Lansing, has been under way. The line will be 174.24 miles long and will pass through Ada, Saranac, Portland, Lansing, Fowlerville, Howell, Brighton, South Lyon, Northville and Plymouth. The company holds fourteen city and village franchises, comprising all the municipalities through which it will pass. These franchises have all been approved by vote of the electors. The company also holds franchises from fifty-two townships, all approved by vote of the people.

Mr. Fyfe stated that it is probable the road will be double-tracked between Detroit and Plymouth. The road will be standard gage and laid with 90-lb. rails. Henry M. Wallace, 705 Union Trust Building, Detroit, is vice-president of the company.

Contracts Opened for Construction of Seventh Avenue Section of New York Subway

Bids for the construction of a section of the proposed Seventh Avenue subway in Manhattan were opened by the Public Service Commission for the First District on Oct. 1. The section is known as Section No. 2 of Routes Nos. 4 and 38, a part of the new system which will be operated by the Interborough Rapid Transit Company in connection with the existing subway. The Seventh Avenue extension will leave the existing subway at Times Square and run down Seventh Avenue to and under the East River to a connection with the subway in Brooklyn. It will be a four-track underground railroad from Times Square to Park Place, where two of the tracks will continue to the Battery and two diverge to Brooklyn. Section No. 2 covers a part of the line under Greenwich Street, West Broadway and Varick Street, between Vesey Street and Beach Street. The commission's engineers have not yet reported the official totals of the bids submitted, but according to unofficial figures furnished by the contractors the lowest bidder was the Thomas J. Buckley Engineering Company, New York, at \$3,036,000, and the next lowest bidder the O'Rourke Engineering Construction Company, New York, at \$3,138,000. As soon as the engineers' report is received the commission will award the contract.

The Board of Estimate has refused to concur in the action of the Public Service Commission in granting to the Interborough Rapid Transit Company the contract for the construction of the temporary work in the Steinway Tunnel at a profit of 10 per cent on the actual cost and has adopted a report recommending that the work be let out on public bids. Chairman McCall says that the commission will advertise for bids as soon as possible.

The commission has authorized the New York Municipal Railway Corporation to contract with George W. McNulty for the immediate reconstruction of the Sea Beach railroad from its connection with the Fourth Avenue subway at about Sixty-fifth Street, Brooklyn, to a point immediately south of Eighty-sixth Street, near Coney Island. This road will be one of the Coney Island connections with the new Fourth Avenue subway and over it the Brooklyn company will be enabled to provide a fast express service between points in Manhattan and Coney Island. It will

be a four-track line, built in a cut for the greater part of the distance. This line is owned by the company, but under the dual system contracts it is to be rebuilt and made a part of the Broadway-Fourth Avenue subway. According to estimates submitted by Mr. McNulty, the reconstruction work is to cost about \$1,877,525, and if completed within seventeen months the contractor is to receive a bonus of 15 cents a cubic yard for excavation and 50 cents a cubic yard for concrete. A corresponding penalty is provided in case the work is not completed within the time specified.

Branch Canadian Line to Be Electrified.—J. L. Englehart, chairman of the board of directors of the Temiskaming & Northern Ontario Railway, states that in the spring the Kerr Lake branch of the railway may be electrified and operated as a portion of the Nipissing Central Railway.

Minneapolis to Build Short Municipal Line.—The city of Minneapolis, Minn., has decided to build a municipal street railway of short length to its filtration plant, in order to haul building supplies for the construction of new units at the plant, supplies for road construction and other equipment and to carry passengers. The road will cost about \$26,000. Power for operating the line will be furnished by the Twin City Rapid Transit Company.

Newark Terminal Ordinances Passed.—Mayor Haussling of Newark, N. J., has signed the seven ordinances passed recently by the Board of Public Works in favor of the Public Service Railway. Thirty-one ordinances will be presented to the Board of Public Utility Commissioners for consideration. The ordinances all bear on the plans made by the Public Service Railway in connection with its proposed terminal improvement for Newark.

Bids for Municipal Railway Advertising.—The Board of Public Works of San Francisco on Sept. 23 received bids for the advertising privilege on the cars of the Geary Street Municipal Railway. The R. W. Scott Advertising Company, Trenton, N. J., submitted the highest bid, offering \$115 per year for use of each of the thirty-eight cars in regular use. In all, six bids were received. The nearest competitor of the Scott company offered \$101.25, while the price offered by the lowest bidder was \$64.80 a car a year.

London & Port Stanley Electrification.—At a public conference on Sept. 30 the Grand Trunk Railway System, represented by Mr. Long, head of the freight department for Ontario, stated that the company would refuse to operate its coal and freight business over the London & Port Stanley Railway if it is electrified. The company, he said, would also refuse to accept a commission to operate the road. The question as to whether the city will electrify the road is to come before the ratepayers on Oct. 20, when a by-law will be presented providing for the expenditure of \$700,000.

Recommendation to Abolish Commerce Court.—A subcommittee of the Senate appropriations committee decided recently to recommend the abolishment of the United States Commerce Court in practically the same terms as were contained in the deficiency appropriation bill passed by the House recently. The future of the court will depend on the action of the full appropriations committee of the Senate. The provision passed by the House would abolish the court on Dec. 31 next and would reduce the number of circuit judges so that the Commerce Court judges would be legislated out of office at once.

New Offer from City for Purchase of Seattle, Renton & Southern Railway.—Agreeing to pay \$1,400,000 for the property of the Seattle, Renton & Southern Railway, provided that the rate of interest on the deferred payments is reduced from 6 per cent to 5 per cent, the city utilities and finance committees of the City Council of Seattle, Wash., recently submitted a new proposition to the receivers of the company. Scott Calhoun, one of the receivers of the company, has agreed to place the new offer before the bondholders of the company and will report to the utilities and finance committees shortly.

Petition for Compulsory Extension in Seattle.—An appeal which it is intended to carry to the State Public Service Commission for an order directing the Puget Sound Traction, Light & Power Company, Seattle, Wash., to extend its lines from Seattle Boulevard to Holgate Street on Fourth Avenue South, has been referred by the corpora-

tion counsel to the City Council for approval. Property owners on Fourth Avenue South and the owners of mercantile and manufacturing establishments appealed to the company to construct this extension, and, failing, they have placed the matter before the City Council.

Proposed Service Between Buffalo and Attica.—Residents of Batavia have called the attention of officials of the Central Railway of New York to the feasibility of operating an out-of-town connection to Buffalo over the Buffalo, Attica & Arcade Railroad, which is a leased line of the New York Central. It is not improbable that the Central Railway will devise plans for the operation of such a line with an Edison-Beach storage battery car. E. G. B. Fox, New York, engineer of the Central Railway, is expected to visit Batavia to report on the plan. The car will enter Buffalo over the tracks of the Buffalo & Williamsville Electric Railway at North Main Street.

Steam Road Electrification Ordinance Held Up by Chicago City Council.—The ordinance submitted to the Chicago City Council last spring, which contained provisions for the electrification of the railroad terminals and the abatement of the smoke nuisance, was again referred to committee for further investigation and recommendations. This action was taken owing to a protest raised by five organizations representing more than 55,000 members, all of whom are railroad employes in and around Chicago. They charge that the ordinance is unfair to them as compliance with its provisions would endanger the lives of railroad employes and cause many of them to lose employment because of the change from steam to electricity.

Decision in Cincinnati Extension Case.—The Ohio Supreme Court has affirmed the decision of the Hamilton County Court in which David L. Carpenter and others were granted a perpetual injunction against the Cincinnati Traction Company to prevent an extension of the Avondale Street railway line out Paddock Road to Bond Hill. When consents of property owners on Paddock Road could not be secured the City Council resorted to the expedient of changing the name of the thoroughfare from Clinton Springs Avenue to the Norfolk & Western Railway to Reading Road. Consents of a majority of property owners on the newly named streets were then obtained. The courts decided that the act of Council was not made in good faith, but to further a plan to deprive the property owners of their rights.

Franchise Negotiations Later in Toledo.—Henry L. Doherty, of Henry L. Doherty & Company, New York, N. Y., who control the Toledo Railways & Light Company, is quoted in part as follows by the Toledo *Blade* in regard to the plans for developing the property and the prospects in regard to negotiations with the city for a new franchise: "We are in no hurry about the franchise. We want time to show the residents of Toledo what we can do. In a sense the new ownership of the Toledo street railway properties is on probation. I believe that a public utility should be so developed and operated as to give the community which it serves the greatest possible benefits, and when the highest possible efficiency has been reached in this respect, we may naturally expect courtesies in return on the part of the city. The new management is doing some improving, but definite plans for larger betterments of the Toledo properties have not been worked out."

Plans for Civic Lines from Toronto to Port-Perry.—Blueprints of the proposed civic radial line to run from Toronto to Port Perry have been distributed among the various municipal councils representing the townships which will be served by the system. J. O. McCarthy, chairman of the permanent committee of the various municipalities, arranged a conference with Adam Beck to discuss the proposed plans. Mr. Beck stated that the Hydro-Electric Power Commission of Ontario is now prepared to deal with the question. The principal problem is that of securing an entrance into Toronto. Under present conditions the proposed line could not operate beyond Danforth Avenue, where a connection could be made with the Toronto civic line. This would necessitate the payment of a fare to the Toronto Railway to travel to the business section. The chairman pointed out that if the negotiations for the purchase of the property of the Toronto Railway are concluded by the city it would be possible to eliminate the second fare.

Financial and Corporate

Stock and Money Markets

October 8, 1913.

A short reaction occurred in the New York stock market to-day, bringing prices of prominent issues down a point or more. New low points were reached by noon, but they seemed to be the result of raiding rather than of liquidation. The only buying in the late afternoon represented the covering of shorts. The sale of bonds also showed a decline in volume. Rates in the money market to-day were: Call, 3½ @ 4 per cent, ruling rate 4 per cent; sixty days, 3¾ @ 5 per cent; ninety days and four months, 4½ per cent; five and six months, 5 per cent.

The Philadelphia market showed a continued weakness to-day and was dull and featureless to the end of the fourth hour. Trading ended quiet without material price changes.

Lower levels were established in the Chicago stock market to-day. Bonds also were frequently off.

After a firm start, weakness developed on the Boston Stock Exchange to-day, and during the remainder of the session irregularity was shown.

Fair activity was developed on the Pittsburgh stock market to-day, while no material changes at all were recorded in the Cincinnati market.

Quotations of traction and manufacturing securities as compared with last week follow:

	Sept. 30	Oct. 8
American Brake Shoe & Foundry (common).....	90	90¼
American Brake Shoe & Foundry (preferred).....	131½	131
American Cities Company (common).....	36	36
American Cities Company (preferred).....	66	65
American Light & Traction Company (common).....	353	353
American Light & Traction Company (preferred).....	105	105
American Railways Company.....	39¾	39
Aurora, Elgin & Chicago Railroad (common).....	41	41
Aurora, Elgin & Chicago Railroad (preferred).....	83	82½
Boston Elevated Railway.....	86½	86
Boston Suburban Electric Companies (common).....	7	*7
Boston Suburban Electric Companies (preferred).....	56½	*56½
Boston & Worcester Electric Companies (common).....	*10	*10
Boston & Worcester Electric Companies (preferred).....	43	*43
Brooklyn Rapid Transit Company.....	89	87
Capital Traction Company, Washington.....	115	115
Chicago City Railway.....	150	160
Chicago Elevated Railways (common).....	20	25
Chicago Elevated Railways (preferred).....	75	75
Chicago Railways, ptcptg., ctfr. 1.....	93	95½
Chicago Railways, ptcptg., ctfr. 2.....	30	28½
Chicago Railways, ptcptg., ctfr. 3.....	8	7¾
Chicago Railways, ptcptg., ctfr. 4.....	3	2½
Cincinnati Street Railway.....	107½	108
Cleveland Railway.....	102½	103½
Cleveland, Southwestern & Columbus Ry. (common).....	*5½	*5½
Cleveland, Southwestern & Columbus Ry. (preferred).....	*28¼	*28¼
Columbus Railway & Light Company.....	18	18
Columbus Railway (common).....	69½	*69½
Columbus Railway (preferred).....	88	88
Denver & Northwestern Railway.....	*104	*104
Detroit United Railway.....	69	69
General Electric Company.....	146¼	143
Georgia Railway & Electric Company (common).....	117	*117
Georgia Railway & Electric Company (preferred).....	87	*87
Interborough Metropolitan Company (common).....	15¾	15¼
Interborough Metropolitan Company (preferred).....	61¾	61¾
International Traction Company (common).....	*30	*30
International Traction Company (preferred).....	*95	*95
Kansas City Railway & Light Company (common).....	*22	*22
Kansas City Railway & Light Company (preferred).....	30	*30
Lake Shore Electric Railway (common).....	*5	*5
Lake Shore Electric Railway (1st preferred).....	*89	*89
Lake Shore Electric Railway (2d preferred).....	*24	*24
Manhattan Railway.....	133	128
Massachusetts Electric Companies (common).....	13¾	13
Massachusetts Electric Companies (preferred).....	67	68
Milwaukee Electric Railway & Light Co. (preferred).....	95	*95
Norfolk Railway & Light Company.....	*27½	*27½
North American Company.....	72	71
Northern Ohio Light & Traction Company (common).....	63	63
Northern Ohio Light & Traction Company (preferred).....	97	98
Philadelphia Company, Pittsburgh (common).....	42¾	41
Philadelphia Company, Pittsburgh (preferred).....	40	40
Philadelphia Rapid Transit Company.....	22¾	22¾
Portland Railway, Light & Power Company.....	55	*55
Public Service Corporation.....	112	111
Third Avenue Railway, New York.....	42	40¼
Toledo Traction, Light & Power Company (common).....	30	a30
Toledo Traction, Light & Power Company (preferred).....	80	80
Twin City Rapid Transit Co., Minneapolis (common).....	105	104½
Union Traction Company of Indiana (common).....	*5	*5
Union Traction Company of Indiana (1st preferred).....	80	*80
Union Traction Company of Indiana (2d preferred).....	*20	*20
United Rys. & Electric Company (Baltimore).....	26¾	25¾
United Rys. Inv. Company (common).....	20	18
United Rys. Inv. Company (preferred).....	40	35
Virginia Railway & Power Company (common).....	53	a56
Virginia Railway & Power Company (preferred).....	94	95
Washington Ry. & Electric Company (common).....	89½	93
Washington Ry. & Electric Company (preferred).....	89½	90¼
West End Street Railway, Boston (common).....	71	*71
West End Street Railway, Boston (preferred).....	89	*89
Westinghouse Elec. & Mfg. Company.....	69¾	67
Westinghouse Elec. & Mfg. Company (1st preferred).....	110	107

*Last sale. a Asked.

ANNUAL REPORTS

Eastern Pennsylvania Railways

The consolidated statement of earnings and expenses of the Eastern Pennsylvania Railways, Pottsville, Pa., for the year ended June 30, 1913, follows:

Gross earnings.....	\$769,680
Operating expenses and taxes.....	436,004
Net earnings from operation.....	\$333,676
Deduct:	
Underlying companies' charges.....	45,148
Balance.....	\$288,528
Interest:	
Interest on bonds, loans and rentals of Eastern Pennsylvania Railways.....	170,155
Surplus.....	\$118,373

John H. Pardee, president of the company, says in part:

"Compared with the year ended June 30, 1912, the gross earnings for the fiscal year show an increase of \$70,374, or 10.06 per cent; the operating expenses were reduced \$2,589, or 0.59 per cent; the net earnings from operation increased \$72,963, or 27.96 per cent, while the net profit for the year increased \$71,906. The earnings of the railway department showed an increase of \$45,202. The electric department earnings increased \$27,210. The earnings of the gas department increased \$743 and the park earnings decreased \$2,782. During the year there was expended for maintenance in the railway department over \$64,000, or more than 10 per cent of the gross earnings of that department.

"During the year your company acquired the entire outstanding capital stock of the Edison Electric Illuminating Company, Ashland, Pa., which has since been merged with the property of the Eastern Pennsylvania Light, Heat & Power Company. It is expected that the acquisition of this property will add materially to the earnings of the lighting department of the company.

"There was certified by the trustee under the mortgage of your company \$263,500 face amount of the first mortgage 5 per cent gold bonds to reimburse the company for amounts expended from its earnings for improvements, betterments and extensions to its properties. Of this amount \$6,000 was given in part payment of the stock of the Edison Electric Illuminating Company, Ashland, Pa., above mentioned; the remainder is held in the company's treasury, making a total of \$409,000 now held in the treasury.

"A new turnout in Tamaqua, known as the Armory Turnout, was completed. Mining conditions necessitated the relocating of 1400 ft. of track on the Nesquehoning Mountain. There were 11,014 ties used in maintenance and 3071 in new construction. Thirteen thousand five hundred and sixty feet of new No. 4/0 grooved trolley wire was strung, replacing old wornout No. 2/0 wire. We laid 2800 ft. of new 70-lb. high 'T' rail on Dock Street, Schuylkill Haven, and the street was paved with stone, concrete and brick for a width of 18 ft. The double track on the Tumbling Run Division, a distance of 1 1/6 miles, was widened to permit the use of larger equipment."

New York, New Haven & Hartford Railroad

The annual report of the New York, New Haven & Hartford Railroad system for the year ended June 30, 1913, made public on Oct. 6, shows a deficit in the general income account of \$4,127,632. The operating revenues of the system amounted to \$95,190,466 and the operating expenses to \$65,694,517. The net revenue derived from outside operations was \$641,061, making the net revenue for the system \$30,137,009. Taxes paid during the year were \$5,062,683, leaving an operating income of \$25,074,326. The income derived from other sources, such as dividends, interest, rentals, etc., was \$4,979,409.42 and deductions from income on account of interest, rentals, etc., were \$22,394,337, leaving a net income for the year of \$7,659,397. There was paid out in dividends on the stock of the New York New Haven & Hartford Railroad and on the stock of subsidiary companies held by the public a total of \$11,787,030, making a deficit on the year's operations of \$4,127,632.64.

In referring to these figures President Howard Elliott says that while the earnings for the first few months of the fiscal year were highly encouraging, "being the greatest

in the history of the company for a similar period, the net results for the year compared with 1912 show a large decrease, due to heavier operating expenses, which reflect principally the expenditures made by the company to put the property and equipment in better condition to handle business safely and promptly and to pay increased wages.

Speaking of the company's general policy, Mr. Elliott says in part:

"The past year marks the completion of a period in which your directors and management deemed it essential, for the protection of its lines and the enlargement of its business and to serve effectively the public and develop the New England States by a comprehensive transportation system operated co-operatively with your railroad, to adopt the policy of acquiring an interest in various transportation lines adjacent to and serving the territory in which your railroad is located. These acquisitions, in the opinion of your board, were legally made, and after due consideration that they were for the best interests of the company and the public, which is the only source from which its revenues are derived, but your company has no desire to retain these investments except in conformity with law and sound public policy. During the same period the company was also confronted by very large reconstruction outlays for the electrification of the important section of the system terminating in the Grand Central Station, New York City, for new equipment and facilities, larger and heavier bridges and other structures, as shown in the annual statements to the stockholders. In the opinion of your management all of these steps were necessary and advisable for the internal development of the territory in which your lines are located and to handle increased local and through traffic with safety, economy and expedition and enable your company properly to discharge its duty to the shippers and the public. It could not with any certainty be expected that this company, or any other, could make expenditures of this extraordinary character produce immediate results in the shape of increased profits, but undoubtedly they will have the effect of attracting more traffic to your lines, strengthening the company's position and utility as a large transportation system and eventually will produce satisfactory and permanent returns."

Referring to the electrification policy, the report says:

"Your company was the pioneer in adopting the overhead single-phase system of electrification on a long-distance steam railroad for freight as well as passenger traffic. It has constructed the first important freight yard in the world for electrical operations, this being essential for the freight as well as the passenger traffic, because of the legislation requiring your company and others to electrify their tracks and stations in the city of New York. While the operation of freight trains by electricity has many problems still to be solved, in order to demonstrate beyond a doubt the adaptability of electricity for freight yard and shifting service, these large electrification outlays have been beneficial not only in relieving passenger terminal congestion in New York City but in making it possible for your company to move more and heavier passenger trains on its main line between that city and New Haven."

The work of electrifying the main line tracks from Stamford to New Haven, according to the report, is sufficiently advanced to permit electric operation early in 1914. This work was seriously delayed on account of strike and flood conditions. New equipment to the value of \$4,268,385, an increase of nearly 33 1/3 per cent, has been purchased during the year, the entire amount being charged to equipment account.

Concerning the New York, Westchester & Boston Railway the report says that the business of this company has shown a satisfactory increase month by month and that it is now handling at the rate of 3,000,000 passengers per year. It is estimated that considerable revenue will be received from the freight service inaugurated during the year and by a contract lately entered into with the Adams Express Company granting this company express privileges over its lines. The earning power of this subsidiary, it adds, cannot be fully demonstrated until various connections with the New York City transportation lines are completed.

The gross earnings of the New York, Westchester &

Boston Railway for the year were \$290,000; expenses, \$470,000; fixed charges, \$1,130,000, and the deficit from operation, \$1,405,000. The Berkshire Street Railway was operated at a deficit of \$92,000. The Connecticut Company had a surplus of \$109,000 after the payment of \$1,500,000 in dividends. The Millbrook Company lost \$180,000. The New York & Stamford Railway lost \$36,000, but the Rhode Island Company earned \$670,000 over interest charges. The deficit of the Westchester Street Railroad was \$55,000.

Questions and Answers Under Uniform System of Accounts

Another series of tentative answers to questions raised in connection with the uniform system of accounts established by the Interstate Commerce Commission is published below. Agreement on these answers, as on those published previously in the *ELECTRIC RAILWAY JOURNAL*, has been reached by members of the committee on a standard classification of accounts of the American Electric Railway Accountants' Association and representatives of the commission. As these answers have not yet received the formal approval of the commission, however, it should be understood that the decisions do not represent its final conclusions and that they are subject to such revision as may be thought proper before final promulgation in the accounting bulletins of the commission.

Q. What account should be charged with the cost of caring for switch lamps, including cleaning, lighting and filling with oil?

A. Operating Expense Account No. 68, "Operation of Signals and Interlocking Systems."

Q. To what account should the cost of keys for switch locks be charged?

A. Operating Expense Account No. 63, "Miscellaneous Car-Service Expenses."

Q. What accounts should be charged with the cost of repairs to switch stands, locks, targets and lamps?

A. The cost of repairs to switch stands and locks should be charged to Operating Expense Account No. 6, "Special Work," and that of targets and lamps to Account No. 17, "Signal and Interlocking Systems."

Q. To what account should the cost of driving a well to furnish water for condensers be charged?

A. Account No. 24, "Power Plant Buildings," in the classification of "Expenditures for Road and Equipment of Electric Railways."

Q. What account should be charged with the cost of restoring a trestle destroyed by fire in excess of the amount of insurance recovered?

A. Operating Expense Account No. 15, "Bridges, Trestles and Culverts," except that any excess in the cost of the new trestle over the cost of the old as carried in the construction accounts should be charged to Road and Equipment Account No. 15, "Bridges, Trestles and Culverts."

Q. An electric railway company is required to lay improved paving and before doing so puts its tracks in good repair. What accounts should be charged with the cost of the track work and of the paving?

A. The cost of labor and material used in the track work should be charged to the appropriate operating expense accounts. The excess cost of the new and improved paving over the original cost (estimated, if not known) of the paving replaced should be charged to Road and Equipment Account No. 10, "Paving," and the remainder of the cost to Operating Expense Account No. 9, "Paving."

Q. What disposition should be made of charges for depreciation made to cover the entire period from the beginning of a company's operations to the present?

A. Such portion of the charges as apply to periods prior to the current fiscal year should be included in profit and loss, while the operating expense accounts should be adjusted to cover the monthly charges applicable since the beginning of the fiscal year.

Q. What account should be credited with the value of the scrap recovered in making renewals of trolley brackets not to be sold until later, perhaps after the close of the fiscal year?

A. The estimated salvage value should be credited to the appropriate operating expense account at the time of their removal. Any adjustment necessary when the material is sold should also be made through operating expenses.

Q. What account should be credited with the revenue derived from the sale of berths in sleeping cars operated in electric railway trains?

A. Operating Revenue Account No. 3, "Parlor, Chair and Special Car Revenue."

Q. To what account should be charged the wages of persons engaged in checking up the riding on various routes with a view to changing the schedules?

A. Operating Expense Account No. 48, "Superintendence of Transportation."

Valuation of Iowa Interurban Railways

The forty-second annual report on the assessed valuation of railroad, equipment and express companies' property in the State of Iowa, compiled by the Executive Council, includes a tabulation of valuations for the principal electric interurban railways in the State as follows:

Names of Systems and Divisions	Total Miles of Road	Assessed Valuation
Albia Interurban Ry.....	10.00	\$25,000
Cedar Rapids & Marion City Ry.....	17.49	148,665
Centerville Light & Traction Co.....	7.84	23,520
Charles City Western Ry.....	16.33	32,660
Davenport & Muscatine Ry.....	25.27	75,810
Fort Dodge, Des Moines & Southern R.R.....	159.10	395,040
Inter-Urban Ry.....	64.18	224,630
Iowa & Illinois Ry.....	33.05	122,285
Iowa Railway & Light Co.....	31.22	115,514
Mason City & Clear Lake Traction Co.....	14.62	65,790
Oskaloosa & Buxton Electric Ry.....	2.30	8,510
Waterloo, Cedar Falls & Northern Ry.....	67.59	304,155

The report also contains the following abstract of the financial reports of the electric interurban railways for the year ended Dec. 31, 1912:

Names	Gross Earnings	Operating Expenses	Net Earnings
Albia Interurban Ry.....	\$31,197	\$19,136	\$12,062
Cedar Rapids & Marion City Ry....	269,895	162,617	107,277
Centerville Light & Traction Co....	45,705	24,879	20,826
Charles City Western Ry.....	37,115	38,227	*1,111.81
Davenport & Muscatine Ry.....	12,955	5,897	7,057
Fort Dodge, Des Moines & Southern R. R.....	649,679	522,163	127,516
Inter-Urban Ry.....	299,819	207,086	92,732
Iowa & Illinois Ry.....	187,743	129,235	58,506
Iowa Railway & Light Co.....	232,519	147,438	85,085
Mason City & Clear Lake R. R.....	109,790	58,126	51,664
Oskaloosa & Buxton Elec. Ry.....	9,115	7,875	1,239
Waterloo, Cedar Falls & Northern Ry.....	369,631	163,827	205,803
Totals for the State.....	\$2,255,163	\$1,486,503	\$768,659

* Deficit.

Progress of Second Avenue Railroad Receivership

The Second Avenue Railroad, New York, N. Y., which has been operated by a receiver since the fall of 1908, has extended for another year the \$3,140,000 of 5 per cent receiver's certificates which matured on Oct. 1. It is stated by bankers interested in the company that steps toward the reorganization of the company will be taken within the next year. The Second Avenue Railroad is the most important subsidiary of the old Metropolitan Street Railway that has not been reorganized and placed on a permanent basis.

For the year ended June 30, 1913, the surplus earnings of the company after the payment of charges, including the interest on the receiver's certificates, is estimated at \$55,756, compared with \$33,027 for the previous year. The special franchise tax, which is in litigation, is not included in the charges, nor is interest on the \$5,631,000 of 5 per cent consolidated first gold 5's and the \$80,000 of 5 per cent debentures. The record of results for the past four fiscal years is as follows:

Year	Gross Earnings	Surplus After Charges
1913.....	\$1,032,467	\$55,756
1912.....	975,016	33,027
1911.....	890,062	* 14,277
1910.....	829,403	* 1,680

* Deficit.

The Guarantee Trust Company, New York, N. Y., is offering for sale at 99 $\frac{3}{4}$ and interest, yielding 6 $\frac{1}{4}$ per cent, one-quarter of the entire issue of \$3,140,000 of 6 per cent receiver's certificates, the remaining three-quarters of which have already been sold at private sale. The certificates are dated Oct. 1, 1913, due Oct. 1, 1914, and are in coupon form, \$1,000 par value each. They are a first and paramount lien on all the property of the company and are issued under an order of the Supreme Court of New York author-

izing \$3,200,000 to refund the amount of \$3,140,000 originally maturing on Oct. 1, 1913, the remainder being held in reserve for future orders from the court. The court expressly provides that no additional receiver's certificates can be issued on the company's property unless they shall be subordinate to the lien of these \$3,200,000 of certificates or unless this issue be expressly provided to be discharged in full out of the proceeds of such additional certificates. The principal items of the property subject to the lien of these certificates, according to recent appraisements by the engineers of the Public Service Commission, are valued at \$5,748,271.

Brooklyn & North River Railroad, Brooklyn, N. Y.—The Brooklyn & North River Railroad has applied to the Public Service Commission of the First District of New York for the authorization of the issue of \$500,000 of capital stock. Another application has been also made by the New York Railways, the Coney Island & Brooklyn Railroad, the Third Avenue Railway, the receiver of the Dry Dock, East Broadway & Battery Railroad, the Brooklyn Heights Railroad and the Nassau Electric Railroad for permission to purchase all this stock, as soon as it is issued, and to divide it among themselves, according to the proportions to which the companies have agreed. Then the new company seeks the approval of the commission to exercise the franchise granted it by the Board of Estimate on Sept. 9. The hearing before the commission has been set for Oct. 15.

Brooklyn (N. Y.) Rapid Transit Company.—Up to Sept. 8 \$11,733,000 of Brooklyn Rapid Transit Company first re-funding convertible 4 per cent bonds have been exchanged par for par for Brooklyn Rapid Transit stock. In the ELECTRIC RAILWAY JOURNAL of May 10, 1913, note was made of the fact that up to that time the holders of \$2,130,000 of these bonds had exercised their right to exchange the bonds for the stock. At present there is left \$23,106,000 of the bonds still outstanding in the hands of the public, and approximately \$16,000,000 additional issued and in the hands of the company, pledged as collateral in the treasury or reserved to retire bonds of constituent companies. Conversion during the past five weeks has amounted to approximately \$4,000,000. As a 6 per cent return is received on the stock against only 4 per cent on the bonds, and as the conversion privilege, which expires July 1, 1914, makes the bonds sell at least 7 points above a normal investment level, as indicated by other Brooklyn Rapid Transit bonds, it is to be expected that most of the remaining bonds will be turned in for stock before the privilege expires.

Detroit (Mich.) United Railways.—Macpherson, Weiss & Company, auditors, on the basis of business in the past, estimated some weeks ago that the percentage of increase of passengers carried by the Detroit United Railway in the last six months of 1913 would be slightly more than 18 per cent over the same period of 1912. For the first month that seven tickets were sold for a quarter, Aug. 15 to Sept. 14, inclusive, 18,897,980 revenue passengers were carried and for the same period last year 15,853,580, an increase of slightly over 19 per cent. For the first month of the seven-for-a-quarter tickets the revenue from passengers carried amounted to \$694,634 and for the same period last year \$695,271. While the company carried about 3,000,000 passengers more than in the same period last year the receipts from the passengers fell behind \$637.

Electric Properties Company, New York, N. Y.—The plan for the reduction and readjustment of the capital stock of the Electric Properties Company, referred to in the ELECTRIC RAILWAY JOURNAL of Aug. 23, 1913, has been accomplished by the reincorporation of the enterprise under the laws of Virginia under the name of the Electric Properties Corporation. The new company has the same assets as the old, except the \$298,258 of cash, which is to be distributed on account of accumulated and unpaid dividends upon the preferred stock of the old company. The preferred stock of the new company is the same as that of the old, but the common stock has been reduced from \$6,000,000 to \$4,000,000. Holders of certificates of deposit are requested to surrender them immediately to the Equitable Trust Company, New York, N. Y. Upon such surrender they will receive cash or new securities as follows: For old preferred stock, certificates of an equal amount of new preferred stock and

cash obligations of the new company aggregating an amount equal to the dividends accumulated and unpaid on the old preferred stock to Sept. 1, 1913, and for old common stock, certificates for new common stock at the rate of two shares of the new for three shares of the old. Fractional interests in common stock of the new company will be adjusted by the depository for the account of the committee until Nov. 1, 1913, on the basis of \$21 per share.

Halifax (N. S.) Electric Tramway.—The Board of Commissioners of Public Utilities has refused to grant the application of the Halifax Electric Tramway to issue \$600,000 of new capital, mentioned in the *ELECTRIC RAILWAY JOURNAL* of Sept. 6, 1913. Permission was received by the company to amend the application and present it at a later date. The board declared that while reluctant to hamper the financing of any public utility, in the present case it has not information enough to satisfy it as to the propriety of the proposed plan.

Interborough Rapid Transit Company, New York, N. Y.—J. P. Morgan & Company, New York, N. Y., announced on Oct. 1, 1913, that a syndicate headed by Lee, Higginson & Company, Harris, Forbes & Company and Kissel, Kinnicutt & Company had purchased a large block of the new Interborough Rapid Transit Company first and refunding mortgage fifty-three-year 5 per cent bonds. The proceeds of this sale will be used to retire the balance of the \$33,000,000 issue of the Interborough Rapid Transit Company first mortgage forty-five-year 5 per cent bonds, called for payment on Nov. 1 next, and for carrying on construction work upon the new subway. The new bonds, in addition to being secured on property in which the city of New York will have an investment estimated at more than \$66,000,000, will be protected by unusually strong sinking fund provisions. Beginning July 1, 1918, the company will set aside every six months a sum equal to one-half of 1 per cent of the par value of the bonds issued and outstanding, including bonds held in the sinking fund. The sinking fund will buy bonds at not exceeding 110 and interest, and bonds held by the sinking fund will be kept alive. The sinking fund payment for the first year will exceed \$1,600,000, and by accumulation the annual income of the sinking fund to be used for the purchase of bonds will increase from \$1,600,000 the first year to about \$10,000,000 in 1958.

Milwaukee Northern Railroad, Cedarhurst, Wis.—The Milwaukee Northern Railroad has been authorized by the Railroad Commission of Wisconsin to issue \$95,500 of 5 per cent bonds, the proceeds to be used to reimburse the company for expenditures made for the improvement and extension of its interurban lines.

Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, Minneapolis, Minn.—The Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, known as the Dan Patch Electric Line, has announced that it has leased the branch of the Chicago Great Western Railroad from Randolph to Mankato, Minn., for fifty years and expects to operate cars over the newly acquired line beginning April 1, 1914. The Dan Patch line is already operating cars over leased tracks of the Great Western Railroad between Northfield and Faribault, running trains from Minneapolis to Faribault, a distance of 52 miles. The additional leased mileage amounts to 54 miles. When the newly leased tracks are put into use it is expected that the Minneapolis terminal, which will be used jointly by the Dan Patch line and the Electric Short line, will be finished. The road is now using a station on the outskirts of Minneapolis for its terminal.

New York, Auburn & Lansing Railroad, Ithaca, N. Y.—H. W. Fitz, chairman of the reorganization committee of the New York, Auburn & Lansing Railroad, has announced that a plan of reorganization has been prepared for the company and for the Ithaca Street Railway, and has been deposited with the Columbia-Knickerbocker Trust Company, New York, N. Y.

San Diego & Southeastern Railway, San Diego, Cal.—As a result of an application made to the Railroad Commission of California by the San Diego & Southeastern Railway for authorization to issue \$600,000 of thirty-year 5 per cent mortgage bonds, the company has received permission to issue \$343,000 face value of such bonds. They

are to be issued under and in pursuance of the terms of a trust deed or mortgage to be made and executed by the company to the Bank of Commerce & Trust Company, San Diego, as trustee, on condition that the company shall sell the bonds so as to net not less than 85 per cent of the par value of the principal thereof, besides interest accrued thereon. The proceeds from the sale of the bonds is applicable only as follows: (a) The proceeds from the sale of the bonds in an amount not to exceed \$170,286 shall be expended to pay notes in the amount of \$35,000 and cash advances of \$100,978 and to reimburse the company for expenditures amounting to \$34,307 for construction and betterments made from income during the period from May 2, 1912, to Jan. 31, 1913. (b) The proceeds from the sale of the bonds not to exceed \$121,000 shall be expended for proposed additions and betterment expenditures during the year 1913 subsequent to Jan. 31, 1913.

Twin City Traction Company, Uhrichsville, Ohio.—Joint application has been made to the Public Utilities Commission by the Twin City Traction Company, operating the street railways of Uhrichsville and Dennison, and the Ohio Service Company for authority to consolidate. The Ohio Service Company proposes to purchase the holdings of the Twin City Traction Company for \$100,000, paying therefor its entire capital stock of \$30,000 and giving notes aggregating \$70,000, which are to be converted into first mortgage and refunding bonds after one year. The Twin City Traction Company represents that its outstanding capital stock is \$100,000 and that it has demand notes outstanding, aggregating \$75,000, besides unpaid current debts of \$10,736. The holders of the notes agree to accept \$70,000 in notes of the Ohio Service Company in payment of their claims and the latter agrees to pay the current debts. The plan is to connect the two street railway systems.

United Gas & Electric Corporation, New York, N. Y.—In connection with the purchase of the common stock of the American Cities Company by the United Gas & Electric Corporation Bertron, Griscom & Company, New York, N. Y., have sent a letter to common stockholders of the American Cities Company requesting that their holdings be forwarded to the Pennsylvania Company for Insurance on Lives and Granting Annuities, Philadelphia, Pa., on or before Oct. 20, for which they will receive negotiable certificates of deposit of the company just mentioned. The banking firm recommends that the stockholders of the American Cities Company deposit their stock at once, as the United Gas & Electric Company may at any time after Oct. 20 terminate its offer should it be determined that the amount of stock deposited is not sufficient to warrant its carrying out the transaction.

United Light & Railways Company, Grand Rapids, Mich.—Notice has been sent to holders of the second preferred stock of the United Light & Railways Company, asking them to exercise, within sixty days beginning Oct. 1, their option to convert their holdings into either common stock or first preferred stock, on a share-for-share basis.

United Properties Company, Oakland, Cal.—Judge Dunne of San Francisco has granted a temporary injunction to R. G. Hanford restraining the trustees of F. M. Smith from entering into an agreement with N. W. Halsey & Company to extend the time for payment of \$2,500,000 of notes of the San Francisco-Oakland Terminal Railways, a subsidiary of the United Properties Company, due last June. Mr. Hanford has an option on stock owned by Mr. Smith from the trustees of the United Properties Company and is endeavoring to form a syndicate to take over the San Francisco-Oakland Terminal Railways. The injunction was obtained on the ground that the proposed agreement between the trustees and N. W. Halsey & Company contained a clause which made the notes due and payable in event of Mr. Smith being declared a bankrupt. Mr. Hanford contends that such a provision in the agreement would make it impossible for him to complete negotiations which he has under way with a syndicate for taking over the property and that his option entitles him to purchase the property unencumbered.

Washington-Virginia Railway, Washington, D. C.—The stockholders of the Washington Utilities Company will meet on Oct. 10 to take action on a plan to re-create the Washington-Virginia Railway and restore conditions as

they existed prior to the absorption of that company by the Washington Utilities Company. This action is the outcome of the recent decision of the Public Utilities Commission of the District of Columbia on the application of the Washington Utilities Company for the right to issue \$10,000,000 of bonds, as mentioned in the ELECTRIC RAILWAY JOURNAL of July 12, 1913. The commission held that the relations of the two companies were contrary to the terms of the anti-merger law.

Dividends Declared

Green & Coates Streets Passenger Railway, Philadelphia, Pa., quarterly, \$1.50.

Massachusetts Consolidated Railways, Greenfield, Mass., one-half of 1 per cent, common.

Memphis (Tenn.) Street Railway, quarterly, 1¼ per cent, preferred.

Metropolitan West Side Elevated Railway, Chicago, Ill., quarterly, 1¼ per cent, preferred.

Milwaukee (Wis.) Northern Railway, 3 per cent, first preferred.

Ottawa (Ont.) Electric Railway, quarterly, 3 per cent.

Ottumwa Railway & Light Company, Ottumwa, Ia., quarterly, 1¼ per cent, preferred.

Rio de Janeiro Tramway, Light & Power Company, Toronto, Ont., quarterly, 1¼ per cent.

South Side Elevated Railroad, Chicago, Ill., quarterly, 1½ per cent.

Springfield & Xenia Railway, Springfield, Ohio, quarterly, 1½ per cent, preferred.

West Penn Traction Company, Connellsville, Pa., quarterly, 1½ per cent preferred.

Youngstown & Ohio River Railroad, Leetonia, Ohio, quarterly, 1¼ per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY, CLEVELAND, OHIO

Period	Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus
1 mo. August '13	\$129,052	\$70,909	\$58,142	\$32,593	\$25,549
1 " " '12	117,208	62,691	54,518	32,011	22,506
8 " " '13	824,768	495,521	329,247	252,115	77,132
8 " " '12	768,531	453,510	315,021	245,523	69,498

INTERBOROUGH RAPID TRANSIT COMPANY, NEW YORK, N. Y.

1 mo. August '13	\$2,390,387	\$1,009,329	\$1,381,058	\$1,106,447	\$274,611
1 " " '12	2,362,556	1,044,709	1,317,847	1,097,392	220,455
2 " " '13	4,774,220	2,043,239	2,730,981	2,212,665	518,316
2 " " '12	4,656,970	2,094,764	2,562,205	2,190,474	371,731

JOPLIN & PITTSBURG RAILWAY COMPANY, PITTSBURG, KAN.

1 mo. August '13	\$50,405	*\$29,295	\$21,110	\$12,542	\$8,568
1 " " '12	48,475	*25,661	22,814	12,542	10,272
12 " " '13	565,241	*336,486	228,755	150,500	78,255
12 " " '12	516,378	*301,882	214,496	154,245	60,241

LEHIGH VALLEY TRANSIT COMPANY, ALLENTOWN, PA.

1 mo. August '13	\$175,964	\$67,314	\$108,649	\$46,872	\$61,777
1 " " '12	151,181	59,037	92,144	42,089	50,055
12 " " '13	1,711,309	723,855	987,453	543,576	443,877
12 " " '12	1,459,371	635,902	823,469	492,507	330,902

MONONGAHELA VALLEY TRACTION COMPANY, FAIRMONT, WEST VIRGINIA

1 mo. August '13	\$87,561	\$31,522	\$56,038	\$25,558	\$30,480
1 " " '12	76,981	29,728	47,254	23,642	23,612
8 " " '13	610,624	212,280	398,344	194,745	203,599
8 " " '12	543,827	220,688	323,140	162,081	161,059

NEW ORLEANS RAILWAY & LIGHT COMPANY, NEW ORLEANS, LA

1 mo. August '13	\$538,354	\$300,800	\$237,554	\$209,069	\$28,484
1 " " '12	511,804	285,625	226,179	190,987	35,192
8 " " '13	4,544,294	2,402,856	2,141,438	1,616,280	528,158
8 " " '12	4,357,103	2,284,541	2,072,563	1,478,533	603,260

NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO

1 mo. August '13	\$339,306	\$188,171	\$151,135	\$60,312	\$90,823
1 " " '12	305,322	160,243	144,879	59,526	84,353
12 " " '13	2,155,676	1,305,816	853,860	463,766	390,094
12 " " '12	1,979,793	1,111,169	868,623	363,743	504,880

TWIN CITY RAPID TRANSIT COMPANY, MINNEAPOLIS, MINN.

1 mo. August '13	\$776,841	\$393,109	\$383,732	\$150,016	\$233,716
1 " " '12	716,979	354,384	362,594	142,079	219,515
8 " " '13	5,780,872	2,948,867	2,832,005	1,178,735	1,653,270
8 " " '12	5,358,228	2,758,223	2,600,005	1,141,633	1,458,372

*Includes taxes.

Traffic and Transportation

Philadelphia Re-routing Plan Results

While the great benefit of the re-routing plan of the Philadelphia (Pa.) Rapid Transit Company will not be fully evident until the entire plan is accomplished and the public becomes accustomed to the new lines of travel, it is apparent that the changes which are being made are meeting with the approval of the majority of riders. The pairing of the single-track north and south streets through the business district and the more direct routing of the former irregular lines afford to a larger number of patrons direct service from their homes to and through the entire length of the business district. The re-routing system will create sufficient reserve capacity in the delivery district to care for the future growth of those outlying districts that can be satisfactorily served by surface street car transportation. Many passengers who were formerly obliged to pay 3 cents additional for an exchange ticket will now, because of the re-routing, be carried direct to their destination for a single 5-cent fare, without the use of either an exchange ticket or transfer. In thus re-routing the cars the management has also, by establishing new transfer points, endeavored to restore the nearest possible equivalent to the former route. This has necessitated increasing the number of points at which transfers are receivable from 210, which was the number of transfer points in effect at the incoming of the Stotesbury management, to a total of 270, all of which were in effect as of the date of Oct. 5.

Pending the publication of the complete guide book containing descriptions of all lines, with index to route numbers, now in preparation for free distribution to the public, the management, for the information of its patrons and to overcome any temporary confusion due to the re-routing changes, carried in the advertising sections of all the Philadelphia newspapers of Oct. 2 a description of the routes, including the transfer privileges of all the lines as re-routed to Oct. 1.

Hearing on Lynn-Salem Fares

The Massachusetts Public Service Commission gave a hearing on Oct. 1 upon the petition of various citizens of Lynn and Salem for the establishment of a 5-cent fare on the lines of the Bay State Street Railway. The petitioners contended that there is a large interurban travel over the two routes in question and that the distance of 5 miles between the centers of the two cities warrants the proposed 5-cent rate. For the company, James F. Jackson pointed out that the conditions on the Lynn-Salem lines are practically unchanged since 1909, when the former Railroad Commission ruled that the existing 10-cent fare was in no degree unreasonable in view of the company's investment in the line and the density of traffic which prevailed. He pointed out that transfer privileges at each end of the routes enable a passenger to travel 9 or 10 miles for 10 cents, or from any point in Lynn to the center of Beverly, beyond Salem. As former chairman of the board Mr. Jackson had voted that petitioners on fare matters almost invariably overlook the increased length of ride afforded on transfers, a point of great importance in considering the service rendered for a given fare. It was shown that although the company charges a 5-cent fare for the 5-mile trip between Salem and Peabody, no transfer privilege is included. Superintendent Gray, of the Lynn and Salem lines, stated that the traffic over the Highland Avenue cut-off line between Salem and Lynn is made up of a large proportion of through passengers between Salem and Boston and that the volume of local business on this route is comparatively small. Already a workingman's rate of 7 cents during morning and evening rush hours applies on the Highland Avenue line, and a similar 5-cent rate is granted on the other Lynn-Salem route. Chairman McLeod closed the hearing after stating that unless fresh evidence is presented by the petitioners to add further strength to their case the board can see no reason for requiring the company to alter its rates.

Prize Contest of Illinois Traction System

The Illinois Traction System has extended an invitation to persons in Illinois to suggest three words beginning consecutively with the letters "I. T. S." and expressing in a terse phrase what the company stands for in the transportation world. In this connection it arranged for a "phrase contest" to be held during the State Fair at Springfield, Oct. 3-11.

During the fair the company maintained on the grounds a building in conjunction with the information bureau of the State Board of Agriculture, at which representatives of the company received the written suggestions of participants. Cash prizes were offered for the three best suggestions as follows: First, \$25; second, \$15; third, \$10. A committee of capable newspaper men will select the most available suggestions and will report their selections to the company. The only requirement is that the person entering the contest make the trip to the State Fair over the lines of the company. Slips to be used in offering suggestions were supplied at the fair grounds, and the suggestions were deposited in a sealed box at the building of the company upon exhibiting the return portion of a round-trip ticket from any point to Springfield over the lines of the Illinois Traction System.

Elaborate preparations were made by the company to handle fair traffic this year. Augmented schedules were arranged, and the usual low rates prevailed. The block signal and safety devices which the company has installed were demonstrated at its building on the fair grounds.

Preliminary Expenditure Authorized in Toronto Safety Campaign.—The Ontario Safety League, which aims to educate the public to avoid street accidents, at a meeting held on Sept. 30 approved \$7,540 in estimates for the first six months' campaign. The campaign committee was ordered to expend \$1,000 at once. It is estimated that \$20,000 will be required for the first year's work.

Increase in Wages on Canadian Line.—The Lethbridge Municipal Railway has adopted the following wage schedule for motormen and conductors: First six months, 25 cents an hour; second six months, 28 cents an hour; second year, 30 cents an hour; third year, 32 cents an hour. On public holidays the men are paid time and a half, and on Sundays receive nine hours' pay for seven and a half-hours' work.

Complaint Against New York Roads Closed.—The Public Service Commission of the Second District of New York has entered an order closing upon its records the complaint of the Board of Supervisors of Chautauqua County against the Buffalo & Lake Erie Traction Company and the Chautauqua Traction Company with reference to the lack of connections between cars of the company at Westfield, N. Y. A satisfactory connection between cars of these two lines has been agreed upon by the two companies.

Near-Side and Far-Side Stops in Detroit.—Some time ago the Detroit (Mich.) United Railway asked the people to decide whether they wanted near-side or far-side stops. In spite of the heavy balloting the issue remains undecided. First, the far-side gains a lead of a few and then it is supplanted by the near-side. The vote has not indicated any general uprising against the near-side stop, although, on the other hand, it has developed many warm advocates of the far-side stop. To give further opportunity for expression of opinion the ballot has been reprinted.

Vote in Favor of the "Skip-Stop" Idea in Denver.—Patrons of the Colfax lines of the Denver (Col.) City Tramway are overwhelmingly in favor of the "skip-stop" system of scheduling cars for that section. John A. Beeler, general manager of the company, reports the result of a postal card investigation made by the company among patrons of the lines. Those favoring the new plan were seven to one for it when the cards were counted. The answers to the original circular letter announcing the plan were overwhelmingly in its favor. The skip-stop plan, as followed in Denver, was described on page 857 of the issue of this paper on May 10, 1913.

Safety Campaign in Schools of Buffalo.—With the opening of the public schools, the International Railway, Buffalo, N. Y., has entered again upon its campaign for the safety of school children which was carried on with good results last spring. The company's lecturers are being sent

to the various grammar and high schools throughout the city and are teaching the students "don'ts" in connection with street car traffic and crossing streets during the rush hours. The superintendent of education and the public instruction department of the city are co-operating with the company. Large placards with series of "don'ts" are posted in the coat rooms of the schools.

Toilets in Interurban Cars.—As a result of an application made to the Railroad & Warehouse Commission of Illinois by the Alton, Granite & St. Louis Traction Company, the order of Sept. 16, 1912, requiring the railway company to provide toilets and drinking water on its interurban cars was modified on July 8, 1913. As amended the last section of the order required the Alton, Granite & St. Louis Traction Company to install in its interurban cars suitable toilets for the accommodation of passengers, it being provided, however, that this order should not apply to cars operating a less distance between termini than 16 miles or to cars operated in other than regular schedule service.

Freight Service Between Rochester and Lockport.—Freight service between Rochester and Lockport has been inaugurated by the Buffalo, Lockport & Rochester Railway, Rochester, N. Y. H. J. Clark, traffic manager of the so-called Beebe lines, says that from the time the Buffalo, Lockport & Rochester Railway was opened for traffic, it has had complete equipment for handling freight matter, but the question of terminal facilities and traffic agreements at Rochester and Lockport was not settled until recently. Tariffs naming class and commodity rates similar to those which apply to the Empire United Railways have been filed with the Public Service Commission of the Second District.

Company's Answer Filed in Seattle Fare Case.—James B. Howe, counsel for the Puget Sound Traction, Light & Power Company, Seattle, Wash., has filed an answer to the petition of the city to the Public Service Commission for an order to direct the company to sell car tickets on all its Seattle cars at the rate of six for 25 cents and twenty-five for \$1. The franchise under which the company operates provides that tickets shall be sold at certain of the company's offices and at other locations but does not require the sale of tickets on cars. Mr. Howe makes it plain that he does not waive his right to urge a motion which he proposes to make to the commission at an early session to dismiss the petition.

Through Service Demanded on Unprofitable Kansas City Line.—The Missouri State Public Utilities Commission, after hearing requests of Fairmount Park residents at Kansas City for through car service during the winter months, adjourned until Oct. 10, when the hearing will be resumed. Robert J. Clark, comptroller of the Metropolitan Street Railway, offered figures showing that the company loses about \$6,000 monthly during the winter by running to Fairmount Park. The company has heretofore operated a dummy service after the park closes. Twenty dummy tickets are sold for 50 cents, only those without tickets being forced to pay the regular fare of 5 cents. Residents of Fairmount Park want through service, or at least transfer service.

Brief Filed in Washington Fare Case.—The Capital Traction Company, Washington, D. C., has filed its brief in the case of S. T. J. Price and others against the Washington & Old Dominion Railroad and the Capital Traction Company, in which the complainants are seeking a reduction of rates from stations on the Great Falls line to Thirty-sixth and M Streets Northwest. The company declares that an agreement between it and its co-defendant calls for an exchange of passengers by transfer and that the slips are redeemed at 2½ cents each. The company says in its brief: "It is respectfully submitted that in no event would the Interstate Commerce Commission have jurisdiction to pass any order affecting the Capital Traction Company, which is admittedly purely an urban railroad. Without undertaking any extended argument or the citation of any other authority, it is deemed sufficient to refer to the very recent case of the Omaha & Council Bluffs Street Railway against the Interstate Commerce Commission, decided by the Supreme Court of the United States on June 9, 1913."

Personal Mention

Mr. John Pearson, formerly assistant superintendent of the Hamilton (Ont.) Street Railway, has been appointed superintendent to succeed the late Duncan Miller.

Mr. Leon Snyder has been appointed assistant division superintendent of the Baker, Sherman, Harper, Springwells and Chene extension lines of the Detroit (Mich.) United Railway to succeed Mr. Boyd S. Brown, resigned.

Col. Harry C. Trexler, who has been elected chairman of the board of the Lehigh Valley Transit Company, Allentown, Pa., was vice-president of the company during the connection of Mr. R. P. Stevens with it. He was elected president of the company on its re-organization and held that place for a year, being succeeded by Mr. Stevens, who resigned from the company recently. Colonel Trexler is president of the Lehigh Portland Cement Company, Allentown, and senior partner of the Trexler Lumber Company, Allentown, Pa., and Newark, N. J.

Mr. Norman McD. Crawford, the retiring president of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, and its subsidiaries, was the guest at a farewell banquet tendered to him on the evening of Sept. 29 by the officers of the companies and the employees. Among the speakers were Mr. Crawford, Mr. J. F. Wessell, general manager of the company; Mr. G. J. A. Paul, general superintendent; Mr. M. E. McElligott, chief clerk; Mr. R. A. Sauce, representing the trainmen, and Mr. Thomas Bannon. Mr. Crawford was presented with a watch and chain and a diamond stickpin by the employees as tokens of esteem.

Mr. Harrison R. Fehr, whose election as president of the Lehigh Valley Transit Company, Allentown, Pa., to succeed Mr. R. P. Stevens was noted in the *ELECTRIC RAILWAY*

JOURNAL of Oct. 4, was born near Nazareth, Pa., in 1863, and was educated at the Moravian parochial schools in that city. For three years he taught in the public schools in Pennsylvania. In the spring of 1883 Mr. Fehr accepted a position with the engineering corps of the Lehigh Valley Railroad and later became assistant engineer. In the fall of 1891 he was elected to the office of city engineer of Easton, Pa., and occupied that position for eight years. He next engaged in engineering construction work on electric railways



H. R. Fehr

and in general contracting. In May, 1904, he was appointed general manager of the Easton Transit Company and the following year was elected as president of the company. Mr. Fehr has made an extremely successful record in the management of the property of the Easton Transit Company, which now is part of the Lehigh Valley Transit Company's system. When he took charge of the property in Easton in 1904 it was in poor physical condition and the relations of the company with the public were somewhat strained. The property has been thoroughly re-established and the administration under Mr. Fehr's direction has been so successful that dividends have been paid for several years. Mr. Fehr has spent the greater part of his life in the Lehigh Valley district and is intimately acquainted with the territory along the lines of the Lehigh Valley Transit Company. In 1911 Mr. Fehr was elected president of the Pennsylvania Street Railway Association. He is a member of the American Society of Civil Engineers.

Mr. R. P. Stevens, the retiring president of the Lehigh Valley Transit Company, Allentown, Pa., was the guest at a banquet tendered to him at the Elks' Club, Allentown, on Sept. 30 by the officers' club, an organization made up of the heads of the departments of the company. Mr. Charles N. Wagner, the secretary and treasurer of the company, acted as toastmaster and responses were made

to toasts by Mr. C. C. Collins, the traffic manager; Col. H. C. Trexler, newly elected president of the board of directors; Mr. E. M. Young, vice-president of the company, and Mr. Reuben J. Butz, attorney for the company. Mr. Butz, on behalf of the club, of which Mr. Stevens has been the head for almost six years, presented Mr. Stevens with a silver loving cup. Mr. Stevens in acknowledging the gift paid tribute to the various men in the organization and bespoke for his successor the same earnest co-operation and fealty that had been shown him. On the cup that was presented to Mr. Stevens are engraved the names of the members of the officers' club and an etching of the Eighth Street bridge appears beneath, the men considering that this marks his greatest achievement. Among those in attendance at the banquet were Mr. Charles C. M. Walters, Mr. E. C. Spring, Mr. W. W. Wysor, Mr. G. E. Miller, Mr. Harry Branson, Mr. H. L. Coker, Mr. Thomas L. Gibson, Mr. C. L. Murray, Mr. R. J. Pike, Mr. F. A. Burgess, Mr. William Trythall, Mr. J. B. Stewart, Mr. C. C. Collins, Col. H. C. Trexler, Mr. Reuben J. Butz, Mr. S. B. Stevens and Mr. R. P. Stevens.

OBITUARY

William Clark Wood is dead. Mr. Wood was president of the New York Switch & Crossing Company, Hoboken, N. J., a director of the Hoboken Trust Company, a member of the Board of Trade of that city, and interested in the development of the street railway properties in Catskill, N. Y. At his works at Hoboken Mr. Wood manufactured a great deal of track material for electric railways. Previous to his establishment of the New York Switch & Crossing Company, some twenty years ago, Mr. Wood was connected with the Lewis & Fowler Girder Rail Company, formerly of Brooklyn.

William M. Larned, the engineer who had charge of the construction of most of the Geary Street Municipal Railroad, San Francisco, Cal., and who designed the cars and equipment for that system, succumbed to an attack of pneumonia in San Francisco on Sept. 20, 1913. For many years Mr. Larned was chief draftsman for the United Railroads of San Francisco and left that position to accept the appointment of assistant city engineer. He designed the reinforced concrete cisterns which form an important part of the city's auxiliary water supply system for fire protection and helped to select the route for the municipal railway. Mr. Larned was a native of Washington, D. C. He was forty-eight years of age.

R. D. Apperson, until recently president of the Lynchburg Traction & Light Company, Lynchburg, Va., died on Oct. 6 at Santa Monica, Cal., where he had gone in the hope that the climate would be beneficial to him. Mr. Apperson was born in 1863. He entered the office of the Pullman Palace Car Company in 1875. In 1886 he became connected with the Little Rock & Citizens' Street Railway, Little Rock, Ark., remaining with that company until 1890, when the property was sold. He then went to Staunton, Va., and in five months an electric railway was built in the interest of his New York and Arkansas associates, who insisted on Mr. Apperson assuming the management of the property. While thus engaged he carried on a contracting business and later built and operated an electric light and gas plant in Staunton for the same interests. In 1899 Mr. Apperson and his associates purchased the property of the Petersburg Gas & Light Company, Petersburg, Va., and the Lynchburg Gas Company. Two years later they purchased the property of the Lynchburg Electric Railway & Light Company and the Lynchburg & Riverton Street Railway, and these properties and that of the gas company were consolidated as the Lynchburg Traction & Light Company. In 1903 the Apperson interests purchased the property of the Roanoke Railway & Electric Company. In January, 1910, the American Railways acquired the property of both the Lynchburg Traction & Light Company and the Roanoke Railway & Electric Company, Mr. Apperson continuing as president and general manager of both of the companies and becoming a director of the American Railways. Mr. Apperson resigned a few months ago as president of the Lynchburg Traction & Light Company, but continued as chairman of the board of directors of the company and of the Roanoke Railway & Electric Company.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

Birmingham (Ala.) Rapid Transit Company.—Incorporated in Alabama to build an electric railway in Birmingham and Jefferson County. Capital stock authorized, \$2,000. Incorporators: George B. Kelley, president; W. E. Kelley, vice-president; Carl Steiner, secretary and treasurer. [E. R. J., March 15, '13.]

Twin Falls (Idaho) Railroad.—Incorporated in Idaho to build electric and steam railways in Twin Falls. The immediate purpose is an interurban line from Twin Falls to Shoshone Falls on the Snake River. Capital stock, \$1,000,000. Directors: S. D. Perrine, R. R. Spofford, L. C. Moore, all of Twin Falls. [E. R. J., Nov. 30, '12.]

***Evanston (Ill.) Street Railway.**—Incorporated in Illinois to build an electric railway in Evanston. Capital stock, \$10,000. Incorporators: Bertram W. Rosenstone, Claude O. Netherton and Jacob E. Replogle.

***Elkhorn & Arnold's Fork Railway, Frankfort, Ky.**—Incorporated in Kentucky to build a 20-mile interurban railway in Floyd and Knott Counties. Capital stock, \$5,000. Incorporators: John F. Hager, John S. Hager, James G. Serey, Charles Russell and H. S. Smith, Ashland.

***Limestone Railroad, Elkins, W. Va.**—Chartered in West Virginia to build an interurban railway in the Beverly and Leedsville district, Randolph County. Capital stock, \$15,000. Incorporators: E. A. Cody, Buckhannon, W. Va.; J. H. Isherwood, Elkins, W. Va., and Robert Connell, Washington, D. C.

FRANCHISES

Little Rock, Ark.—The Little Rock & Argenta Railway has received a three-year extension of time on its franchise in which to begin the construction of its line in Little Rock.

Los Angeles, Cal.—The City Council has been recommended by the Board of Public Works that the Pacific Electric Railway be granted a forty-year franchise for its proposed elevated structure from the rear of the main street station to connect with the new San Pedro Street line, in Los Angeles. The elevated railway will cost, together with right-of-way, close to \$500,000.

Pittsburg, Cal.—The Oakland, Antioch & Eastern Railway, Oakland, has received a fifty-year franchise from the Council over certain streets in Pittsburg.

San Diego, Cal.—The San Diego Electric Railway has received a franchise from the Council to extend its lines in San Diego from Twelfth Street and F Street through Balboa Park.

San Francisco, Cal.—The Park-Richmond Improvement Club has asked the Supervisors to construct a loop for the Geary Street Municipal Railway by laying tracks from the Golden Gate Park terminus of the line at Tenth Avenue and Fulton Street, so that the cars may run along Fulton Street, between Tenth and Fifth Avenues, and along Fifth Avenue to Geary Street, in San Francisco.

Idaho Falls, Idaho.—The City Council recently granted the Idaho Falls Electric Railway a franchise to build a 40-mile interurban railroad through Idaho Falls and into the adjacent country. Work will begin within ninety days and the line will be completed and in operation within two years. One consideration of the franchise is the granting to the promoters of the right to secure electric power from the municipal hydroelectric power plant, provided that the promoters increase the capacity of the plant sufficiently to take off the additional power used. Local stock to the amount of \$1,000 to the mile is being subscribed, that being one of the conditions of the contract. The franchise covers a period of fifty years. J. L. Milner, Idaho Falls, president. [E. R. J., April 6, '13.]

Lewiston, Idaho.—An ordinance to revive the franchise of the Lewiston Terminal Company was passed by the City

Council recently. The Terminal Company is the owner of the tracks now laid within the city limits of Lewiston, and its franchise was forfeited when the Sturm franchise was repealed some time ago. The new franchise will permit the company to negotiate with any enterprise desiring to operate over the tracks, and three applicants—the Nez Perce & Idaho Railway, F. L. Sturm, who has been promoting an electric line from Lewiston to Asotin via Clarkston, and H. L. Powers, vice-president and general manager of the Lewiston Orchards Company—are seeking this privilege.

Farmington, Ill.—The Peoria, Canton & Galesburg Railway, Peoria, has received a franchise from the Fulton County Board of Supervisors to use certain roads in Farmington for an electric line. Horace Clark, Peoria, president. [E. R. J., Oct. 4, '13.]

Topeka, Kan.—The Topeka Railway has asked the County Commissioners for a twenty-year franchise over the Eighth Street line from the city limits of Topeka on the west to Gage Park.

Brandon, Man.—The City Council has decided to extend the present lines of the Brandon Municipal Railway, which have only recently been completed, on several streets in Brandon.

Detroit, Mich.—The Detroit United Railway has received a franchise from the Common Council for its new Junction Avenue north and south line in Detroit.

***Minneapolis, Minn.**—The City Council of Minneapolis has voted to build a municipal electric railway in Minneapolis to the filtration plant. The estimated cost including cars is \$26,000.

St. Joseph, Mo.—The St. Joseph Railway, Light, Heat & Power Company has asked the Council for a franchise to extend its Frederick Avenue line from its present terminus at Twenty-sixth Street to the state hospital in St. Joseph.

***Ely, Nev.**—A. B. Witcher, Ely, has asked the Council for a franchise to build an electric railway through Ely.

Akron, Ohio.—The Northern Ohio Traction & Light Company will ask the Council for a franchise to build 6 miles of extensions in Akron.

Bucyrus, Ohio.—The Cleveland, Southwestern & Columbus Railway, Cleveland, has received a franchise from the Council in Bucyrus through Charleston Street to the plant of the American Clay Working Machinery Company.

Cleveland, Ohio.—The Cleveland Railway has asked the Council for a franchise for an extension from London Road east to Dille Road in old Collinwood. Right-of-way is being obtained and work will soon be begun.

Gladstone, Ore.—Stephen Carver has asked the Council for a franchise to build an electric railway in Gladstone.

Portland, Ore.—The Portland & Oregon City Electric Railway recently petitioned the City Council for a franchise to construct a line on East Seventeenth Street, in Portland.

Portland, Ore.—George F. Heusner, Portland, has asked the Council for a twenty-five-year franchise in Portland. [E. R. J., July 19, '13.]

Sharon, Pa.—The Sharon & Wheatland Street Railway will ask the Council for a franchise to build a line through the hill district in Sharon.

Westmount, Que.—The Montreal Tramways has received a franchise from the Council on Sherbrooke Street from Green Avenue to the city limits of Montreal.

Nashville, Tenn.—The Nashville Traction Company has received a franchise from the Council in Nashville. The company plans to build a 34-mile line in Nashville. Walter O. Parmer, Nashville, is interested. [E. R. J., Oct. 4, '13.]

New Braunfels, Tex.—The San Antonio & Austin Interurban Railway, San Antonio, has asked the Council for a franchise in New Braunfels. This 27-mile line will connect Austin, San Antonio, Kyle, Manchaca, Hunter and New Braunfels. Vories P. Brown, San Antonio, president. [E. R. J., Aug. 16, '13.]

Seattle, Wash.—The Puget Sound Traction, Light & Power Company recently petitioned the City Council for permission to relay its tracks in Leary Avenue, from Kilbourne Street and Second Avenue Northwest to Sixth Ave-

nue Northwest and between West Forty-second and West Forty-third Streets. An ordinance now before the Council granting this petition has been put over in order that the residents of the district involved may be heard. The company has petitioned the City Council for permission to extend its line on Fourth Avenue south from the Seattle Boulevard to Holgate Street in Seattle.

Tacoma, Wash.—C. E. Muckler and E. K. Murray, of the Tacoma-Seattle Electric Short Line Railway, recently appeared before the Council and asked for an extension of time on their franchise in which to enter Tacoma. The grant has been withheld for further consideration. The promoters aver that the line could not be built into Tacoma in the time of the present franchise, which expires January, 1914, and ask that they be given until Dec. 31, 1915.

Kenosha, Wis.—The Wisconsin Gas & Electric Company has received a franchise from the Council to build an electric railway in Kenosha.

TRACK AND ROADWAY

Birmingham (Ala.) Rapid Transit Company.—This company, the incorporation of which is noted elsewhere in this issue, has awarded the contract for the construction of its line in Birmingham and Jefferson County to the Cortlandt Engineering Company, 146 Liberty Street, New York, N. Y., George B. Kelly, Birmingham, president. [E. R. J., March 15, '13.]

Birmingham Railway, Light & Power Company, Birmingham, Ala.—This company placed in operation on Oct. 5 its 1-mile extension of its East Lake line through the properties of the East Lake Land Company, a suburb of Birmingham known as Roebuck.

Calgary (Alta.) Municipal Railway.—Seven extensions in Calgary are being planned by this company of from $\frac{1}{2}$ mile to $\frac{3}{4}$ mile each and aggregating about 4 miles.

British Columbia Electric Railway, Vancouver, B. C.—The work of laying the 2-mile extension of the tramway line from Boundary Road along Hastings Street east is being carried on by this company as rapidly as possible, and it is declared that this section of the line will be in operation by Dec. 1. The proposed line will be extended as far as Holdom Avenue at Capitol Hill. Plans were submitted to the Board of Works recently showing a proposed line to be built on Forty-third Avenue in South Vancouver, from Bridge Street to Main Street, being an extension of the new line from Kerrisdale to Point Grey. The plans were approved and the line will be constructed to Main Street this year and extended to Victoria Road next year.

Victoria, B. C.—Tenders will be received until noon Oct. 20, 1913, by the purchasing agent in Victoria, B. C., for the delivery of about 555 gross tons of 25 lb. to the yard rails in 20-ft. lengths as follows: 8 miles of single track to Goldstream, B. C.; $1\frac{1}{8}$ miles to Fitzgerald, B. C.; $8\frac{3}{8}$ miles to Cooper Cove Wharf, B. C., together with necessary splice bars, bolts and $\frac{1}{2}$ -in. x $3\frac{1}{2}$ -in. track spikes, 10,700 to the mile. W. G. Alt, purchasing agent.

Northern Electric Railway, Chico, Cal.—Plans are being made by this company to extend its line to Princeton and Butte City. Eventually the company will build a line from Colusa northward along the Sacramento River to Hamilton City.

***Fresno, Cal.**—An interurban railway from Fresno to Clovis and one that will probably be extended past Clovis and take in the foothills of the Sierra Nevada Mountains and open up a great orange belt of the San Joaquin Valley is under consideration. F. S. Granger, promoter of the Fresno, Hanford & Summit Lake Railroad, is interested in the project.

Fresno (Cal.) Traction Company.—Plans are being considered by this company to build an extension of its Arlington Heights line from its present terminus through Arlington Heights and the Belmont Addition.

Geary Street Municipal Railway, San Francisco, Cal.—The Board of Supervisors has voted the passing of the ordinance for the sale of \$3,400,000 in bonds for the construction of additional units of this municipal railway in San Francisco.

Stockton (Cal.) Electric Railway.—Work has been begun by this company on the extension of the Poplar Street line through Yosemite Terrace in Stockton.

Sacramento Valley West Side Electric Railway, Willows, Cal.—Surveys have been completed by this company from Red Bluff to Woodland and the survey was extended to Dixon and a point 7 or 8 miles from Sacramento to connect with the Oakland, Antioch & Eastern Railway, with which traffic arrangements have been made. A survey has also been made from a point near Dixon to Solano City. The company has secured about 80 per cent of the right-of-way, and within the next thirty days bids will be asked for grading the line. C. L. Donohoe, Willows, president. [E. R. J., Aug. 16, '13.]

East St. Louis & Suburban Railway, East St. Louis, Ill.—Work has been begun by this company on the 1-mile extension of its Washington Park line from Forest Boulevard and King's Highway, to the Alton & Southern Railway in East St. Louis.

Rock Island Southern Railroad, Monmouth, Ill.—This company plans to build extensive improvements and extensions of its lines. Among the improvements will be the construction of a line into Rock Island from the present terminus of the line upon the outskirts of the city, and tracks and right-of-way into Galesburg.

Capital Circuit Traction Company, Indianapolis, Ind.—Interest has again been revived in this company. Financial backing has been secured and franchises have been extended in the seven county seat towns through which the projected line is to extend. It is the intention of the company to begin the construction of the line in the spring. This line will encircle Indianapolis and take in all towns within a radius of 30 miles. C. E. Worth, Indianapolis, is interested. [E. R. J., Jan. 4, '13.]

Indianapolis, Linton & Vincennes Traction Company, Indianapolis, Ind.—Preliminary work is being done by this company for a line from Indianapolis to Patoka, via Mooresville, Linton, Bicknell and Vincennes. William C. Thompson, Indianapolis, secretary. [E. R. J., Sept. 27, '13.]

Pineville, Ky.—The Clay County Land & Lumber Company, Pineville, which recently acquired a large block of timber in eastern Kentucky, is planning the operation of a line between the timber and Barbourville, Ky. It is proposed to operate storage battery cars.

Brandon (Man.) Municipal Railway.—It is reported that this company will extend its line to the experimental farm, industrial school and Lake Percy Park, in the early spring.

Commonwealth Power, Railway & Light Company, Grand Rapids, Mich.—This company announces that it will place in operation on Nov. 1 its new line between Saginaw and Bay City.

***Grand Rapids, Mich.**—Plans for a new interurban line between Grand Rapids and Detroit have been completed. Andrew Fyfe and associates from Cincinnati, Pittsburgh and New York have purchased the right-of-way of the Detroit, Lansing & Grand Rapids Railway of Dr. Oliver H. Lau, Detroit, and the work of constructing the line will begin next spring. The length of the railway will be 174.4 miles, and it will pass through twenty-five important cities. The company now holds franchises from fourteen cities and fifty-two townships through which the line will pass.

Iron River-Stambaugh-Crystal Falls Railway, Iron River, Mich.—Work has been begun by this company on its line to connect Iron River, Spring Valley, Crystal Falls and Stambaugh. F. D. Sullivan, Iron River, is interested. [E. R. J., July 12, '13.]

Electric Short Line Railroad, Minneapolis, Minn.—This company has awarded a contract to H. F. Balch & Company, Minneapolis, to grade a section of its line.

Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, Minneapolis, Minn.—A 15-mile extension from Faribault to Owatonna will be built by this company in the near future.

Twin City Rapid Transit Company, Minneapolis, Minn.—This company has just opened an extension into the outlying residence districts, giving service to a large district which has recently been built up.

Red Lodge (Mont.) Electric Railway.—Capitalists of Red Lodge recently organized and incorporated this company, which has for its object the construction of an electric railway from Red Lodge to Bear Creek, a distance of 9 miles. The company is capitalized at \$100,000, and it is reported construction will begin shortly. C. L. Mayo, Seattle, is interested. [E. R. J., Sept. 27, '13.]

St. John (N. B.) Suburban Railway.—This company plans to have its extension to Kane's Corner, near East St. John, in operation this month. A further agreement has been made between the company and the City Council to extend the line from Kane's Corner along the Marsh Road, so as to complete the circuit for which the people lately petitioned.

Public Service Railway, Newark, N. J.—This company has awarded the contract to the Newark Paving Company for grading its new Hawthorne Avenue line. The company's franchise for this line has been approved by the Public Utility Commissioners at Trenton.

Middletown, Reasing & Cincinnati Interurban Railway, Middletown, Ohio.—Surveys are being made by this company on its 30-mile line between Middletown and Cincinnati. This is part of a plan to build a 50-mile line between Dayton and Cincinnati. E. H. McKnight, Middletown, chief engineer. [E. R. J., June 21, '13.]

Temiskaming & Northern Ontario Railway, North Bay, Ont.—Plans are being made by this company to electrify its line between Cobalt and Haileybury.

Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont.—Of the 11 miles to be covered by this line between St. Catharines and Niagara-on-the-Lake, Ont., rails have been laid for a distance of 8 miles, while 5½ miles of the line is entirely completed and before the next ten days will be in operation. A freight service has been inaugurated between McNab, the principal fruit section on the south shore of the Niagara River, and St. Catharines.

Portland & Oregon City Railway, Portland, Ore.—This company announces it will extend its lines into Milwaukie and that a new route has been surveyed east of the first one decided upon, by which it will enter East Milwaukie.

Regina (Sask.) Municipal Railway.—The City Council has under consideration plans for the extension of the municipal railway into the Canadian Pacific Railway annex, crossing the Grand Trunk Pacific Railway at Thirteenth Street. The line is also being extended on Young Street to the new power house at Winnipeg and Twentieth Streets in Regina.

Greenville, Spartanburg & Anderson Railway, Greenville, S. C.—This company, which is completing an extension from Greenville to Spartanburg, with a prospect of soon starting construction on another link from the latter point to Gastonia, N. C., thus connecting up the two sections of the Piedmont Northern lines, will be connected from Greenwood via Edgefield, S. C., with the Carolina & Georgia Railway, which James U. Jackson and others plan soon to build from Augusta, Ga., to Columbia, S. C., via Johnston and Batesburg. The connection will be constructed by the Carolina & Georgia Railway, and it will supply the demand for an interurban line from Greenwood via Edgefield to Augusta.

***Austin, Tex.**—Bird M. Robinson, president of the Tennessee Railway Company, is promoting the construction of an electric railway between Roswell, N. M., and San Antonio, via San Angelo.

Bryan & Brazos River Railway, Bryan, Tex.—Steps have been taken by this company to build a 22-mile extension from a point near Clay to Braham, via Independence.

Gulf, Freeport & Northern Railway, Freeport, Tex.—Grading has been begun by this company on its line from Freeport, situated at the mouth of the Brazos River, to Sealy, about 100 miles. It will connect with the Missouri, Kansas & Texas Railroad and the Gulf, Colorado & Santa Fé Railroad at Staley. C. L. Sharp, general manager. [E. R. J., July 12, '13.]

Ogden (Utah) Rapid Transit Company.—Work will be begun at once by this company double-tracking its Washington Avenue line between Twenty-eighth Street and Thirty-second Street in Ogden.

Utah Light & Railway Company, Salt Lake City, Utah.—Surveys have been begun by this company on the extension from Holiday to Big Cottonwood Canyon along the county road.

South Richmond & Chesterfield Railway, Richmond, Va.—Right-of-way has been secured and financial backing has been obtained by this company for its 3-mile electric railway from the intersection of Broad Rock Road and Hull Street, Richmond, to Falling Creek. John C. Robertson, Richmond, is interested. [E. R. J., Aug. 2, '13.]

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—Plans are being made by this company to build a new depot at Hermosa Beach. The cost is estimated to be about \$5,000.

Illinois Central Electric Railway, Canton, Ill.—Work has been begun by this company on its new carhouse in Farmington. The structure will be 18 ft. x 22 ft. and of cement block construction. There will be a waiting room and a baggage room.

Rock Island Southern Railroad, Monmouth, Ill.—This company plans to improve its terminal station in Galesburg in the near future.

Springfield (Ill.) Consolidated Railway.—This company, together with the other utilities operated by the Hodenpyl-Hardy syndicate, has taken a lease on the first two floors of the Odd Fellows' Building at Fourth Street and Monroe Street in Springfield to be used as general offices.

Kentucky Traction & Terminal Company, Lexington, Ky.—This company is preparing to lease a building on Main Street for use as an interurban depot and also for the general offices of that company and its local subsidiary, the Lexington Utilities Company. It is planned to remodel the building along modern lines, the ticket office and waiting rooms on the first floor to be improved, while the second floor would be used as a club room for employees, with a reading room, billiard and pool tables and other facilities for recreation. F. W. Bacon, vice-president of the company, is in charge of the plans for the changes.

Port Arthur & Fort William Electric Railway, Port Arthur, Ont.—The city of Fort William is advertising for bids to build an addition to the Walsh Street carhouses. The structure will be 260 ft. x 30 ft. and of brick construction.

Canadian Northern Railway, Toronto, Ont.—Negotiations by agents of this railroad for the purchase of a plot of land near the Canadian end of the upper steel arch bridge over the lower gorge of the Niagara again indicate that this company proposes to build a terminal for the Niagara Falls end of the electric line which it proposes to construct between Niagara Falls, Ont., and Toronto. The MacKenzie-Mann interests are said to have offered \$30,000 for the site under consideration.

Ohio Valley Electric Company, Huntington, W. Va.—This company, which operates interurban lines in the upper Ohio Valley, has leased a building in Catlettsburg, Ky., which will be remodeled for use as a depot and waiting room.

POWER HOUSES AND SUBSTATIONS

Tidewater & Southern Railroad, Stockton, Cal.—Negotiations are under way by this company to move its passenger and freight depot to 829 Ninth Street in Modesto.

Tampa (Fla.) Electric Company.—New equipment has been installed by this company in its power plant on West Jackson Street in Tampa.

Idaho Traction Company, Boise, Idaho.—This company has completed the installation of a 750-kw motor-generator set in its power plant.

Jamestown (N. Y.) Street Railway.—This company plans to build an addition, 75 ft. x 62 ft., to its power station to house additional equipment. Eighteen transformers are to be placed in the new structure, which will probably be completed before the end of the month. The concrete foundations are now being laid. The building will be of steel and concrete construction throughout. In December the company expects to install a great 5000-kw Westinghouse-Parsons turbo-generator in the power plant being operated at present.

Manufactures and Supplies

ROLLING STOCK

Union Street Railway, New Bedford, Mass., has ordered twelve 30-ft. double-end cars from the Osgood Bradley Car Company.

North Carolina Public Service Company, Greensboro, N. C., has ordered six single-truck cars from the Southern Car Company.

Lewiston, Augusta & Waterville Street Railway, Lewiston, Maine, has ordered three flat cars from the Laconia Car Company.

London (Ont.) Street Railway has ordered six single-truck, single-end pay-as-you-enter cars from the Preston Car & Coach Company.

Canadian Northern Railways, Montreal, Que., has placed an order with the General Electric Company for seven locomotives and eight multiple-unit car equipments, to be used in the Montreal Tunnel & Terminal. The locomotives will weigh 80 tons each, all weight being on the drivers. They will be equipped with two four-wheel trucks articulated together, with four motors geared to the drivers through twin gears. The motors will be of the commutating-pole type, wound for 1200 volts and insulated for 2400 volts, operating two in permanent series. The control will be multiple-unit series-parallel, the current for the contactors being furnished by a motor-generator set. The motors for the multiple-unit four-motor car equipments are rated at 125 hp and 1200 volts each. The control is in general similar to that of the locomotives.

TRADE NOTES

Universal Safety Tread Company, Boston, Mass., is erecting a large cement factory in Waltham, Mass.

H. H. Althouse, New York, N. Y., consulting engineer, has opened an office in the Woolworth Building.

Railway Utility Company, Chicago, Ill., has received an order for 240 Utility honeycomb-type ventilators to equip thirty cars recently purchased by the Toledo Railways & Light Company.

Allis-Chalmers Manufacturing Company, Milwaukee, Wis., announces the removal of the sales and engineering offices of its mining machinery department from Chicago to the Milwaukee works at West Allis.

Hambleton & Company, Baltimore, Md., will open a New York office at 43 Exchange Place on Nov. 1, and will take into the firm as resident partners Fairman R. Dick, formerly with Dick Brothers & Company; Nicholas L. Tilney and Ernest T. Gregory, formerly with Lee, Higginson & Company, and William F. Ladd, formerly with Kissel, Kinnicutt & Company.

Verne W. Shear, Akron, Ohio, has opened an office as commercial engineer and manufacturer's agent, representing the Condit Electrical Manufacturing Company, Pittsburgh Transformer Company and other manufacturers, at 609 Flatiron Building, Akron, Ohio. Mr. Shear was for five years commercial engineer with the Westinghouse Electric & Manufacturing Company, and during 1912 and part of 1913 was electrical engineer of the Northern Ohio Traction & Light Company, Akron, Ohio.

Lord Manufacturing Company, Brooklyn, N. Y., has received an order from the Brooklyn Rapid Transit Company to equip all of its new center-entrance cars with Spencer or Lord screenless air cleaners. This cleaner is used as an intake to the air compressors, in lieu of a hair strainer. The dirt and dust is removed from the intaken air through a special arrangement whereby it is thrown against the surface of an adhesive liquid, such as oil, the clean air then being free to enter the compressor.

ADVERTISING LITERATURE

National Tube Company, Pittsburgh, Pa., has issued N. T. C. Bulletin No. 17, describing and illustrating its Shelby seamless steel tubing.

Hart & Hegeman Manufacturing Company, Hartford, Conn., has issued Catalog K, listing its various types of H & H switches and accessories.

Walter A. Zelnicker Supply Company, St. Louis, Mo., has issued Bulletin No. 142, listing its cars, and all kinds of railroad and contractor equipment.

General Electric Company, Schenectady, N. Y., has issued Bulletin No. A4142, which deals minutely with the various operating conditions which affect the efficiency and life of incandescent lamps.

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued a catalog describing and illustrating its Type U traveling electric hoist for handling and transporting materials of every description.

Rooke Automatic Register Company, Providence, R. I., has issued a catalog composed chiefly of advertisements which explain in a general way its system of automatic fare collection and registration.

F. D. Spotswood, Lexington, Ky., has written a booklet explaining his copyrighted system for preventing accidents on street railways by means of distributing accident blotters, and by the use of car signs and safety plates.

Trolley Supply Company, Canton, Ohio, has issued a catalog describing its safety fenders, which are of heavy wire apron and cushion construction and are so designed as to prevent pedestrians who are knocked down by the car from being forced under the trucks.

Electric Railway Improvement Company, Cleveland, Ohio, has leased its electric weld-bonding cars to the following railways: Hudson & Manhattan Railroad, New York, N. Y.; Interstate Public Service Company, Indianapolis, Ind., and Calgary (Alta., Can.) Street Railway. Cataluna (Spain) Railways has placed an order through the Pearson Engineering Corporation, Ltd., New York, N. Y.

Q-P Signal Company, Needham Heights, Mass., has issued Catalog No. 5, describing its ball trolley catcher. When the trolley leaves the wire its rapid rise unwinds the rope from the reel with sufficient speed to make the square boss on the hub of the reel throw the ball to the top of the groove, in which position it engages with the next approaching projection on the reel, locking it against further unwinding and holding the trolley pole in that position until released.

Spencer Otis Company, Chicago, Ill., has issued a handbook on track supplies and construction costs. The book is divided into three sections. Section 1 presents in a very comprehensive manner tables relating to track laying and rail renewals. Section 2 contains data and information in regard to spikes, accompanied by a table showing the average holding power in pounds of different forms of spikes in different woods. Section 3 deals entirely with tie plates and their function in track construction. This subject is presented both from the design standpoint and from that of possible economies obtainable in the use of tie plates. A portion of this section is devoted to a brief treatise on iron and steel metallurgy and includes a summary of the processes which result in various kinds of products from iron ore to finished forms.

NEW PUBLICATIONS

Electricity for the Farm and Home. By Frank Koester, New York: Sturgis & Walton Company. 274 pages. Price, \$1.

This book is a detailed discussion of the various uses to which electricity may be put on the farm and in the home. It takes up in full the benefits of electricity in agriculture and describes central station service, the methods of generating electric power and the application of the electric motor. The power cost and labor cost are estimated on the basis of a 100-acre farm. The uses of electricity in the manufacture of farm by-products and the preservation and transportation of farm products and in diverse cases such as electric plowing, milking and incubation are taken up in detail. Mr. Koester has been wise in adding to this book chapters that deal with the general utilization of electricity in the farm districts for purposes such as electric lighting, telephone, irrigation service and the stimulation of vegetation. The book is profusely illustrated with halftones of the principal apparatus described. One praiseworthy feature of the publication is the placing at the end of each chapter of a series of questions which serve to bring out for the benefit of the reader the most striking parts of the ground covered.