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SPLIT VS. SOLID GEARS

The establishment of permanent shop practices is, no doubt, an excellent ideal. Applied in moderation (to paraphrase one of Mark Twain's remarks about marriage) it may be safely advocated, but among its possible results is the chance of losing sight of the real aim of mechanical engineering which, in the end, consists in the use of constructions that are demonstrated to be best from the broadest economic viewpoint, involving not only convenience but also reliability, length of life, and final cost. A case in point will be found in the retention of the split gear on motor-driven axles of electric railway cars to an extent that is by no means restricted, notwithstanding the fact that experience has shown the split gear and key to be a thoroughly non-permanent construction. Admittedly this method of applying gears possesses the great advantage of flexibility, permitting repairs or changes to be made by hand instead of involving the use of the hydraulic press as required where the gear is solid and must be pressed on or off the axle like a wheel. However, the latter construction possesses simplicity, and thereby it acquires ruggedness and reliability, now that the modern gear has a life usually equal to or greater than that of the wheel. Although it is much easier and less expensive to "tinker" with the split gear, a broad comparison of the final results attained by the two constructions shows that the solid gear is infinitely preferable. That any consideration should be given to the former type, therefore, aside from the temporary practice necessitated on roads that are gradually displacing it, indicates the anomalous situation of obscuring the true ideals of engineering practice behind the exigencies of local custom, and this is something that the industry would do well to avoid.

STEPLESS DOUBLE- DECKER

The stepless double-deck car, which for two or three years has been operated more or less experimentally in America in the cities of New York, Pittsburgh, Columbus and Washington, now appears for the first time, according to our records, on a foreign street railway system, the Vienna Municipal Tramways, in a type described and illustrated elsewhere in this issue. Although the double-deck car has not yet won a definite place in transportation since in the United States, and may never do so, if it should gain a position here it will undoubtedly be only with a low-floor body construction, as that insures greater safety, higher schedule speeds through the quicker handling of passengers, and a sufficient reduction in car height so as to avoid overhead

obstructions. Abroad, outside of Great Britain and some of its colonies, the double-deck car has not been much more popular than in this country, in spite of the fact that the narrow streets have offered an inducement for cars to develop vertically rather than longitudinally. Hence the introduction of the low-floor, double-deck car in Vienna, one of the few cities on the continent where double-deckers have been used in the past, is of special interest. Although the seating arrangements of the new Vienna car are novel, the total passenger capacity is considerably less than that of similar models in the four American cities above mentioned, owing to the restrictions in width imposed by the limited double-track clearances in Vienna. This handicap, however, has been partly overcome by the ingenious provision of a bow-window arrangement for the sides of the upper deck, thus making possible the installment of a back-to-back longitudinal bench which does not interfere with the passing of passengers along the adjoining passageways and which would be impossible in any other construction.

LABEL STANDARD SPECIFICATIONS

In the campaign for a greater use of the association's standard specifications, we believe that much could be accomplished through the medium of advertising. We are not using this word here in its technical sense but in its more general meaning of urging emphasis by users of the fact that the specifications are those recommended as standard by the association. For instance, practically all of the rail mills use the American Electric Railway Engineering Association's grades A and B rail specifications when submitting bids to electric railways, but since the association has no standard form of specifications with a prominently displayed credit line, the manufacturers reprint the association's specifications with their names in large type and the association's name in small type. Consequently, the average purchaser assumes that this specification is the manufacturer's specification and not the specification of his association, and buys the rails accordingly. In every instance, the manufacturer gives the association due credit, and he is hardly to be criticised for printing his concern's name in large type, but the association would promote the knowledge that it had prepared these specifications as well as extend their use if it should publish them in a standard form which could be supplied to all member companies. For a railway company to retype from the Manual, when they are required, the rail specifications or any other specifications is more of a task than it usually cares to under-

take. Consequently, it adopts the first printed form of specification that is offered, making interline modifications. These association forms could be kept in stock by the secretary so that copies could be furnished member companies on request and at a price that would pay for the cost of printing. If the member companies could be educated to depend upon the association to this extent, it would not be so difficult to bring about the more general use of the standards now printed in the Manual.

PAVEMENT COST AFFECTS SERVICE STANDARDS

Paving in the track allowance, the heritage of horse-car operation and an unjust burden which only increases the cost of operation at the expense of service, is a subject of ever-increasing worry to the way engineer. In Chicago, for instance, it represented at the beginning of 1914 an investment of \$7,373,683, or about one-fifth of the total track cost, yet the pavement maintenance cost was approximately equal to that for the track. Hence it occupies an important place in the budget of every city company, and the proper type of paving for various conditions is a subject of concern to the industry.

In 1915 the way committee of the American Electric Railway Engineering Association was of the opinion that granite block laid on a mortar cushion was best suited as a paving material in the track allowance. This committee refused at that time to go on record, however, with any definite recommendations because there were so many conditions to meet. Where one type of pavement was suitable in one locality it was found to be absolutely unsatisfactory in another. W. M. Archibald, engineer of way Houston (Tex.) Electric Company, in a paper delivered before the recent Southwestern convention, reminds us that, owing to the changed character of wheel traffic in most cities, granite block paving is relatively less advantageous than formerly. A smooth pavement rather than wear value is in demand to-day, whereas a decade ago smooth pavements were objectionable because they were too slippery for horse-drawn vehicles.

It is quite true that the larger proportion of rubber-tired vehicles of the present have introduced new problems, but we are of the opinion that more skilled workmanship with the unit types of pavement will make them meet the demands of the most critical community. For extremely heavy traffic, accurately cut granite block carefully laid on a mortar cushion with grout filler has given an unquestioned account of itself in the larger cities of this country and Europe. Vitrified brick and wood block appear to be equally well adapted for medium traffic streets, but with the latter material more skilled attention is necessary to obviate the objectionable qualities, such as bleeding and buckling. For residential streets where light vehicular traffic obtains, the various sheet pavements, with toothing blocks to form the car-wheel flangeways and stretcher courses to form the pavement brow outside of the track, continue to be popular, and as far as we can ascertain they are satisfactory.

It frequently occurs that railway companies are forced, against their better judgment, to use an unsatisfactory paving material for certain streets. While strenuous objection on their part in cases of this kind may seem impolitic or ill advised, yet as long as the service must carry the burden it appears proper to oppose any change in construction which will increase operating expense. Property holders who are benefited because a railway company pays for a portion of their pavement have no just right to force additional burdens which in turn must affect the quality of the service to the rest of the community. Unless the industry as a whole points out this condition and takes a definite and united stand against it this expense will continue to increase in amount.

Of course, this point is in addition to the general question of the inadvisability of forcing the railways to bear any part of the cost of paving. Relief from this charge affords, to our mind, a very simple means of increasing the fare.

IS TOO MUCH SAND BEING USED?

In a paper recently delivered by Richard T. Fox, general manager Chicago Citizens' Street Cleaning Bureau, before the Western Society of Engineers, some very interesting data were presented relating to the sources of street dust and where the street cleaners pick up the most of it. While this paper was a discussion of a standard of cleanliness for intensive street cleaning, the average of a number of tests indicated that on a basis of 1000 sq. yd. of area, 4.3 lb. of dirt were swept up from the sidewalk, 6 lb. from the roadway between the street railway tracks and the curbs, and 90 lb. in the double-track allowance. In the instance cited the sidewalks were of concrete and the entire street was paved with wood block. While to a certain extent the large quantity of dirt in the track allowance may be attributed to the fact that the rails broke the continuity of the street surface, yet the analysis of the dirt collected at this point indicated that 50 per cent of it was silica or sand. Whether this should be taken as an indication that the railway company was using sand too freely or not, is a question. In any event it appears from the results of this test that the amount of sand used by cars operating on city streets in general may be worth careful study. If sand is being employed too liberally, economies are apparent because the purchase, preparation and delivery of sand on a large system make its cost per unit of quantity a considerable item.

To determine further whether the fine dirt picked up in the track allowance was blown there from other sources or was sand deposited in braking and starting cars, tests were made on other sections of the same street where street railway tracks had not been installed. These indicated a different distribution as well as a reduction in the total quantity of dust found. The total fell from 96 lb. to 12.2 lb. for the same roadway areas. This is equivalent to an increase from 6 lb. to 9.6 lb. per 1000 sq. yd. of roadway between the track

allowance and the curbs, and a reduction from 90 lb. to 2.6 lb. per 1000 sq. yd. in the track allowance. While this is an unfair comparison because the dust from the smooth streets is blown away and lodged in the track areas of other streets, yet the marked difference in the quantities in the streets with and without tracks did prevail and, if the subject is carefully investigated, it may afford a means of economizing in the amount of sand used.

RAILWAY LOADS FOR CENTRAL POWER STATIONS

There is ample evidence that the central power companies are going after the railway business vigorously. They have their eye on the steam railroad electrification business, but while that is developing they plan to cover the street and interurban field as far as possible. They have very plausible arguments on which to base selling campaigns, and there are many reasons why railway loads are attractive to them.

The central power companies are in the business to sell electrical energy and are not primarily concerned with the uses made of it. They started in as lighting companies, but lighting is now but one of several fields for their activities. The railway field is especially alluring, because here energy can be sold in large blocks, and railways are managed by men who are trained to appreciate the merits of a good business proposition. The importance of the railway business is illustrated in the case of Chicago, where more energy is now supplied to the electric railways than to all other customers combined. If we assume 3 kw.-hr. per car-mile as the unit energy consumption of a car, and 25,000 as its annual mileage, the annual energy consumption is 75,000 kw.-hr. at the car or, say, roughly 100,000 kw.-hr. at the power house. At 1 cent per kilowatt-hour, here is a business of \$1,000 per year per car, one well worth going after.

Moreover, in spite of its fluctuating character, the railway load is a good one, as its load factor is reasonable, even high compared with some classes of load, as, for example, the lighting load in which there is but one daily peak as compared with two in the railway load. There is nothing in the latter to compare with the exciting current losses in lighting transformers, which must be magnetized continually although used but a small portion of each day. Again, the power factor of the railway load is good because rotary converters are used, and these can, if necessary, be over-excited to improve the character of the load in this particular. Lighting load has a notoriously poor power factor at certain times of the day.

The attitude of the railway toward the purchase of power involves considerable of reliability and cost. Continuity of power supply is absolutely vital, and is even more important than cost. The giving over of the power involves considerations of reliability and cost. Absolute confidence in its ability to carry out the terms of its contract. There is no doubt a certain insurance, or at least a feeling of assurance, that comes from the possession of the power source, even if the supply of

fuel, oil and water must come from without. The question is, then, how much is this insurance or assurance worth as compared with a possible saving in the cost of energy, the total of which is probably not more than one-eighth of the total expense of running the railway.

This whole power matter must be considered from two sides, that of the seller and that of the buyer. As seller, the power company has the plausible argument that, as the railway's primary business is transportation, it can attend to this better if not distracted by a secondary activity or side line, such as electrical energy generation. The central power company claims that on general principles it is obviously cheaper to generate the power required by the railway on top of the lighting and industrial power load than to generate it separately. This follows partly because the peaks of the several components of the load do not occur simultaneously—in other words, there is a certain "diversity." Diversity permits the addition of load without proportionate increase in generating capacity. At the same time, the consolidation of generating capacity of several stations in one permits the use of larger and more economical units, which can be employed under more advantageous operating conditions. Moreover, the use of the latest type of unit conduces to greater reliability, and if the central power company's business is great enough to permit it to use more than one plant reliability is still further assured.

As buyer, the railway has first to be convinced that central power supply is at least as reliable as its own energy, next that it is cheaper. The rub comes in deciding whether or not it is cheaper. The price offered by the power company is definite, exact; the cost of home-made energy is not so easy to determine. The bills for fuel, water, power-house labor, etc., are definite enough, and the energy output can be accurately metered. There are, however, the less tangible elements of overhead charges, especially for management, depreciation and obsolescence, which form an important element of power cost. As the railway must have an engineering staff whether operating a power plant or not, it is quite a question to decide how much additional cost is incident to the power generation. It is, therefore, a far-reaching problem accurately to determine the reduction in expense which will follow the abandonment of power plants to offset the cost of purchased power.

To sum up the situation, it may be said that undoubtedly the combination of different kinds of loads conduces to economy, but before a railway decides to purchase energy its management must be convinced that the railway will reap the benefit in the way of greater reliability and lower cost which should result. It may often prove more economical for the railway to absorb the lighting and industrial power business, or to sell energy to a company which will retail it for these purposes. The latter would be especially true in connection with an interurban railway system. In any case, it is very important for the railway to know exactly what its energy is costing.

Stepless Double-Deck Car Introduced in Vienna

The Author Has Evolved a New Stepless Double-Deck Car Which Embodies an Unusual Seating Plan and Contains Bow Windows on the Upper Deck for Increasing Seating Capacity Without Affecting Track Clearances

By LUDWIG SPÄGLER

Manager Vienna (Austria) Municipal Tramways

DOUBLE-DECK motor cars, in general, embody the advantage of short length for a given capacity, thus requiring the occupation of only a small area of the street surface. More passengers can be handled, therefore, on one line with double-deck cars than with trains of single-deck cars. The former also permit a much quicker handling of cars at terminals, avoiding the necessity for the coupling up of trail cars. Moreover, double-deck cars have for the same space a much greater seating capacity than trains. In America, where uniform fares are customary, double-deck cars can be used with only one conductor, which results in a great saving in labor as compared with train operation.

In spite of these obvious advantages, double-deck cars up to this time have found widespread usage only in England. The reason for this may be that, excepting

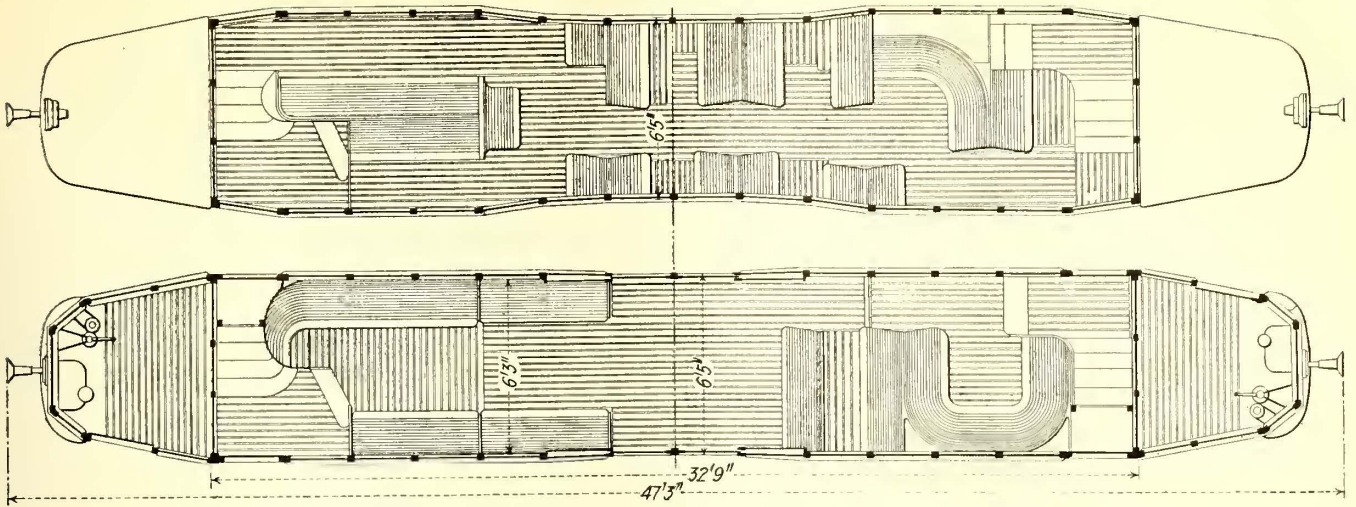
in hot countries, the double-deck car is servicable practically only with an inclosed upper deck. The addition of the inclosed second deck requires a height of at least 15 ft. 9 in., too great for many clearances, and provides too little insurance against lateral upsetting from the force of the wind when rounding curves. The design of the newly-built cars differs essentially in details from the plans followed under somewhat similar conditions in New York and Pittsburgh. In Vienna it was possible to have a height of only 13 ft. 7 in. to 14 ft. 5 in. to permit cars to be stored in the present carhouses. This is accomplished by the use of the low, stepless center entrance. Over the trucks the necessary lowness is obtained in spite of the greater elevation of the floor by a "nesting" of the rows of seats. This is a customary arrangement with longitudinal-seat cars. The cross-seat

WEIGHTS AND CAPACITIES OF VARIOUS TYPES OF VIENNA CARS

	Passenger Capacity				Total Weight in Pounds Including Electrical Equipment	Length Over Buffers, Ft. In.	Weight in Pounds			Passengers per 1 M. of Car or Train Length		
	Seating Capacity	Normal Standing Capacity	Normal Total Capacity	Total Capacity with Extra Standing Room			Per Seat	Normal Weight Per Passenger	Number of Seats	Normal Sitting and Standing Capacity	Total Capacity with Extra Standing Room	
New 14-ft. 5-in. high double-deck car with longitudinal seats...	56	30	86	100	47,628	47	3	855	553	3.9	6.0	6.95
New 14-ft. 5-in. high double-deck car with cross-seats.....	56	28	84	92	48,510	47	3	866	578	3.9	5.8	6.4
16-ft. 9-in. high double-deck car	52	20	72	84	30,870	34	11	595	428	4.9	6.76	7.9
Single-deck motor car.....	22	20	42	56	27,783	35	0	1,263	661	2.07	4.0	5.26
Two-car trains	44	44	88	118	40,564	68	8	922	461	2.1	4.2	5.6
Three-car trains	66	68	134	180	53,361	102	6	809	397	2.1	4.28	5.76



VIENNA DOUBLE-DECK CARS—INTERIOR VIEW OF LOWER AND UPPER DECKS OF LONGITUDINAL-SEAT CAR



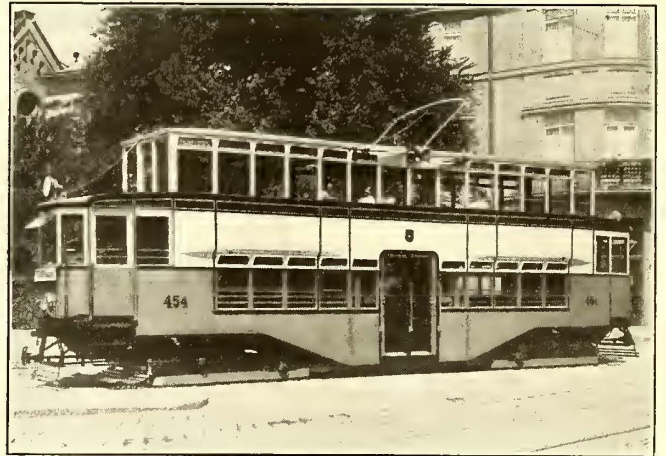
Longitudinal-Seat Car
Cross-Seat Car
VIENNA DOUBLE-DECK CARS—PLAN OF UPPER AND LOWER DECKS OF LONGITUDINAL AND CROSS-SEAT CARS

car embodies an entirely new seating arrangement, which has also been applied in the auto buses in Vienna. These were described in the *ELECTRIC RAILWAY JOURNAL* of Jan. 2, 1915.

The longitudinal passageway in the lower deck of the cross-seat car lies entirely on one side, while the longitudinal passage in the end of the upper deck lies along the opposite side. On the upper deck, above the lower side passage, is arranged a curved bench, shown in one of the accompanying illustrations the floor underneath which is cut away in order to utilize the space for the stairway. Between this bench and the staircase is placed a cross-seat for two persons, under which the floor is likewise cut away. This extends across to the connection of the passageway with the head of the stairs on the other side of the car. At this point there is also an arch in the roof of the lower deck beneath which one can stand easily.

In the lower deck, underneath the passageway of the upper deck, are arranged benches, which consist of a U-shaped bench in the elevated portion of the lower deck, next to which, toward the center of the car, is a cross-bench, and then another cross-bench, the base of which is on a lower level. A step is provided between the central and end portions of the lower-deck floor in order to allow clearance for the trucks.

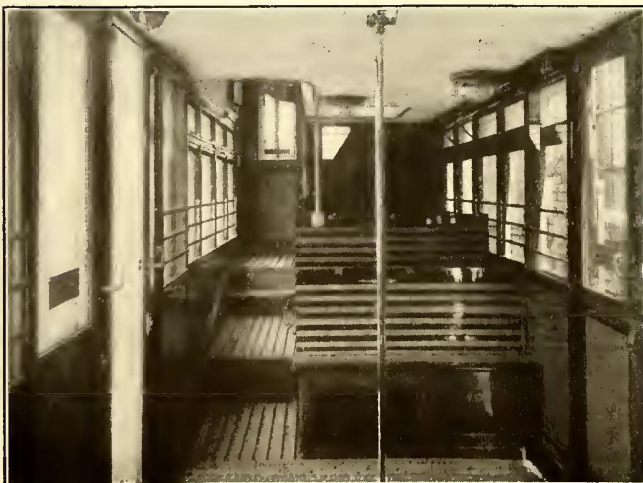
The new design would be of particular value for wide cars, because a large seating capacity can be provided by the cross-seats. In Vienna these double-deck cars had to be built very narrow on account of the narrow spacing between double tracks, and their operation was only pos-



VIENNA DOUBLE-DECK CARS—EXTERIOR VIEW OF CROSS-SEAT CAR, SHOWING BOWS IN UPPER DECK TO OVERCOME CLEARANCE LIMITATIONS

sible with the longitudinal-seat car by widening the portions of the sides of the upper story directly over the trucks into the form of bows, two on each side of the car, as shown in the exterior view. This form of construction does not prevent two cars from passing on curves. In the cross-seat car these bows could have been omitted.

The stairs leading up to the upper story are arranged crosswise and directly above the trucks, and are unusually convenient and easy to mount. At each end of the



VIENNA DOUBLE-DECK CARS—INTERIOR VIEW OF LOWER AND UPPER DECK OF CROSS-SEAT CAR

car are compartments providing for the motorman and also furnishing standing room for passengers. The movement of passengers at stops is greatly facilitated thereby, because there is plenty of room for loading and unloading in the low-lying central part of the car, adjacent to which are long, wide aisles leading to the stairs.

The side framing of the car is of steel posts, so connected by suitable framing with the upper-deck floor as to enable the floor construction to be built low.

The exterior of the car, as illustrated, has a highly pleasing appearance. The cars are very popular with the riding public in Vienna, particularly the upper deck on which smokers are allowed. Comparative data as to weights and capacities of the various types of Vienna cars are given in the accompanying table.

The designs were made by the author and are patented in America.

Electrical Distribution as Discussed by N. E. L. A.

Committee Reports Presented at Chicago Convention
Last Week Give Present Status of
Progress in This Direction

THE thirty-ninth convention of the National Electric Light Association was held in Chicago last week. Several topics of value to railway men were discussed, principally relating to power purchase, generation and distribution. Abstracts of some of the reports were given in last week's issue of this journal. Others are given herewith.

ELECTRICAL APPARATUS

The keynote of the recent work of the committee on electrical apparatus has been standardization, particularly with regard to sizes, voltages and taps for transformers. Attention was directed in its report to the fact that during the past five years the capacities of single generating units have increased more than three-fold.

On the subject of minimizing noise in substations, the following design features were mentioned: The foundations for the apparatus should be separate and distinct from the walls of the building to prevent the transmission of noise. Where possible, the walls should be built with air spaces to form a cushion to impede the direct transmission of noise. Windows should be omitted from the walls of the substation building as a further means of avoiding the transmission of noise. Substations provided with forced ventilation should be carefully designed to avoid the transmission of noise to the outside through the ventilating system. In some cases it is required that the air passages be equipped with baffles to prevent the transmission of sound. Methods of installation which materially assist in a reduction of noise include the use of felt pads under transformers, regulators, etc., or the isolation of noisy apparatus in separate soundproof rooms. It was believed by the committee that manufacturers pay too little attention to the reduction of noise in apparatus.

An interesting development in the starting of heavy rotating elements of large machines, such as synchronous converters, is the application of a high-pressure oiling system to bearings where it is desirable to reduce the starting current to a minimum. Oil may be forced to the bearings at sufficient pressure actually to raise the rotating element out of mechanical contact with the bearings so that it floats on a film of oil. The high pressure is shut off as soon as the machine starts.

The application of single-phase service to transportation and other fields frequently involves the use of synchronous condensers for power factor correction and voltage regulation. The construction of these involves some unusual conditions in certain situations, such, for examples, as where one phase is grounded. Such machines have been constructed for direct application to 11,000-volt systems requiring insulation suitable for use on a 19,000-volt three-phase system. The difficulties involved in converting three-phase energy into single-phase energy have led to the development of the phase converter. As compared with a straight motor-generator for converting three-phase to single-phase current, the phase converter is cheaper, more efficient and more flexible.

The committee stated that two new pieces of laboratory apparatus may now be considered as standardized for general use, namely, the harmonic analyzer and the cycle recorder. The analyzer provides an efficient and accurate method for determining the components in an alternating current or emf., which otherwise would require tedious mathematical processes. The cycle recorder is used in testing the time elements of high-accuracy relays and circuit-breakers. Its pointer commences to revolve one step per cycle the instant that power is applied to the test circuit. Its particular field is in measuring elapsed intervals of time too short to be satisfactorily observed with a stop watch, and where readings in steps of one alternation are sufficiently accurate for the purpose in view.

Improvements in electrolytic lightning arrestors during the year have included a new form of electrolyte which may be operated at higher temperatures, namely, up to 135 deg. Fahr. In the application of electrolytic arrestors for d.c., low-voltage protection, a charging gap has been added to the equipment, with arrangements for closing the gap for daily charging. A new lightning arrestor for use in d.c. generating stations, or for the protection of railway equipment was also described. It consists of a condenser in parallel with a resistor and both in series with a spark gap between line and ground. The improvement consists in the use of a flat plate condenser with a new insulating wax of much higher dielectric strength than paraffin. For the protection of railway equipment and station apparatus up to 1500 volts, a condenser of 1 m. f. capacity is used, while for line mounting, a 0.3-m. f. condenser is used. The gap may be safely short-circuited as the resistance of the condenser shunt is high.

Considerable advance has been made in the past year in the construction of switchboard apparatus to improve the product from the point of safety to the operator. This has included the isolation of dangerous parts by inclosing and screening, or by placing all large parts at the back of the boards and equipping switches with indicating tell-tale lights or signs. The committee described and illustrated in its report a number of sample safety devices.

UNDERGROUND CONSTRUCTION

The report of the committee on this subject was largely devoted to details of conduit construction, cable installation and cable testing. The process of making "stone" conduits, the material for which is fine limestone screenings and Portland cement in proportions of 4.75 to 1, was described. This conduit is made in lengths of 5 ft. and of an internal diameter of 2½ in., and a wall thickness of 5⁄8 in. It is laid with a minimum of 1 in. of concrete between ducts and between layers, and with a 3-in. concrete envelop. One company has installed 10,000,000 ft. of this conduit.

The committee described a new type of cable joint in

which ingenious insulating forms are used for separating the conductors of a cable. These forms are constructed of thin sheets of mica cemented together and made up over an iron core. A porcelain spacer at each end holds the separators symmetrically about the three conductors and centrally in the lead sleeve. Another type of joint, known as a vacuum joint, was also described. In this the insulating material is forced into the sleeve and all air is eliminated by exhausting the interior of the sleeve to a high vacuum.

An apparatus for testing cables was also described by means of which it is possible to measure direct current in a single-conductor cable without opening the circuit. The instrument consists of two parts, a coil and a meter. The coil is an iron ring wound with a large number of turns of small wire, and having a hinged section which opens to permit the ring to be slipped over the conductor. In the core is a small air gap in which a polarized magnet is pivoted. This magnet is free to turn according to the polarity of the core poles terminating at the air gap. When the coil is slipped over a conductor carrying a direct current the core is magnetized and the needle is deflected and makes contact completing an electric circuit through a relay and indicator. Current from a battery is sent through the coil to neutralize the effect of the current in the conductor, and a condition of neutralization is indicated by the polarity indicator. The current necessary for this purpose, which is measured by an ammeter, is proportional to the current in the conductor. The apparatus comprises an adjustable resistor for use in varying the current in the coil.

The committee also described a pothead for use in connecting underground cables with overhead lines. It was stated that some companies using multi-conductor terminals made of iron have had trouble due to heating caused by eddy currents when the terminal is used on cables carrying alternating current. This trouble has been overcome by making the metal forked cap of the terminal of non-magnetic material. The committee directed attention to the importance of cooling of duct lines under certain conditions, some cable failures having been shown to be due to overheated cables. The temperature of a duct of any given construction will vary with changes with the character of the soil through which it runs. A line which gives no trouble from overheating in moist soil might overheat in dry or sandy soil. Attempts have been made to produce artificially the conditions favorable to rapid heat dissipation, but as yet none have shown results to justify general adoption. One of these is the use of a porous tile drain laid in a trench above the conduit line. Another is the sprinkling of the duct line.

OVERHEAD LINES AND INDUCTIVE INTERFERENCE

In view of the importance of the movement toward public regulation of line construction, the committee on overhead lines and inductive interference devoted its report entirely to this subject. The histories of the national joint committee on overhead and underground line construction and of the Bureau of Standards National Electric Code were traced, the latter being covered in considerable detail. In the opinion of the committee, the effect of the safety code on the industry, if widely adopted and enforced, will be to eliminate or restrict inadequate construction and improper operating methods. On the other hand, there has been widespread apprehension of unwarranted increases in construction cost and restrictions of development. While there has been considerable opposition to the general proposition of having a safety code, and while the association has been criticised for assisting through its representatives in the preparation of such a code, it is the opinion of the

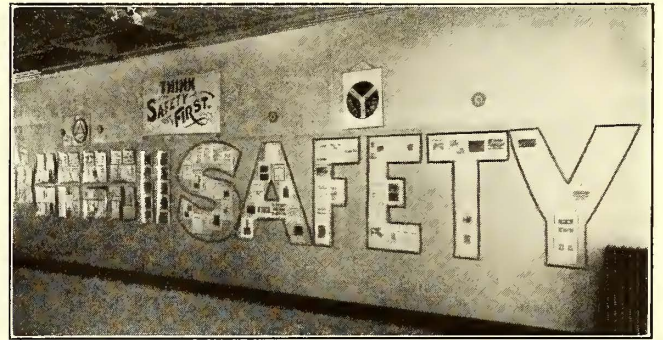
majority of the committee that some degree of public regulation is inevitable. Hence, the influence of the association can more advantageously be directed to assuring that the regulatory measures adopted contain a minimum of unwise features than to conducting a campaign of probably fruitless opposition.

The committee concluded its report with a summary of the most important of the state commission developments in this field.

Safety Exhibit at Aurora

More than 7,000 People Inspect the Exhibit of the Aurora, Elgin & Chicago Railroad—Safety Lectures to School Children

A COMPREHENSIVE yet inexpensive safety exhibit conducted by the Aurora, Elgin & Chicago Railroad at Aurora, Ill., was visited by more than 4000 adults and 3000 children. Safety bulletins, posters and placards in sufficient number to appeal to persons in every walk of life were collected by H. B. Adams, the company's safety supervisor, and arranged on the walls of a vacant storeroom in the business district of Aurora. This material was exhibited for more than six weeks, and attention was attracted to it through the co-operation of the newspapers, which were supplied with material of news interest throughout the period of the exhibition. The safety supervisor and assistants were in charge of the exhibit, which was open daily from 1 o'clock to 9 p. m. The newspaper stories attracted the



A VIEW OF THE AURORA, ELGIN & CHICAGO RAILROADS SAFETY EXHIBIT

public at large, and special arrangements were made with the school authorities to permit the school children to visit the room and inspect the exhibit during school hours. The railway furnished special cars for this purpose, and practically all the school children in Aurora visited the exhibit. In a safety-first lecture to each group of pupils who visited the exhibit, attention was called to the significance of the various posters and signs. In these lectures an effort was made to impress the safety idea upon their minds, with examples and explanations of what should and should not be done under many different conditions in order to avoid accidents.

Safety supervision on the Aurora, Elgin & Chicago Railroad has been put on a permanent basis, and the safety supervisor devotes all of his time to this work. He holds periodical meetings with the employees to teach them safety-first principles and has spent much of his time in an effort to educate the public to form the safety habit. The exhibit above described was a step along this line. In addition to this, much time has been spent among the school children teaching them safety principles, and this work has had the hearty co-operation of the school authorities. Effort has also been made to impress upon automobile drivers the responsibility which rests on them for their own protection, as

well as for the protection of others. Violators of traffic ordinances and careless drivers, when observed, are first warned and then informed that legal action will follow a second offense. The work of the safety department is reflected in the greatly reduced number of accidents, demonstrating that the expense of maintaining a safety organization is fully warranted.

Central Power Station Service for Electric Railways

Railways Paid Central Power Company in Chicago Nearly \$5,000,000 Last Year, About 23 Per Cent of Total, and Used More than Half of the Energy Generated

AT the March meeting of the Engineers' Society of Western Pennsylvania, Peter Junkersfeld, Commonwealth Edison Company, Chicago, Ill., read a paper on "Electric Service Problems and Possibilities." In this paper, among other things Mr. Junkersfeld gave some recent data regarding the supply of power to electric railways in Chicago which are of particular interest in view of the fact that in Chicago the Edison Company furnishes all of the power to the electric railways. The following figures which he gave summarize the situation.

During 1915 in Chicago the income from railway business was \$4,870,000; from commercial power business, \$4,690,000; from commercial lighting business, \$7,622,000, and from residence lighting business,

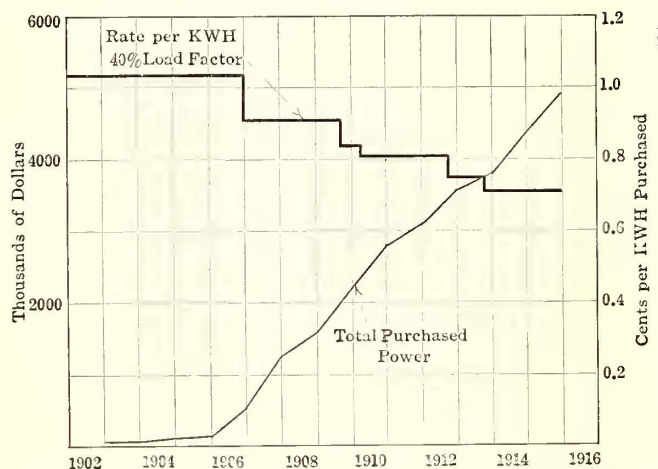


CHART SHOWING INCREASE IN TOTAL COST OF PURCHASED POWER AND DECREASE IN UNIT COST FOR ELECTRIC RAILWAY SERVICE IN CHICAGO

\$3,700,000. Of the total income there was paid for taxes and municipal compensation the sum of \$1,582,000; the payroll with an average of 4175 employees was \$3,796,900, and there were paid for the use of the money employed in the business \$1,890,000 for bond interest and \$3,667,110 in dividends to 3000 stockholders.

The quantities of energy supplied to the several classes of service were as follows: For street and elevated railways, 680,112,000 kw.-hr.; for commercial electric service, 326,728,000 kw.-hr.; for domestic use, 53,284,000 kw.-hr., and for electric automobile charging, 14,300,000 kw.-hr. The company supplies 100 per cent of the available street and elevated railway business, about 35 per cent of the possible domestic business, about 30 per cent of the commercial electric service, and about 10 per cent of the possible electric automobile service assuming that the present 60,000 horse vehicles were replaced with 30,000 electrics.

The accompanying diagram shows the rate at which energy is purchased for electric railway purposes, on a basis of a 40 per cent load factor, which is slightly less than the present load factor. This rate has fallen from slightly more than 1 cent per kilowatt-hour between 1902 and 1906 to slightly more than 0.7 cent per kilowatt-hour for the past two years. The total cost of purchased power for electric railways has increased at an almost uniform rate since 1906 from about \$200,000 to nearly \$5,000,000. More than one-half of the nearly 1,200,000,000 kw.-hr. generated last year was sold to the electric railways. Due to the use of improved generating machinery, the number of pounds of coal burned per kilowatt-hour has fallen from about 7 in 1902-1903 to about 2.7 in 1915, the total coal consumption during this period increasing from less than 300,000 tons to about 1,600,000 tons. The rate of coal consumption in the latest units averages about 1.95 lb. per kilowatt-hour as contrasted with 7 lb. in 1903. These figures are for Illinois coal with about 10,000 B.t.u. per pound.

The full text of Mr. Junkersfeld's paper and the discussion which followed its presentation will appear in volume 32 of the Proceedings of the Society.

In this connection, it is interesting to note that in the 1916 report of the committee of the N. E. L. A. on energy supply for electrification of steam roads, of which Mr. Junkersfeld is chairman, further data in regard to the power situation are given. An abstract of other parts of this report appeared in last week's issue of the ELECTRIC RAILWAY JOURNAL. The report states that the railway peak in Chicago for the winter of 1915-1916 was 203,560 kw. and it occurred between 5.30 and 6 p. m. on Jan. 6, 1916. The light and power peak amounted to 155,670 kw., and it occurred between 4.30 and 5 p. m. on Dec. 22, 1915. The total of these peaks, if they had occurred at the same hour, would have been 359,230 kw., but the greatest load on the combined system amounted to only 337,900 kw. and it occurred on Nov. 29, 1915. This shows a "diversity" of 21,330 kw., or 6 per cent.

If the steam railroads of Chicago were electrified they would require from the central power company a power supply with a peak amounting to about 30 per cent of the present combined peak. By the time such railroad terminals could possibly be electrified the combined peak would be much larger and the percentage smaller. The railroad maximum load occurs in the morning and has a diversity as compared with the combined peak of 10,000 kw. The load factor for the day, based on the one-hour peak, is 62½ per cent for the steam railroad requirement only, whereas the light and power and street and elevated railway requirements show a load factor for the day of 59.3 per cent, and the combined system a load factor of 62 per cent. This distinctly shows what the beneficial effect of the electrified steam railroad requirements would be upon the present central power company load.

The suburban service of the electrified steam railroads in the Chicago district makes the annual load factor less than would be the case in some smaller-sized city, for the steam railroads there do not have such a pronounced morning and evening peak in suburban service. This pronounced suburban peak will, of course, be found in ten or twelve of the large cities in the country.

Sydney City Railway, New South Wales, Australia, has two new types of car under consideration, with accommodations for 100 passengers seated and 166 standing, and ninety-eight seated and 100 standing, respectively.

Some Problems of the Electric Railway Industry*

Slight Increases in Required Standards of Service or Labor Costs or Slight Decreases in Fares Seriously Affect an Electric Railway—The Interest of the Public in Proper Transportation More Vital than It Usually Realizes—Ways in Which It Can Help

By F. W. DOOLITTLE

Consulting Engineer, New York City, and Formerly Director of the Bureau of Fare Research, American Electric Railway Association

IT has been suggested that an appropriate matter for discussion at this time is the very general but very important question: "What is the matter with the electric railway industry, and how may the situation be improved?" Without proposing to attempt any rigorous treatment of a subject so involved and of such significance as this, it may still be within the province of these remarks to discuss some of the problems of the industry and perhaps to be able to say in conclusion: "These things among others are significant as adverse factors to the development of the industry."

It has become increasingly apparent during the last few years that the electric railway business is not particularly prosperous. An examination of the returns earned in the electric traction industry shows that for a number of years they have been steadily decreasing in this State. For example, the average rate of return has been 6.5, 5.5 and 5.25 per cent during three consecutive eight-year periods. While this is a specific answer to the question, "What is the matter with the industry?" it is merely preliminary to the more pertinent inquiry as to why the net earnings in the industry have been steadily decreasing. This situation is so general and the factors entering into it vary so little from place to place that a diagnosis and some prognosis may be made in general terms.

INCREASES IN OPERATING EXPENSES AND INVESTMENT RATIO

It has been generally recognized that electric railways are continually furnishing more service, better service and very much more expensive service for the same or a smaller fare and have, in fact, in many instances, long since passed the point where the fare equalled the cost of the service. A considerable part of the increased quantity of service, or increased length of ride, has followed the expansion of cities and the consolidation of lines, with the attendant interchange of traffic. This addition to the quantity and quality of service has not been accompanied by added revenues.

The demands of growing communities have imposed many unremunerative and unnecessary expenditures upon the street railways. Paving must be laid, and streets must be graded and maintained. Streets must be cleaned and sprinkled and snow removed. Extensions of service must be made where little traffic exists, even though every passenger is carried at a loss. Equipment must be abandoned for later types, even though neither the company nor the community is able to absorb the economic loss resulting from the change. Tracks are required to be idle during the hours of the night when, but for a false pride on the part of the community, they might be permitted to carry express and freight and thus assist in the relief of an intolerable traffic congestion during the hours of the day. Autos are permitted to park in the streets. In one city

a recent survey showed 72 per cent of the area on a number of downtown streets so occupied. These streets have one railway track and are 40 ft. between curbs. Of this 40 ft., 28 ft. was being used as a public garage. Such practices result in crowding all moving vehicles into the track zone to the demoralization of schedules, the delay and vexation of patrons and the substantial increase of cost of operation.

Nor have these community requirements resulted only in increased operating cost. The required capital additions to property have been unproductive. From the published reports of the Boston Elevated Railway, for example, it is evident that its investment ratio has increased in twenty years from 3 to 6. That is, it now requires twice as many dollars to earn \$1 of revenue as it did twenty years ago. Some of this investment has, of course, been useful in lowering operating costs, though the operating ratio has not been greatly lowered. If we capitalize the net earnings in 1914 at the rate of return earned twenty years ago, an investment value \$40,000,000 less than the actual investment is found. That is, the net earnings of the company in 1914 on an investment of more than \$100,000,000 did not exceed the earnings on \$60,000,000 at the rate of twenty years before. Nor is this case exceptional. The reports of the Public Service Commission of this State, together with those of its predecessor, show that the investment per revenue passenger for all Massachusetts electric railways is now almost twice what it was twenty years ago.

Many of these tendencies are well known and have been pointed out and discussed for many years, but no systematic study has been made of their individual effect on net earnings and their probable future importance. A few typical factors exercising an adverse influence on electric railways and their influence on cost may be more critically examined.

STANDARDS OF SERVICE

Within the last ten years the matter of quality of service, measured by so-called standards of service, has received an increasing amount of attention and will doubtless continue to do so in the future. There have been styles in standards, and a great variety of conditions have been imposed by regulating bodies in attempts to adjust features of electric railway service which had been made the subject of complaints. To these requirements can be ascribed a considerable part of the growing insufficiency of earnings.

It will be well to consider some of the factors which have brought the question of service standards into prominence. It must be admitted that, from the standpoint of the passenger, any service other than that which provides him with a seat is more or less unsatisfactory. The patron, it appears from experience, cannot be expected to consider such questions as the ability of the company to furnish a seat for every passenger, and he is constantly reminded of standards of

*Abstract of paper read before the New England Street Railway Club, Boston, Mass., on May 25, 1916.

service because of the discrimination which is apparent whenever one passenger in a car must stand. It is immaterial that this standing passenger might have had a seat by waiting for the next car, the fact remains that he sees others seated while he himself stands, and this is a constant aggravation.

Actually, of course, the public has little or no accurate knowledge as to what constitutes reasonable service. Leaving out of consideration the ventilation and heating of cars, style of steps and seats, near-side and far-side stops and other matters upon which it cannot be expected that there would be agreement, there remain such things as headways, speed and available seats upon which it would be expected that the opinion of the passenger would be of value. A recent study of this question indicates, however, that such opinion is most unreliable. In one case where it was possible to submit a number of questions to a group of people, under conditions favorable for such an examination, two of the questions asked were: "What is the average headway between cars?" and "What in your opinion is a reasonable headway?" The time of day and place were given so as to make the replies as definite as possible. The answers showed a wide variation, as was to have been expected. It is of at least equal interest that the average figure given for a reasonable or satisfactory headway was approximately that of the schedules then in effect, while the estimates as to the actual headway were considerably greater. In other words, reasonable service was better service, but when expressed in figures the result was existing service.

In another case the question was asked: "How many people constitute a comfortable load for a car seating fifty?" The conditions were here further defined by specifying different times of the day, for each of which answers were to be given. The maximum answer was to the effect that 150 people would comprise a comfortable load, and the minimum answer was thirty, a range quite sufficient to justify almost any standard of service if the opinions of the patrons could be used as a basis. Two-thirds of the answers were based, according to the statements of those who made them, on the number of passengers in the car, that is, probably on the imagined amount of space available for each. Of the answers sent in 15 per cent were based on the matter of ventilation, and 6 per cent on difficulty experienced in boarding and leaving cars. Many similar instances could be cited, but these will suffice to indicate that the judgment of the patron as to what constitutes good service is not, and should not be expected to be, of much service in establishing standards. It indicates the low value of opinion testimony in service cases.

One of the peculiarities of the electric railway industry is that it has but one grade of service. The steam railroad has the advantage over the electric railway in this respect. It has been permitted to differentiate between the classes of service it renders. It has been possible to vary speed and accommodations for commutation as compared with through service. It has been enabled to differentiate in fares and accommodations as between the all-stop and the limited train. There is a vast difference in revenues received from carrying one passenger 10 miles in a coach on a local train and that received for carrying one passenger 1000 miles in a Pullman drawing room on an especially fast train. Many of the patrons of street railways would be glad to pay an additional fare if additional service could be purchased therefor, but with a few exceptions, and these in interurban operation, no attempt has been made to provide different classes of service. Here and there attempts have been made to adjust fares

to the quantity of service, if not the quality, but these are still in the experimental stage and are having some difficulty in overcoming the real estate man's slogan of "one city, one fare," which has worked such hardship on the carriers who have made city expansion possible.

In the earlier years of the industry it was expected that growth in density of traffic would occur, with an attendant betterment in net earnings. Yet, in 1915, there were fewer revenue passengers per mile of track in this State than there were a quarter of a century before, and despite the increase in size and speed of cars, offset no doubt in part by the greater average length of ride, the number of revenue passengers per car-mile was less by 12 per cent than twenty-five years before. With service growing faster than traffic, it is obvious that the changing standard of service must have a pronounced effect upon the financial results of operation. It has been easy to say and to prove that cars have been crowded, and it has been equally easy for commissions to say that more cars should be run. It has frequently been assumed that it is possible to provide a seat for every passenger, and to a considerable extent the cost of rendering such service has been overlooked. Gradually, however, opinions have been modified to take into account the financial ability of the company to render service. Out of the confusion of standards there is gradually emerging this idea: "Reasonable service is that service which the public is willing and able to pay for." It is of interest, then, to examine in some detail the matter of what it costs to render additional service.

THE EFFECT OF INCREASED SERVICE—AN EXAMPLE

Let us assume an electric railway plant representing an investment of \$20,000,000. The annual operating revenue will be taken as \$4,500,000—all from passenger service—and operating expenses, including taxes and replacement insurance, as \$3,500,000. The net of \$1,000,000 is sufficient to pay 5 per cent on the investment. This is not a reasonable rate of return, but it is typical, and the assumptions will stand. The company owns and operates 225 miles of track and at times of heaviest traffic has in service some 450 cars. The service is good, but due to the low earning power of the property it is difficult to get money for new equipment and extensions. At the times of heaviest travel and at the heaviest points on the lines, about as many passengers will be standing as seated. Now suppose that an order is issued, of either the headway type or the seat ratio type, requiring 10 per cent more cars in service during the heaviest two hours in the morning and the heaviest two in the afternoon. The investment must be increased by \$800,000 for new cars and power equipment, and the operating expenses, including taxes and replacement insurance, will be increased by \$138,000 per year, all of which must come out of net earnings. The rate of return is thus decreased from 5 per cent on \$20,000,000 to 4.14 per cent on \$20,800,000. The significance of these figures is this, that the difference between 4.14 per cent and 5 per cent represents more than \$3,500,000 of property made unproductive to its owners, while the rate of return on the remaining property is held at the very low rate of 5 per cent.

Again, suppose the increase in service were made to cover not only the four rush hours, but all periods of the day. The cost of operation exclusive of return on investment would be increased by some \$375,000 per year, with a resulting decrease in rate of return from 5 per cent to 3 per cent. This would be equivalent to the confiscation of some \$8,500,000, or more than 40 per cent of the investment.

It is quite likely, also, that these demands for in-

creased service would be accompanied by requirements to extend lines into unremunerative territory, to construct crosstown lines of the type which the railroad man characterizes as "suckers" instead of "feeders," and to extend transfer privileges so that the situation is thus further aggravated.

These figures are given for the purpose of emphasizing the narrow margin in the traction business and to show how sensitive the returns are to even slight changes in services. One answer to the question: "What is the matter with the traction industry?" is that any business with an investment ratio as high as that in the electric traction industry is dependent for its success upon a more careful study of costs than has been usual in the past. It is obvious that when a business is earning but the most meager returns, experiment is a hazardous procedure, and it is especially important that careful study be given to the effects of proposed service orders before they are entered. By very conservative figures a 10 per cent increase in service may serve to render unproductive or confiscate 40 per cent of the investment. This in itself demands that great care be taken by those in whose power the matter lies, to see that the service prescribed be within the financial ability of the company to render.

EFFECT OF INCREASED LABOR COSTS AND LOWER FARES

In addition to the changed character of the standards of service demanded at the present time, another tendency is seriously hampering the growth of the traction industry. This is the increased cost of labor and materials. With the increasing rise in prices, the nickel fare has had less purchasing power. With the increased price in the cost of living, moreover, there have been increased demands for adjustment in the wages paid labor in all industries. Manufacturers and producers have been able to meet these by an increase in the price of the commodities they sell. Under present limitations of rates of fare such an adjustment of revenues and wages has not been possible in the street railway business. The street railway differs from other public services in that it is a very large employer of labor. The greatest part of its payroll consists of that expended in platform wages, and the continued increase in platform wages is one of the most important factors affecting the future development of the industry.

Returning to the hypothetical electric railway which was used in computing the cost of additional service, it will be noted that there is paid annually some \$965,000 for platform labor, or at the rate of about 26½ cents per hour. Suppose this average wage is raised by 13½ per cent to 30 cents an hour. The cost of operation is increased by \$132,000 per year, or nearly the amount of the increase in operating expenses following an increase in the service of 10 per cent for four hours per day. Reversing the comparison, the cost of decreasing the service 10 per cent during rush hours is equal to an increase of 5 cents per hour in platform wages, or an increase in the return on the investment from 5 per cent to 5.9 per cent. These figures, it should be borne in mind, are based on the operation of a hypothetical plant in which, in so far as possible, average and normal conditions were assumed to prevail. Unit costs, it is believed, are not widely different from those current during the past year in the New England states, but it must be understood that the conclusions here reached are based on and relate to no particular property.

It is believed that the point has been reached on many important electric railways where demands for increased wages have reduced the real net earnings below those corresponding to the legal rate of interest; and wage arbitration awards are becoming as important

from the standpoint of preserving the integrity of the property from confiscation as are some of the problems for which the law gives jurisdiction to the regulating commissions.

A slightly different presentation of this point may be of interest. The property above considered now has a passenger revenue amounting to \$20,000 per mile of track per year. Assume that the community grows and that traffic becomes more dense, the passenger revenue reaching \$30,000 per mile of track in the course of a number of years. If the standards of service remain unchanged, that is, if the average patron receives the same service then as now, and it is assumed that he will, although experience would indicate that he will receive much more service, the earnings available for return on investment will increase by some \$4,000 per mile of track per year. But, in the meantime, it will have been necessary to increase the investment by some 20 per cent, so that the increase in gross earnings of 50 per cent, or \$10,000, per mile of track per year may be expected to yield not much more than \$3,000 per mile of track, applicable to the payment of interest or dividends, to improvements in the service, or to increases in the wage scale. If, however, the wages have been increased meanwhile, by no more than 5 cents per hour, the entire increase in net earnings will be thereby absorbed, and the return on investment will fall short by \$75,000 of meeting the present rate of return of 5 per cent. In other words, an increase of 50 per cent in traffic density would yield less than a 20 per cent increase in platform wages, if existing standards of service and dividend rates are to be maintained.

Two other factors which have been much discussed are the possibility of competition by motor vehicles and reductions in the rate of fare. The former possibility, while it has had a far-reaching effect upon the financial condition of many street railways throughout the country, does not under present conditions appear to be permanent. Where the gasoline-driven vehicle has been compelled to perform in even a limited degree the functions of the common carrier, it has proved unremunerative and has largely disappeared. Claims for reduction in the rate of fare are not now as pressing as they were in years past. If we assume, referring again to our typical property, earning under present conditions a 5 per cent return on an investment of \$20,000,000, that its operations are subjected simultaneously to these demands: (1) an increase of 10 per cent in the service; (2) an increase in platform wages to a rate of 35 cents per hour, and (3) the sale of six tickets for 25 cents, we find that the property, after nearly \$1,000,000 additional investment, would fail by \$350,000 per year to pay operating expenses and taxes.

EFFECT OF INCREASED FARES

We have thus far considered the effect of increases in service and increases in platform wages on cost, and it has been observed that a relatively small increase in either may amount to the confiscation of a substantial portion of the property. In other industries, if better or more service is desired, the purchaser expects to pay a higher price and, as has been frequently demonstrated, an increase in the wage scale in manufacturing establishments is followed almost without exception, and immediately, by an increase in the selling price of the commodity produced. It is then of particular interest to observe what would be the result of an increase in the rate of fare. There is ample evidence that increased fares for a time at least decrease the riding of some classes of patrons. The decrease, moreover, is effected in the short haul or more remunerative part of the traffic.

It is usually very difficult to analyze the results of changes in rates of fare, because of the very many factors other than rates of fare which affect the riding habits of individuals and communities. Such studies as have been made seem, however, to indicate that within the limits of 6 cents and 3 cents as the rates of fare, an increase in fare, although resulting in decreased riding, is nevertheless accompanied by an increased gross revenue, and a decrease in fare likewise results in decreased revenue although riding is increased. In other words, the effect on the number of rides is not sufficient in either case to offset the change in rate of fare. In one city where opportunity was given to study the question in some detail, it appeared from the records of twelve years that in but seven of the twelve periods was a reduction in rate of fare accompanied by an increase in riding habit or an increase in rate of fare by a decrease in riding. That is, in only slightly more than half the cases was the expected result obtained.

Speaking still in terms of the hypothetical plant which has been considered in connection with increases in service and increases in platform wages, it will be assumed that a 20 per cent increase in rate of flat fare will yield only a 10 per cent increase in revenue, due to a falling off in riding of 9 per cent. This will be accompanied by a lowering of operating expenses if the service is reduced, so as to maintain it at the same standard as at present, or, if the same service is maintained, it will be equivalent to an increase of 9 per cent in the standard of service. This increase in fares might be so distributed as to result in (1) a 9 per cent increase in the standards of service; (2) an increase of 5 cents per hour for all platform labor, and (3) an increase in the rate of return earned by the property. It is significant that in accordance with this distribution the owners would receive a 6 1/3 per cent return instead of the present wholly unremunerative return of 5 per cent. In other words, the result of a 10 per cent increase in revenue and a 9 per cent decrease in passengers and car-miles would be absorbed in a wage increase of 5 cents an hour and an increase in return to slightly more than 6 per cent.

THE INTEREST OF THE PUBLIC IN THE QUESTION

These conclusions are not pointed out in a spirit of pessimism. On the contrary, it is a sign of promise that the dangers and difficulties of electric railway operation are becoming known and are being carefully studied. While the industry can never be one of large profits, it can well be one where investment is protected and where a reasonable return can be assured to the investor. The public is entitled to all the service it is willing and able to pay for, and it is to the interest of the operator to see that the patron gets what he pays for. Just here has lain much of the difficulty of the last decade. "How much does a given service cost?" "Does it cost more than is received for it?" "How much would it cost to render additional service?" These questions cannot be answered with ease. Perhaps the best that can be done in many cases is an approximation, but so long as the ultimate test of the reasonableness of the rates and service of a public utility is whether the owners are being properly recompensed for the property they have devoted to a public use, it will be increasingly necessary to undertake to answer these questions. If the margin of profit is large, unskilled hands can control the business with relatively small danger of disaster, but when the return is so low as it is in the electric traction industry, the greatest skill and care are necessary to preserve solvency.

Nor are the conditions outlined presented as an argument for increased revenues of electric railways on the

ground that "the laborer is worthy of his hire," but rather because the efficient operation of transportation agencies is essential to city growth and any failure of our street railways to be an economic success results in a loss to the community far greater than the loss to the investor. Real estate values are determined by transportation facilities. In one city recently a survey was made of assessed property values on streets upon which street railways are located and on adjacent streets. The comparison disclosed that the value of frontage on streets with street car facilities was 2.15 times the value of that on adjoining streets. It is difficult to measure by any money standard the cost of congestion due to curtailed transportation facilities. The slums are due primarily to lack of rapid ingress and egress from the city. Adequate city planning requires the development of suburbs and auxiliary business centers in close contact with the center of the metropolis. The growth of such centers is necessary to the healthy expansion of the city. We are all aware that they are not possible where transportation is inadequate. The fundamental problem of city planning is not the establishment of widths of streets, the regulation of heights of buildings, housing, forestation, municipal art or ornamental street lighting, but the planning of transportation. Just as proper drainage is the essential factor to consider in the construction of the highway or roadbed, so transportation facilities are fundamental to intelligent city planning. And as compared with these tremendous benefits to the community which come with adequate transportation we may consider the remarkably small part which street railway fares play in the patrons' yearly expense budget, ranging, as has been pointed out by the bureau of fare research, from 2.6 per cent for families in New York City having incomes of less than \$500 to 1.2 per cent for families with incomes of \$1,500. Co-operation of street railway agencies and the communities they serve will result in far greater gain to the community than to the investors in street railway securities.

THE PROPER DIRECTION FOR CO-OPERATION

It is possible briefly to outline the steps along which such co-operation must proceed:

First. The increase in earnings where street railways are now earning inadequate returns so as to make it possible at least to attract new capital into the development of the industry. Increased earnings do not necessarily mean increased fares. They may possibly be secured by removing the many burdens foreign to the business that are now imposed upon it by municipalities, particularly taxes, special assessments and unremunerative capital expenditures. Municipal aid should, in fact, be given to provide public improvements which permit more rapid service.

Second. The development of rational standards of service, or a definite understanding of what is adequate service. This has been possible in the gas and electric business, and the public is satisfied that such standards are all the industry can afford. Lack of such standards is responsible for the ever-increasing demands for more accommodation. Public understanding of such rational standards is necessary. It must be recognized that street railway service is cheap, that it cannot provide facilities immediately when they are desired, that it serves the community and not the individual, that the community's habits and not the street railway create congested periods of traffic and that the right-of-way for the street car serving the majority of the community must be preserved by enforced city ordinances, if rapid service is to be obtained.

Third. Co-operation in meeting the problem of increased cost of material and labor. It may be neces-

sary for regulating commissions to fix standards for allowances for operating labor and return on capital in terms of operating revenues, increasing revenues where increased wages are necessary. In the Middlesex case in this State your commission found, as one of the factors necessitating an increase in fares, wage increases resulting from an arbitration. This points clearly to the fact that the matter of wages and revenues cannot be permanently dissociated and should not be dissociated even temporarily.

Fourth. The establishment of rates or a system of fares in conformity with service which will insure the future development of the industry, limiting the tendency of increased transfer privileges and length of haul for the single fare. This leads to the consideration of the possibilities of the zone system of fares. The zone system may not be as practicable a solution as a gradual increase in rates of fare with the increase in the service area under certain conditions, but it appears in some places, at least, to have been the most effective method of solving some of the more pressing problems of the industry.

Fifth. The scientific rearrangement in many places of routes, the differentiation of through and local routes and the establishment of limited stops to conform to a predetermined plan of city development.

In conclusion, the purport of these remarks is this: The trouble with the electric traction industry is that the revenue is limited and that continual demands on the part of the city for unremunerative investment, on the part of the patrons for additional service and on the part of labor for higher wages have reduced the return on investment to a point where capital is reluctant to engage in the industry and to a point where further burdens of investment, of additional service or of increased wages are likely to confiscate a considerable portion of the investment. To what relief individual traction companies are entitled rests, of course, on determinations of cost, including a reasonable return upon utility capital invested in the business. If revenues are not increased by arbitrary changes in rates of fare the reasonableness of municipal burdens, the reasonableness of wage increases and the necessity of municipal aid must be determined by the necessity of maintaining such a reasonable return on utility capital. The street railway business does not differ from other commercial enterprises. It cannot grow without new accretions of capital, and these cannot be obtained unless the returns are sufficiently high to compete with other forms of investment.

Fare Questions Discussed in Boston

Following Mr. Doolittle's Paper, R. W. Perkins, President Shore Line Electric Railway, Described the Copper Zone System of That Company

A LARGE attendance was present at the meeting of the New England Street Railway Club in Boston on May 25. Following the presentation of Mr. Doolittle's paper, published on the preceding pages, R. W. Perkins, president of the Shore Line Electric Railway, Norwich, Conn., spoke of the satisfactory results obtained by the use of the copper-zone system on that property.

Mr. Perkins said that the zone system of the Shore Line Electric Railway is applied on 240 miles of the road and affects intimately about 200,000 people in eastern Connecticut. The Connecticut law permits a company to advance its rates, and then follows its justification before the Public Utilities Commission, whereas in Massachusetts the advance follows the approval of the commission, the procedure being reversed. The Connecticut plan gives a company courage to go ahead

and discuss its needs while reaping the benefit of at least a temporary increase in rates.

With the exception of one case, the company met with no serious difficulty in the fare increase on the whole 240 miles of its lines affected. A final decision has not yet been received from the commission, but the outlook seems hopeful in the light of the hearings. The company also had a hearing before the Interstate Commerce Commission on a portion of the property which is interstate and looks for a favorable outcome. Mr. Perkins said that he did not know of a property in New England that is not justified in an advance of passenger rates, but the institution of a flat 6-cent fare carries with it many difficulties. Most of the Shore Line company's difficulties were smoothed out by talks before the chambers of commerce and business men's associations in the different towns. The company feels the results in a change in rate which means a change in gross, which is practically reflected in the net. The increase of gross which comes from an increased service is very different from an increase in gross which comes primarily from an increase in rate. Better results can be obtained by several or many companies seeking fare increases than one or two.

The speaker emphasized the value of Mr. Doolittle's book on fare problems to the electric railway manager seeking a favorable rate decision. He touched upon the lack of detail knowledge of some of the legal advisers representing remonstrants, pointing out that the favorite policy of such lawyers is to attempt to disqualify the statements of company witnesses. "The whole work of such a lawyer," said Mr. Perkins, "is nothing more nor less than a fishing expedition, and you have got to do everything you can to put it up in the right light to the commission. And I will say right here that our commission is a reasonable commission, meaning to do absolutely the right thing." The copper-zone system is the solution of the problem, in the speaker's opinion.

Regarding extensions, Mr. Perkins said that he has recently been purchasing material in Norwich for two or three extensions of lines. If these had been built under the old nickel-zone system, the company would simply have been obliged to give additional service as the result of additional investment and would not have had a penny of revenue to take care of the added investment. With the smaller increment of fare and smaller unit of service, it is able to get recognition for every piece of track built.

In the Norwich city system there are lines radiating from specific centers. The company charges a nickel fare in two short zones, or two zones for a nickel fare—a minimum fare of 5 cents in any two zones of the system. The result of this is that a person riding from Niantic to Taftville, the other end of the 2-cent zone system, travels 2.29 miles for 2 cents with a transfer, but he pays 5 cents from Niantic to a specific center, and if he rides between the two points he pays 8 cents. Therefore, he rides through four zones for 2 cents each, and if he rides through one short single zone to the other he pays 5 cents; if he journeys from Taftville out half way to Niantic he pays through three zones, 6 cents, and this rule is used on every two zones of the system. The speaker said that he believed that the zone system is bound to become general. Nothing is so discriminatory as the old 5-cent fare, where a passenger rides for 5 cents beyond a certain point and then rides beyond, paying another 5 cents, and making 10 cents for perhaps 3 miles. Under the zone system the man who rides just over the line pays 6 cents, so that between Norwich and New London the company gets 24 cents. A through ticket is sold in order to make up for the man who rides just over the end of the first zone.

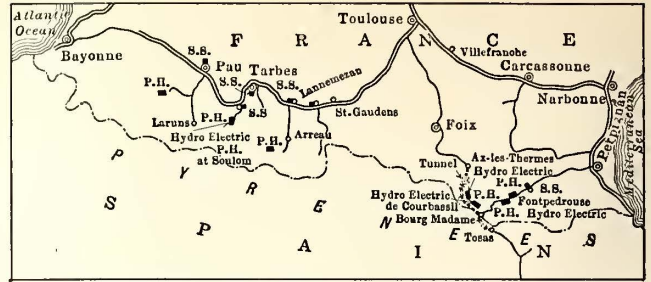
New Locomotives for the Midi Railway

Eight Electric Locomotives Rated at 1500 H.P. Are Being Built for This Extensive Electrification Project in France in Preparation for the Reconstructive Period Which Will Follow the War

THE Midi Railway, which operates in southern France and to the frontier of Spain, is having built at the present time eight single-phase locomotives designed for both freight and passenger service on its electrified lines, this extension of the electrical equipment on a governmental railway system being obviously in preparation for the reconstructive period which must come after peace has been declared in Europe. The new locomotives are intended for the system's western group of electrified lines and they will ultimately be placed in service on the main line from Toulouse to Bayonne on the Atlantic Coast.

Each locomotive will have a continuous rating of 1500 hp. and a one-hour rating of 1800 hp. at a maximum speed of 62 m.p.h. It will be of the 4-6-4 type, having bogie trucks at the front and rear, with three mechanically independent driving axles. The wheelbase will be approximately 15 ft., and the six motors on each locomotive will be of the doubly-fed type. The motors are mounted in pairs, each pair being geared to a quill surrounding one of the driving axles and connected to the drivers by helical springs, clearance being provided between the quill and the axle, so that vertical movement of the drivers is independent of the motors. The locomotive cab will have several compartments, one at each end for the motorman, another for the electric boiler for the steam heating system, another for the motors, transformers and accessories, and still another compartment for the high-tension switches. A passage 20 in. wide will be left on each side of the apparatus in the cab.

Current collection at the trolley, which carries 12,000-volt, 16 2/3-cycle current, will be effected by two pantographs, the current being stepped down to the voltage required for the motors by two transformers. Each locomotive will be required to handle a train weighing 300 metric tons, including the locomotive, at a minimum speed of 53 m.p.h. on grades of 0.5 per cent. On grades of 1.6 per cent a speed of 37 m.p.h. is required with a 200-ton train, and on the ruling grade of 3.2 per cent a speed of 31 m.p.h. will have to be made with a 160-ton train. The locomotives are to be capable of holding back on the down-grades a load equal to that called for on the up-grades, the motors acting as generators and delivering current either to the line or to resistance. The electric brake equipment will thus have to permit a 160-ton train to descend the 3.2 per



MIDI LOCOMOTIVES—MAP SHOWING GROUPS OF ELECTRIFIED LINES

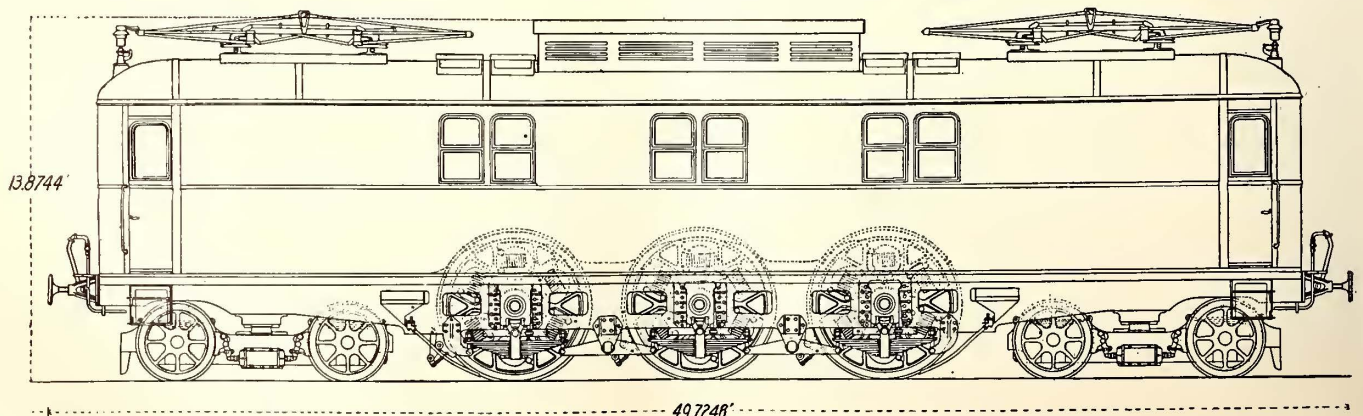
cent grade at speeds ranging between 31 m.p.h. and 6 m.p.h., but the electric brakes will be operative only at speeds below the higher figure.

The forty-eight motors for these locomotives, each of which is of 300 hp. at 790 r.p.m. with 312-volt, 16 2/3-cycle current, are being built in this country, because of the crowded condition of work at the Havre shops of French Westinghouse Company with which the order for the locomotives was placed, the construction of the motors being transferred to the East Pittsburgh plant of the Westinghouse Electric & Manufacturing Company. Under ordinary conditions it would have been necessary to have the entire equipment made in France, but as a result of the existing war conditions the French government gave the manufacturers permission to have the material for the locomotives made wherever it was most convenient.

DEVELOPMENT OF MIDI ELECTRIFICATIONS

The use of single-phase locomotives for this project is the result of an interesting process of development. Single-phase power has been used on the Midi Railway since 1908, when 10 miles of track near the Mediterranean coast were equipped with apparatus for 4000-volt, 16 2/3-cycle operation. After two years of experiment, authorization was given for the electric equipment of 175 miles of single track. Of this, 70 miles were on main lines and 105 miles on intermediate branches. The work was divided into two groups, the eastern one of which extends from Perpignan to Villefranche, approximately 30 miles, and includes a 34-mile direct-current, third-rail extension to Bourg-Madame, as well as a section which is a part of the main line from Toulouse to Barcelona in Spain. The western group includes 33 miles of main-line double-track from Montrejeau to Pau, and also 220 miles of single-track branch-lines in the same section.

For this trackage the railway company requested bids for electric locomotives from various manufacturers of electric equipment in France, reserving the right to return the locomotives to the builders if they



MIDI LOCOMOTIVES—ELEVATION OF NEW MACHINE SHOWING DRIVING WHEEL ARRANGEMENT

did not fully meet the specifications. The bids of six companies were accepted, and the locomotives furnished were subjected to special tests during the years 1911 and 1912. As a result of the tests, which were made on a 15-mile section of the line, three of the locomotives, including the one furnished by the French Westinghouse Company, were accepted.

The latter type of locomotive was equipped with two single-phase, 600-hp., 15-cycle, 327-r.p.m., 410-volt motors connected to a jackshaft by means of twin gears, connection from the jackshaft to the main driver being made by means of a Scotch yoke and connecting rods. This initial locomotive is now working in freight service on the Lourdes-Tierrefitte line, one of the branches where maximum speeds of 44 m.p.h. are attained, and it is as a result of the excellent performance of the machine that the railway placed the order for the eight new locomotives described in the foregoing paragraphs.

One of the major reasons for this extensive electrification was the availability of large amounts of hydroelectric power. The eastern group of lines is supplied by several hydroelectric plants, of which one on the Tet River delivers three-phase power at 60 cycles, 600 volts to a substation at Villefranche, where it is converted from three-phase to single-phase power at 16 2/3 cycles and 12,000 volts. This substation also supplies power to the 800-volt direct-current equipment on the Villefranche-Bourg-Madame line. Another hydroelectric plant on the Tet River is equipped with two 1375-kva., 16 2/3-cycle, 500-r.p.m., 12,000-13,500-volt single-phase generators, and in addition there is a power station at Fontpedrouze and another at Porte in the valley of the Caroe, to furnish stand-by service. The power for the western group of lines is supplied by a hydroelectric station located near the village of Soulom, where there are two waterfalls of great height. The equipment of this station includes six 3500-kva., single-phase, 6000-volt, 16 2/3-cycle generators. Three of them operate at 500 r.p.m. and three at 320 r.p.m. The voltage is raised to 65,000 for distribution to four substations, where it is reduced to 12,000 volts for the trolley. Two other power stations are projected. One of them, at Eget on the Aure River, will contain four 3500-kva., 16 2/3-cycle, 6000-volt, single-phase generators, and the other, which will be located at Orleans, will supply power to the Transpyrenean line from Dedous to Aronanos.

Entertaining the Sunday School Class

The Task of the Chicago Elevated Railways in the Maintenance of Rolling Stock Described

AN interesting bit of public relations work was recently done by H. A. Johnson, master mechanic Chicago Elevated Railways, who entertained a class of twenty-five from one of the Oak Park Sunday Schools with a trip over some of the elevated railway lines and an inspection of the repair shops. This class, whose members' ages range from fifteen to fifty, has regular outings and accepted the invitation of Mr. Johnson with a view to gaining a better knowledge of city transportation methods.

The party was carried in one of the new all-steel trains, which was run from Oak Park to the city, then around the Union Loop and over the south side lines to the terminus of the Kenwood division. From here the train was run back to the city and over the northwestern division to the large shops at the Wilson Avenue terminal. The train was run directly into the shops, and then Mr. Johnson gave the party a little talk on the mechanical features of the cars.

The nature of his talk is of particular interest in showing how the confidence of the public may be gained when a fuller knowledge of railway company affairs is obtained.

Mr. Johnson first addressed the ladies with regard to the care of the cars from the standpoint of cleanliness. He said that the ordinary housewife with a five-room apartment considered it quite a task to keep clean ten or fifteen windows, but he had 42,000 windows to wash. Moreover, the duty of scrubbing floors in a home was onerous, but what would the housewife think if she had 600,000 sq. ft. of floor to scrub, as much floor as would ordinarily be in 1200 apartments. Mr. Johnson then pointed out the bigness of the equipment maintenance task by stating that if all the elevated railway cars in Chicago were coupled together, they would make a train 15 miles long, and that during the evening rush hours seats were available for 83,000 people. Here were more than enough seats for every man connected with all branches of the United States army. In fact, the entire army could all be transported by the Chicago Elevated Railway at one time, every man could have a seat, and there would be seats left.

Mr. Johnson then spoke of the number and possibilities of road failures of equipment. During 1915 there were 893 small delays due to equipment causes, and yet more than 50,000,000 car-miles were run. That meant about 57,000 car-miles per failure. "Do you realize that you can ride the equivalent of a trip twice around the world with an average of but one delay due to equipment?" he asked, and then said he wished his automobile would make that kind of a record. He then pointed out that reliability of service was not a matter of chance. It was the result of a thorough system of inspection and maintenance. He also spoke briefly of the general mechanical organization of the road and how cars were inspected regularly at short periods and received a general overhauling at longer periods. The party was then divided into groups and shown through the repair shops by the foremen, who acted as guides. Attention particularly was drawn to the size of the axles, wheels and the motor. It was pointed out that the trucks and motors, that is, the running gear of the car, weighed half the total weight of the car.

Next a demonstration of the automatic safety track trips was made in the terminal yard, showing how these trips set the air and stopped the train without any act on the part of the motorman. The reason for the "dead-man" handle on the controller and the automatic acceleration features were also explained and their action illustrated. To convey an impression of the power of the braking system on a train, the brakes were set and the current put on the motors. Even with 300 or 400 hp. applied, the brakes still held the car. Later the safety overload action of the circuit breakers was demonstrated by throwing the controller into multiple with the air brakes set on a standing car.

The general feeling conveyed to Mr. Johnson's guests on this trip, as evidenced by their remarks, was one of increased confidence in the elevated railway service.

Precautions which have been taken in case of Zepelin raids almost led recently to a strike of the Northampton (England) Tramways. The tramcars ceased to run at 8 p. m. and this led to a reduction of the working hours and a consequent loss of the wages to the drivers and conductors of the cars of from 7 shillings to 8 shillings (\$1.68 to \$1.92) per week. An offer by the tramway committee to pay half rates for the lost time was declined. After further consideration the committee agreed to the demands of the employees.

Interstate Utility Capitalization

R. E. Heilman Points Out the Desirability of Federal Control Over the Securities of Interstate Utilities

THE May issue of the *Journal of Political Economy* contains an interesting review by Ralph E. Heilman on control of interstate utility capitalization by state commissions, the defects of the present chaotic conditions and the remedy therefor by placing the capitalization of interstate utilities under exclusive federal control. According to Mr. Heilman, capitalization, unlike rates and service, does not easily lend itself to control upon a geographical basis. The problem seems to be twofold: first, as to the degree of control exercised by a state through its commission over the issuance by a domestic corporation of securities which represent expenditures upon, or are secured by liens upon, property outside the state; and second, the degree of control thus exercised over the issuance by a foreign corporation of securities which represent expenditures upon, or are secured by liens upon, property within the state.

SECURITIES OF DOMESTIC AND FOREIGN CORPORATIONS

In regard to domestic corporations, the principle is actually applied by some commissions, that such a corporation must secure authorization for the issuance of all its securities from the state of its creation, even though some or all of the proceeds are to be used in other states. The Massachusetts Railroad (now the Public Service) Commission, the Vermont Public Service Commission and the Ohio Public Utilities Commission have acted along this line, as well as the Maryland Public Service Commission, although the Maryland Court of Appeals has held that the commission could exercise no jurisdiction whatever as regards securities the proceeds of which were to be spent outside the State. On the other hand, the New Hampshire Public Service Commission maintains that its approval is not necessary for the issuance of securities by domestic corporations, in so far as the proceeds represent expenditures outside the State.

That the mere fact of foreign incorporation does not preclude a commission from passing upon securities issued to acquire equipment or property within the state is the position of the California, Missouri and Arizona commissions. The Illinois Public Utilities Commission holds that foreign incorporation does not prevent control of capitalization, in so far as the securities are protected by a lien upon property situated within the State. This commission has approved bond issues the proceeds of which were to be spent largely in other states, but which were secured by a mortgage upon property situated in part in Illinois. The views of the Georgia and the New York second district commissions, however, differ from the preceding. While the Georgia commission has held that the issuance of stocks or bonds of foreign corporations was entirely beyond its control or the control of the State, it has indicated that the right to mortgage or encumber property might be restricted by the State in which such property was located, regardless of whether the corporations were foreign or domestic. The New York commission above referred to appears to take substantially the same position.

DEFECTS OF PRESENT SYSTEM

The results of this difference of opinion and variation of power are confusing and unsatisfactory. Frequently an issue of securities must be approved by two or more commissions, with the possibility of lack of agreement as to the amount or terms of issuance. It is asserted that there has been an inclination on the part of some commissions to insist that a certain portion of the pro-

ceeds should be spent within their state as a condition of their consent to the issuance of securities. Another defect is the fact that authorization is often given when the approving commission has no adequate means of acquiring at first hand the information upon which its decision rests. As to expenditures outside the state, a commission must ordinarily rely either upon the representation of the applicant or the findings of the commissions in the other states.

To Mr. Heilman's mind the conclusion that existing methods are inadequate is strengthened by a consideration of the special problem of control of capital stock issues and debentures or unsecured bonds. It is difficult if not impossible to understand how one state can regulate the issuance of capital stock by a foreign corporation, even though the proceeds of such stock are to be spent within the state, or the issuance by a foreign corporation of bonds not secured by a mortgage upon property within the state. Such powers have been actually conferred upon the commissions of several states and are being exercised, but as yet there has been no authoritative judicial determination of this problem. While prediction is dangerous, Mr. Heilman thinks that it is to be expected, in view of the long line of unvarying decisions, that the courts will regard the attempt to regulate stock and debenture issues of foreign corporations as abortive. In such an event it would prove impossible to prevent such corporations from over-capitalizing utility properties without some alteration in the existing system of regulation.

PROPOSED REMEDIES

Mr. Heilman notes that various remedies had been suggested for the present unsatisfactory condition. For example, it has been proposed that the regulation of capitalization be left entirely to the parent state, but such a state is often little concerned with the operations of its offspring, and many important companies are incorporated under the laws of several states. Again, it has been suggested that the various states could prohibit the placing of property within the state under a general mortgage with property outside the state. In view of established methods of railroad financing, however, this would be inadvisable, for it might prove exceedingly inconvenient to a corporation to divide its securities into several issues so as to have each cover simply the property within a particular state, and it might prove difficult to sell the securities thus divided if the entire property were an operating unit. Furthermore, this proposal would not simplify the problem of controlling the issuance of capital stock by foreign corporations. A third suggestion has been that the states could require all corporations owning and operating utility property within their borders to be domestic corporations. The general application of this policy would solve the problem as far as intrastate properties were concerned, but to break up the great interstate systems into fragments each owned by a separate corporation domiciled in a separate state would surely be futile.

The foregoing considerations, in Mr. Heilman's opinion, point conclusively to the desirability of federal control over the securities of interstate utilities. With all intrastate properties owned and operated by domestic corporations, so that their capitalization would be subject to the control of the state in which the property was situated, and with the capitalization of all interstate properties subject to exclusive federal control, there would be no possibility of disagreement between commissions, no conflict arising from differences in state laws, no issuing of authorizations based on the findings of other commissions and no legal difficulties upon the grounds of foreign incorporation.

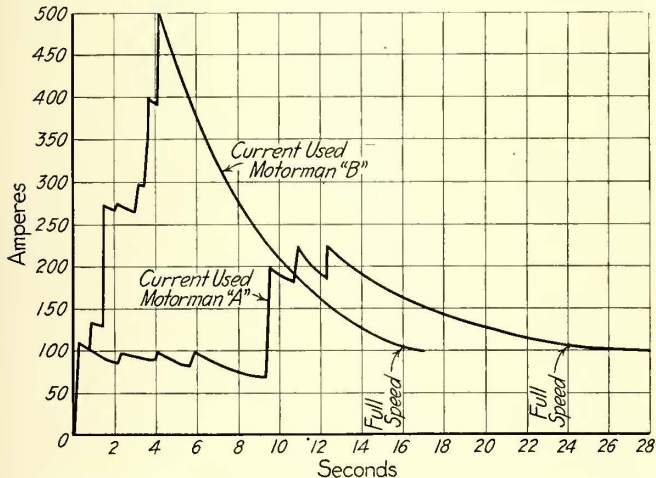
Instructing Motormen in Louisville, Ky.

School of Efficiency and Economy in Use of Car Equipment Has Been Established by Louisville Railway

A PROFITABLE course of instruction in the economical use of car equipment has been inaugurated by the Louisville (Ky.) Railway for its 1000 motormen and conductors. This school of efficiency and economy is an outgrowth of the safety-first school started by the railway company in May, 1914.

F. H. Miller, superintendent of motive power, lectures to the classes on the saving of power and equipment by efficient operation. He is heard once a month by a class of motormen and conductors, together with carhouse foremen and inspectors who attend the lectures in rotation. The motormen and conductors attending the school, one from each carhouse, are selected by ballot the month previous and form a committee for the month. As new men are selected monthly all of them will eventually have the benefit of personal instruction.

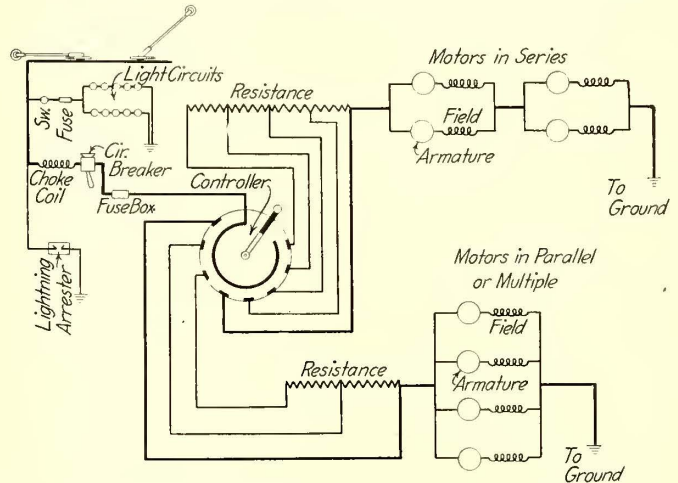
Lecture summaries prepared originally by the instructor for his reference alone have evolved into charts on stiff cardboard, 30 in. x 40 in., on which are printed in letters 3/4 in. high the principal points to be brought before the members of the class. These summaries, the



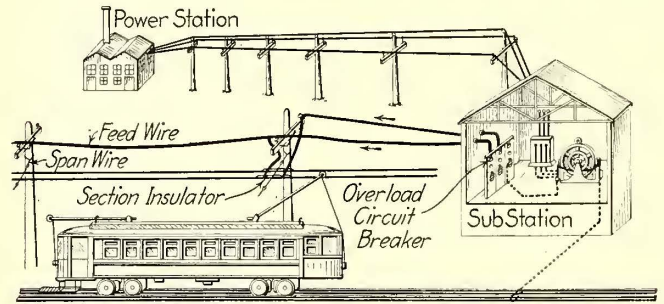
LECTURE CHART FOR DEMONSTRATING SAVING IN CURRENT THROUGH PROPER ACCELERATION

text of which is reproduced herewith, can easily be read by the men from their seats in the lecture room. They have proved unusually effective in making the fundamental details clear.

In connection with the cardboard forms, charts on car wiring, motor and controller wiring and power distribution from the power house and substation, as well as charts showing power saving through the economical use of current in accelerating cars, are used by way of illustration. These charts are reproduced herewith. Interlineations on the cardboard forms, in type visible only to the instructor, indicate to him when his remarks are to be enforced with reference to any of the charts.



CAR WIRING DIAGRAM USED FOR INSTRUCTING PLATFORM MEN



POWER DISTRIBUTION DIAGRAM USED FOR INSTRUCTING PLATFORM MEN

Charts Used in Instruction on Economical Use of Car Equipment on Louisville (Ky.) Railway

- Obey rules and regulations that have been made only after years of trial and experience, as they are the best yet devised to take care of all conditions. Operate your cars and car equipment under these rules, as if the cars and car equipment were your property and any damage done to them or misuse of them came out of your own pocket, for it does in a way, as the company's prosperity means your prosperity.
- Using controller improperly:
 - Opens circuit breaker and scares passengers.
 - Wastes power.
 - Burns out controller or motors.
 - Injures car equipment.
 - Causes car to jerk.
- Having brakes and controller on at the same time:
 - Wastes power.
 - Injures motor equipment.
 - Makes unnecessary brake-shoe wear.
- Coasting as much as possible:
 - Saves power.
 - Prevents accidents.
 - Saves brakeshoes and motor equipment.
- Starting all cars at once after blockade or after power is off line:
 - Opens circuit breaker on trolley feeder at substation.
 - Reduces trolley voltage.
- Moving under overhead switches, crossings and brakes with power on:
 - Causes motors and car to jerk.
 - The arcing wears out trolley wheel and line material.
- Approaching electrically controlled switch at too great speed:
 - Means taking the wrong track with possible accident, in case switch does not operate.
 - Produces unnecessary wear of brakeshoes.
 - Consumes unnecessary power.
 - Is dangerous because car behind may have turned switch.
- Renewal of car equipment costs approximately as follows:

(a) Controller	\$178.00
(b) Armature	220.00
(c) Wheel	21.10
(d) Trolley wheel, 6 in.	1.25
(e) Renewing fingers in controller.....	4.25
- Cost of replacing car parts figured in cash fares, not allowing any part of these fares to go to wages, taxes, accident claims, interest on use of money, insurance or depreciation:

Cash Fares	
(a) Grinding and replacing flat wheel.....	20-80
(b) Repairing and replacing a grounded controller	15-25
(c) Renewing car safety gates after a collision..	40-80
(d) Losing a broom three-quarters good.....	5
(e) Renewing overhead crossing block.....	160
(f) After split switch, replacing car with wreck car, in addition to delay to line.....	24
- Report all defects in cars, track or linework as definitely and as soon as possible:
 - Most important repairs are made first where several reports come in at the same time.
 - This saves longer delays by permitting making of repairs before they stop the service.
- Assist other departments as much as possible:
 - Run slowly over track undergoing repairs, or under trolley wire being renewed or repaired, pulling trolley pole down to roof of car when requested to do so.
- Stop your car and let the emergency wagon pass when ringing gong, with similar to treatment of fire department apparatus. Go slowly over special work, both overhead and track. Always have trolley pole trailing. Keep hand on trolley rope when in doubt as to trolley jumping.
- Taking care of a broken trolley wire:
 - If on the ground get it off the rail first.
 - Attach pick-up to end, lift off the ground and, if possible, to one side so that cars can pass.
 - Stay with broken wire until next car arrives so that no one will run into it.

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

ASSOCIATION NEWS

1916 CONVENTION
ATLANTIC CITY
OCTOBER 9 TO 13

Company Membership in the Association Is Growing Rapidly—Federal Relations Committee Urges Protest on Certain H. R. Bills—Aberdroth Recommends Appraisal of Cost of Training Employees

New Company Members of American Association

More than 100 manufacturers and others had up to and including May 31 joined the association under the provisions of the constitutional amendment adopted at Chicago on Feb. 4, 1910. The names of these arranged alphabetically, are as follows:

Alcott, Edward, Manassas, Va.; Aluminum Company of America, New York City; American Abrasive Metals Company, New York City; American Brake Company, St. Louis, Mo.; American Brake Shoe & Foundry Company, New York City; American Engineering Company, Philadelphia, Pa.; American Railway Guide Company, Chicago, Ill.; American Railway Supply Company, New York City; American Steel Foundries, Chicago, Ill.; Archbold-Brady Company, Syracuse, N. Y.

Barbour-Stockwell Company, Cambridge, Mass.; Bates Expanded Steel Truss Company, Chicago, Ill.; Bishop Gutta Percha Company, New York City; Brill Company, The J. G., Philadelphia, Pa.; Bronze Metal Company, New York City; Buda Company, Chicago, Ill.

Chattanooga Armature Works, Chattanooga, Tenn.; Cheatham Electric Switching Device Company, Louisville, Ky.; Chicago Pneumatic Tool Company, Chicago, Ill.; Cleveland Fare Box Company, Cleveland, Ohio; Consolidated Car Heating Company, Albany, N. Y.; Curtain Supply Company, Chicago, Ill.

Dayton Fare Recorder Company, Dayton, Ohio; Dayton Manufacturing Company, Dayton, Ohio; Drew Electric & Manufacturing Company, Indianapolis, Ind.; Drouvè Company, The G., Bridgeport, Conn.

Edwards Company, The O. M., Syracuse, N. Y.; ELECTRIC RAILWAY JOURNAL, New York City; Electric Service Supplies Company, Philadelphia, Pa.

Falk Company, Milwaukee, Wis.; Federal Signal Company, New York City.

Galena-Signal Oil Company, Franklin, Pa.; General Electric Company, Schenectady, N. Y.; Gest Company, G. M., New York City; Globe Ticket Company, Philadelphia, Pa.; Gold Car Heating & Lighting Company, New York City; Goldschmidt Thermit Company, New York City; Grayson Railway Supply Company, St. Louis, Mo.; Griffin Wheel Company, Chicago, Ill.; Gwilliam Company, The, New York City.

Hale & Kilburn Company, Philadelphia, Pa.; Heywood Brothers & Wakefield Company, Wakefield, Mass.

International Register Company, Chicago, Ill.; International Steel Tie Company, Cleveland, Ohio.

Jewett Car Co., Newark, Ohio; Johnson Fare Box Company, Chicago, Ill.

Keith Car Company, Sagamore, Mass.; Kenfield-Davis Publishing Company, Chicago, Ill.; Kerite Insulated Wire & Cable Co., New York City; Kerschner Company, Inc., W. R., New York City; Keyes Products Company, New York City; Koury Company, C. M., Atlantic City, N. J.

Lackawanna Steel Company, Lackawanna, N. Y. Morden Frog & Crossing Works, Chicago, Ill.; McQuay-Norris Manufacturing Company, St. Louis, Mo.

Nachod Signal Company, Louisville, Ky.; National Brake Company, Inc., Buffalo, N. Y.; National Lock Washer Company, Newark, N. J.; National Pneumatic Company, New York City; Nuttall Company, R. D., Pittsburgh, Pa.

Ohio Brass Company, Mansfield, Ohio. Pantasote Company, New York City; Post & Company, E. L., Inc., New York City.

Q. & C. Company, New York City. Rail Joint Company, New York City; Railway Audit & Inspection Company, Philadelphia, Pa.; Railway Improvement Company, New York City; Railway Materials Company, Chicago, Ill.; Railway Roller Bearing Company, Syracuse, N. Y.; *Railway Signal Engineer*, New York City; Railway Track Work Company, Philadelphia, Pa.; Rooke Automatic Register Company, Providence, R. I.

St. Louis Car Company, St. Louis, Mo.; St. Louis Frog

& Switch Company, St. Louis, Mo.; Seymour Portable Rail Grinder Company, E. P., Waltham, Mass.; Sherwin-Williams Company, Cleveland, Ohio; Simmen Automatic Railway Signal Company, Buffalo, N. Y.; Smith Heater Company, Peter, Detroit, Mich.; Smith Ward Brake Company, New York City; Southern Exchange Company, New York City; Southern Wheel Company, St. Louis, Mo.; Standard Paint Company, New York City; Standard Varnish Company, Port Richmond, S. I., N. Y.; Star Brass Works, Kalamazoo, Mich.

Taylor Electric Truck Company, Troy, N. Y.; Texas Company, New York City; Thompson & Son Company, W. I., Cleveland, Ohio; Tool Steel Gear & Pinion Company, Cincinnati, Ohio; Trolley Supply Company, Canton, Ohio.

Union Switch & Signal Company, Swissvale, Pa.; Universal Lubricating Company, Cleveland, Ohio.

Vacuum Car Ventilating Company, Chicago, Ill.; Valentine & Company, New York City; Van Dorn Coupler Company, Chicago, Ill.

Wendell & MacDuffie Company, New York City; Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa.; Westinghouse Traction Brake Company, Wilmerding, Pa.; Wheel Truing Brake Shoe Company, Detroit, Mich.; White Company, Cleveland, Ohio; Wisch Service, Inc., P. Edward, New York City; Wood Company, Charles N., Boston, Mass.

Yale & Towne Manufacturing Company, New York City.

Committee on Federal Relations

As chairman of this important committee, Arthur W. Brady, president Union Traction Company of Indiana, has this week sent to the members of the American Association a letter calling attention to House bills H. R. 9216 and H. R. 9047. These bills are now pending in Congress, and if passed would seriously affect electric railways.

Bill H. R. 9216 amends the hours of service act, approved on March 4, 1907. It was favorably reported with amendments on May 17, 1916, by the House committee on interstate and foreign commerce. While apparently intended simply to reduce from nine to eight the hours of service of signal and switch operators, the amendment is so worded as to include motormen and conductors of interurban roads engaged in interstate commerce by classing them with dispatchers in case they receive or report orders by telephone. The committee requested a hearing on this bill but through a misunderstanding it was not held. The committee requests interested companies to get into touch with their Congressmen.

The committee also prepared in pamphlet form a memorandum setting forth the effects of this bill, if passed, upon the interurban railways. Copies of the memorandum were placed in the hands of all members of the House committee and sent to the members of the association.

Bill H. R. 9047 was introduced on Jan. 14, 1916, and is now in the hands of a sub-committee of the House committee on interstate and foreign commerce. Its purpose is to regulate car clearances, the side clearance being limited to not less than 3 ft., excepting at station or freight-house platforms, and overhead clearance to not less than 6 ft. The committee on federal relations has requested that the bill be so amended as not to apply to electric railways, and it is suggested that member companies communicate their views to their Congressmen.

Arc Welding Discussed in Denver

The Denver Tramway section held its thirty-sixth regular monthly meeting on May 18, this being the last assemblage for the season. The attendance at the meeting was 100. After a few introductory remarks, President W. G. Matthews read the names of five new members, three being motormen, one a conductor and the fifth the foreman of the paint shop.

The principal speaker of the evening was G. M. Robinson of the General Electric Company, whose subject was "Arc Welding." A lively discussion followed the presentation of the paper.

Public Service Section

The address delivered by Thomas N. McCarter, president Public Service Corporation of New Jersey, at a joint meeting of the electric railway, gas and electric company sections connected with the Public Service Corporation, has been printed by the corporation in attractive form for distribution to those in attendance at the meeting. This address was abstracted in the issue of the *ELECTRIC RAILWAY JOURNAL* for May 6, 1916, page 874. The joint meeting was held on the eve of the opening of the Public Service Terminal.

Milwaukee Section Discusses Appraisals and Employees' Activities

Secretary E. H. Olsen reports that a regular meeting of company section No. 1, was held on May 25, 1916, at which the two papers abstracted below were presented.

H. G. Abendroth reported on behalf of the committee on appraisals, his report being devoted to five divisions of the company's property, namely, land; roadway and track; buildings, fixtures and grounds; rolling stock, and materials and supplies. Each of these subjects was treated separately and appropriately illustrated.

Mr. Abendroth called attention to two new developments in valuation and appraisal-making; perpetual-priced inventory, and cost of training employees. He believed that an up-to-date record of value, based on physical appraisal and actual records, is invaluable, and further that accountants and engineers could render a great service in the development of practical ways and means for keeping a perpetual priced inventory of property.

The cost of training employees was referred to as a new element of value in public utility appraisals. It was believed that in a cost-reproduction value, consideration should be given to the fact that a utility has a trained staff of employees and that this is an element of value just as much as the early losses from operation, which are allowed as a part of the investment in the form of going value.

Bert Hall, welfare secretary, read the report of the committee on employees' co-operative activities. Original research work was undertaken by the committee and statistics were gathered from various sources to permit a comparison between what other public utility corporations were doing along this line and the co-operative activities in effect by this company. Mr. Hall took up first the matter of conservation of health, stating that "It is an indisputable fact that any co-operative activity which promotes the health, happiness and well-being of a large number of persons living in any community will react upon that community in a beneficial way."

From the data which this committee had assembled it was shown that mutual benefit associations group themselves into four distinct classes:

1. Associations in which the members pay a certain

amount of dues and to which the company contributes to some extent. In no case does the contribution by a company under this class of associations exceed the total amount paid in by the individual members.

2. Associations in which membership is divided into classes according to the salaries received. In a typical case of this kind the dues range from 30 cents to 90 cents per month, the benefits from \$7 to \$12.50 per week, and the death benefit from \$300 to \$600. The company under which this association operates stands the cost of clerical work, rentals, etc., and pays in an amount equal to one-half of the dues paid by the individual members.

3. Associations to the funds of which the individual members contribute nothing, the entire expense of sick benefits and death benefits being borne by the employing company.

4. Associations maintained entirely by employees and to which the employing company contributes nothing in the way of money, but may contribute rental of quarters and some clerical help.

The organization of a women's auxiliary of the Employees' Mutual Benefit Association, and the work which they have been engaged in was dwelt on briefly. Membership in this auxiliary is made up of female members of the families of employees who have done much to assist in caring for the sick, performing household duties, and generally making conditions most favorable for a speedy recovery.

The educational work carried on, recreational activities, the steadily increasing number of shareholders in the building and loan association, the enlargement of the scope of the benefit association to provide medical attendance to dependents, the employees' loan fund, pension system, etc., were all briefly discussed with the aid of lantern slides.

Hampton Company Section

A special meeting of Company Section No. 10 was held on May 12 at Newport News. The guest of honor was President C. L. Henry of the association, and in addition Col. W. S. Copeland, editor *Daily Press*, Newport News, and Hon. Harry Houston, speaker of the House of Representatives of Virginia, were present and made a few remarks. After the meeting refreshments were served. Sixty members and guests attended.

C. Loomis Allen, president of Allen & Peck, Inc., and past-president of the association, introduced Mr. Henry. The latter's talk was along the lines of what company section work really means to the employee both from a social and an intellectual standpoint. He said that the employee, and particularly the trainman, must at all times have the good-will of the public.

Portland Section

Company section No. 9, recently organized by employees of the Cumberland County Power & Light Company in Portland, Me., is now well on its feet. The second meeting was held on April 11 with an attendance of 100. Capt. G. E. Fogg spoke on "Preparedness." After the talk local entertainers had the floor, and later a supper was served under the direction of C. H. Houghton of the hall and supper committee.

The third regular meeting of company section No. 9 was held on May 9 with an attendance of 125 members. It was preceded by a supper and followed by two six-round boxing bouts between soldiers from two of the local forts. Five new members were taken into the section. The principal speaker at the meeting was J. W. Belling of the General Electric Company, who spoke on "Electric Car Equipment."

COMMUNICATIONS

Psychological Tests for Motormen

DALLAS CONSOLIDATED ELECTRIC STREET
RAILWAY COMPANY.

DALLAS, TEX., May 25, 1916.

To the Editors:

In the editorial appearing in your issue of May 20, entitled "Psychological Tests for Motormen," wherein reference is made to a paper read by me before the Southwestern Gas & Electrical Association, you conclude with the following paragraph:

"The plan is certainly an ingenious one, although we believe that many managers will consider that careful observation of the action of a man in actual service of the road will be at least as valuable as that with a test model."

I wish to state that I heartily agree with you as to the importance of observing a man's action in the actual service of the railroad, but I would call your attention to the fact that my paper dealt with the selection of employees and did not go into the subject of their training, which is quite a large subject in itself.

Our one idea in adopting these tests was to reduce, in so far as possible, the number of men whom it would be necessary to put on the cars as students. From this small number we expect to secure a higher percentage of first-class trainmen.

P. W. GERHARDT,
Superintendent of Transportation.

Selection of Employees

NEW YORK STATE RAILWAYS

ROCHESTER, N. Y., May 25, 1916.

To the Editors:

In his paper on "Scientific Selection of Employees," read before the Southwestern Association, and abstracted in the issue of the *ELECTRIC RAILWAY JOURNAL* for May 20, page 943, Mr. Gerhardt emphasizes what should be the foundation of accident prevention work, the selection of the employee. To go a step further, the sub-foundation is the selection of the man who selects the employee. The reason for this is that, in the absence of any exact criteria, a man will select his employees as he would his friends, men who are congenial and have similar habits and inclinations. For when a man sizes up another he uses himself as a basis of comparison, consciously or unconsciously. This truth is realized, doubtless, though not expressly stated by Mr. Gerhardt, as is shown by his selection for an employing officer of a type of man who would make an excellent trainman. Such a man would instinctively reject all applicants whose appearance or manner of approach, allowing for differences in education, did not come up to his own standard of neatness and courtesy.

The upper age limits and the limits of height and weight are largely arbitrary, depending on local conditions. Beyond about thirty-five years of age, inexperienced men are apt to be slow in learning and fixed in their habits. Again, when a pension scheme is established, it is undesirable to employ men whose period of active usefulness will likely fall below an established minimum. I believe that a low age limit of twenty-five years instead of twenty-one years is better for motormen, as the men above this age are more settled and better realize their responsibilities. Married men, especially, are not so likely to make changes, and results in practice have shown that the changes in personnel among motormen are very much fewer than among con-

ductors, for whom the lower age limit is twenty-one years. Where hand-brake equipments are used, motormen must have sufficient weight and strength to handle them without undue fatigue, whereas with air equipment much lighter men may be employed. Smaller men as a rule are more active and can think more quickly than heavy, "beefy" men, and are therefore more desirable as motormen when it is possible to use them.

The time required to make out an application is a good test of education and mental ability, but it cannot be applied too strictly, except, perhaps, to conductors, on whom most of the clerical work devolves. Where large numbers of foreigners are employed, it furnishes hardly any clue to a man's ability; it serves chiefly to eliminate illiterate conductors. Motormen are acceptable if they can understand and answer the questions asked and read to them or explained to some extent.

Of the psychological tests, I am not able to speak from experience. I think that the attention test is open to the same objection as the application test, that it would not apply equally to foreigners and native Americans. Allowances should also be made for the mental condition of the applicant at the time the test is made. I should expect considerable difference in the results obtained from a country boy looking for his first city job, a married man with back rent due and an ex-employee applying for reinstatement; although all three might make equally good men when shaken down to familiar routine work.

The observation test seems to apply chiefly to motormen. A similar test could be devised for conductors, with lettered squares to designate stops and numbered colored squares to designate passengers boarding and presenting transfers and coins of various denominations for fare, speed in making change and handling passengers being especially desirable on prepayment cars. A variation might also be made in the test as described by driving the strip at various constant speeds, instead of allowing each man to vary his speed during different portions of the run. This would prevent a man from taking his time when collisions are of frequent imminence and speeding up when he felt he was not taking too many chances. This taking of chances where traffic is light is one of the causes of our most serious accidents.

The judgment test I consider particularly valuable, not only in selecting motormen who will know what to do in case of emergency, but also in getting conductors who can make up their minds on a course of action and pursue it. The conductor who argues over a late transfer, is slow in giving information or hesitates to suppress a nuisance on the car is only too often lost, and creates an impression of incompetence that reflects on the whole service. And only too often can a crew be seen standing around doing nothing or working at cross purposes, when a little initiative and decisive action could replace a car or raise a blockade with a minimum delay to traffic.

When the problem confronting the transportation department is to choose a few employees from many applicants, the standard for employment should be as high as possible, and these psychological tests are of undoubted value in aiding the judgment of the employing officer. But when the problem is to find men of any kind to fill vacancies, the question of paramount importance is whether or not a candidate has any spark of ability that can be fanned into the clear flame of competence by careful and diligent instruction. It then becomes the duty of the employing officer to accept all men who are not obviously unfit for the service and to instruct these men so carefully and to follow up their work so diligently as to reduce the possibility of acci-

dents to a minimum, reserving the right of discharge until the men have shown that, in spite of admonition, additional practice and experience, they are wholly incompetent to perform their duties. Under these circumstances elaborate preliminary tests are not desirable, as the end in view is not so much the elimination of the unfit as the education and evolution of the unpromising recruit into a competent employee.

GEORGE LAWSON,
Supervisor of Employment and Instruction.

Co-operative Education for Employees

THE CINCINNATI CAR COMPANY

CINCINNATI, OHIO, May 29, 1916.

To the Editors:

The article by Prof. A. M. Wilson on "Co-operative Education" in the issue of the ELECTRIC RAILWAY JOURNAL for April 15 is a fair and candid statement of the results accomplished and to be expected under this modern method of training men. Our experience with these students, or "Co-ops" as we call them, has been very satisfactory, and we consider it quite a privilege to have the benefit of the experience under the direct supervision of the originators of the idea.

With the co-operative scheme, the interest shown and opportunity for advancement of the student are supervised by the university faculty, just the same as is the work done by the student, and this supervision is very conducive to real co-operation. In fact, the success of this plan depends largely on the practicality of the university faculty, which in this case leaves nothing to be desired, and there is a punch behind the scheme suggestive of the unglued hand and entirely different from the popular conception of the bewhiskered professor with a short prayer and a long lemonade for lunch.

We have been impressed with the idea that this scheme quickly determines with surprising economy whether a boy has selected a congenial or compatible occupation, as undesirables in the chosen occupation are quickly detected and eliminated, thus saving the time of all concerned. It is certainly refreshing to have a boy go to work in the morning and see how much real good work he can accomplish during the day, and to notice the beneficial results to himself and to the company. This is true co-operation. This plan puts additional obligation on the company, and calls for a very much broader and more intelligent plan of treating apprentices than has heretofore been followed.

It is a distinct advantage to the manager to incite thought and promote interest in the proper direction among the "Co-ops," just as it is with the regular apprentices. This must be done with discretion, because it is a whole lot harder to find one man with constructive ideas to help the company's business than it is to find two men with ideas enough to help get them in trouble.

There is little or no prejudice against these "Co-ops" from the regular men in the shop, largely due to the early elimination of the undesirables. In fact, it is a matter of pride with a good many mechanics to help these boys and to take an interest in their advancement, realizing that their mechanical skill will hardly approximate that of the regular men with their greater opportunity for its acquirement. The ingenuity of a clever manipulator of the slide rule should not operate to the disadvantage of the man who is equally good with the folding type, because the latter is far more useful and valuable in the shop, and it is shop work that we are talking about.

We all remember very frequent cases of injustice under the old scheme when a boy was compelled to per-

form labor which contributed little to his acquirement of skill or opportunity for advancement sometimes for months. For instance, it was not unusual for a beardless boy to start in on a bolt-cutter and stay on the job long enough to acquire the necessary tonsorial articles to eliminate whiskers. The hot fish-oil was very conducive to a good crop, and often excited the envy of the bald heads. If the boy during this time learned to sharpen a razor properly by using the hone and strap it was a useful accomplishment and was frequently suggestive of how to sharpen other things, and largely discounted the need of the "safety," especially of the "hoe type."

Under this co-operative scheme the students learn two things which have heretofore not been taught in school. One is how to get positions, and the other is how to get their pay raised, and there is no special objection to this on the part of the company because of value received and results accomplished. Under prevailing conditions, the adoption and extension of this plan of training men is inevitable, and the plan will be appreciated most by those companies which are willing to assume the obligation of helping to train their own men. It will appeal less to those companies whose only thought is where they can get men from other companies, and like the Brown system of discipline, or the premium plan of paying for work done, the results will not be satisfactory unless undertaken by a school with a faculty which thoroughly understands and appreciates the merit of the scheme, and has a disposition to perform the arduous duties in connection therewith. It will require something better than the "Merry Widow" brand of packing to keep the joints tight in this triangular scheme of training men and getting results.

THOMAS ELLIOTT, Vice-President.

Will It Pay?

WHITE PLAINS, N. Y., May 15, 1916.

To the Editors:

When an improvement is under consideration this is the first question asked. It is generally answered by determining whether a capitalization, at a generous rate, of the decrease in operating expenses will exceed the cost of the contemplated changes or additions—this in spite of the fact that the effect upon the net earnings (after interest) is the factor which should control the decision. This factor does regulate the larger decisions, but common practice, in regard to smaller matters at least, bases its guess upon a consideration of the operating expenses and an assumed and wholly arbitrary rate of capitalization.

It is extremely simple, however, to develop an accurate and easily applied formula which will enable a legitimate estimate to replace the habitually illogical approximation. Let us assume the following:

Reduction in annual operating expenses due to improvement	=	S
Replacement charges for improvement	=	R
Capital charges for improvement	=	C
Total charges for improvement	=	R + C = T
Estimated life of improvement (years)	=	L
Customary rate of interest	=	r
Increase in annual net earnings due to improvement	=	N

We must now remember that, as a result of the improvement, increased capital charges equal to rC must be met each year. Also, in the final analysis, a sum

equal to $\frac{C}{L}$ should in some way be potentially reserved, charged off or held back in the surplus annually to maintain the integrity of the additional capital investment. Finally, and annual prorated of the replacement charges for the improvement, amounting to $\frac{R}{L}$, should be taken into consideration. The particular method of account-

ing for these processes is of small importance, as the main fact to be kept in mind is that, consciously or unconsciously, the indicated charges or expenditures must be met.

The following equation may then be written:

$$N = S - rC - \frac{C}{L} - \frac{R}{L}$$

Thereupon, obviously the improvement will pay whenever N is greater than zero. This condition may be expressed thus:

$$N = S - rC - \frac{T}{L} > 0$$

or

$$S > rC + \frac{T}{L}$$

In other words, the improvement may be made when the saving in operating expenses exceeds the sum of the increases in interest charges and amortization and replacement expenses.

This is not a discovery, but a reminder of already known and understood facts which are frequently elbowed aside by the illogical form of guessing to which reference has been made. The formula is readily applied and has the virtue of being based upon correct principles. It would be employed more frequently if the ease of its application were more universally understood.

G. L. BURR.

Grid-Resistor Tests

INDIANAPOLIS, IND., May 20, 1916.

To the Editors:

One of your correspondents has inquired on the following points, suggested to him by my article on "Grid Resistor Tests and Standardization Found Important," appearing on page 505 of the issue of the *ELECTRIC RAILWAY JOURNAL* for March 11, 1916: Were the capacities of the resistors wrong when supplied by the manufacturer, or were the grids used in making repairs of improper capacity which caused trouble? Are any data available on the variation of resistance values of grids cast from metal of different heats? What is the percentage variation allowed from the approximate test data given in Table 1 of the article?

In reply to these questions I would say that in almost every instance where we found it necessary to alter the step resistances and capacities of resistors as originally furnished by the electrical equipment manufacturers, it is safe to assume that such necessity was brought about either for the reason that the manufacturers had not been sufficiently advised in detail regarding the application of the electrical equipments at the time of purchase, or that the formulas used as a basis of calculation with some of the earlier equipments had been superseded as a result of knowledge gained by later experience. As a rule, we have had no occasion radically to change the step resistances or capacities of resistors as furnished with equipments purchased during the last five or six years, which substantially bears out the conclusions set forth above.

A number of years ago we experimented at quite some length with cast resistor grids fabricated from our patterns by a local foundry which possessed a reputation for a consistent quality of product. Notwithstanding the fact that all possible care was exercised in the composition of successive heats, as well as the relative portion of the individual heats from which the grids were cast, the resistance factor was such a variable one that the proposition as a whole was considered unsatisfactory. With both the General Electric Company and the Westinghouse Electric & Manufacturing Company

it is our understanding that the permissible variation in resistance of cast grids is limited to a 10 per cent variation above and below normal, but in the assembly of resistors in accordance with the data as shown in Table 1 embodied in the article above referred to, we impose a limitation of 5 per cent above and below the values specified.

EQUIPMENT ENGINEER.

Electric Light and Power Interests Do Not Indorse Safety Code

While Appreciating the Valuable Work Done by the Bureau of Standards, N. E. L. A. and A. I. E. E. Representatives and Others Oppose Adoption of Proposed Code

HEARINGS on the proposed national electrical safety code were held under the auspices of the United States Bureau of Standards, at the La Salle Hotel, in Chicago, Ill., on May 29 and 30. The general sentiment of the men representing the various electrical interests was that if the Bureau of Standards could control the administration of its rules, and could definitely order them changed or suspended, where the cases might justify it after the rules had been made mandatory in certain localities, there would be no objection to the issuance of the code. Representatives of the National Electric Light Association, the American Institute of Electrical Engineers and the Electric Power Club, however, pointed out that such control was entirely impossible. Objections were made not so much to the rules themselves as to the method of their administration.

Municipal inspectors and representatives of State commissions held the floor during most of the two day sessions and the evening sessions. To the commission and inspection department representatives, the rules as they now stand seemed to be in the main acceptable. Steam railroad men, electric railway men, telephone and telegraph representatives, although objecting in some cases to details, also seemed to be favorably impressed with the code. Dr. Rosa of the Bureau of Standards maintained throughout the right of the Bureau of Standards to issue such a code, although admitting that the bureau has no legal authority to enforce it. He said it was not the wish of the Bureau of Standards to foist a burdensome code upon the electrical industry, and that the code as finally amended represented the best co-operative work of the Bureau of Standards and the operating and engineering talent of the electrical industry. The rules in his opinion are reasonable and easily complied with. They will probably be printed and issued for trial some time in the summer after such specific suggestions as are thought fair, and which may be received in writing up to July 1, have been added to them.

The Superior Court at Boston, Mass., has awarded a verdict of 12 cents to Charles R. Darling, Newton, against the Middlesex & Boston Street Railway, in a case resulting from the closure of Norumbega Park last fall. The plaintiff purchased a round-trip ticket into the park, for which he paid 20 cents. The park was closed, and he received a refund of 8 cents on the park admission, but the company retained 12 cents for transportation. The plaintiff was sustained in the lower court. It has not been decided by the company whether to appeal the case to the Supreme Court or to modify the wording of its tickets to meet future situations of this kind.

EQUIPMENT AND ITS MAINTENANCE

Short Descriptions of Labor, Mechanical and Electrical Practices
in Every Department of Electric Railroading

Contributions from the Men in the Field Are Solicited and Will Be Paid for at Special Rates.

Some Car Ventilation Ideas

BY R. N. HEMMING

Superintendent of Motive Power Union Traction Company of
Indiana, Anderson, Ind.

In the last four years I have been observing closely the performance of car ventilators from a common-sense point of view, based on practical experience with numerous types of car ventilators. In this article I shall not attempt to determine the number of cubic feet of air per hour per passenger, because, after all, that phase of car ventilation is more or less a secondary consideration. In my opinion car ventilation is in its infancy, although there are a number of ventilators on the market that are very efficient in their performance in some respects. None of them, however, seem to fill the mission which they should, namely, that of providing a combined fresh-air intake with an exhaust feature, or a fresh-air intake and a separate exhaust. Many of the ventilators now obtainable also possess the undesirable feature of causing down drafts, and these admit rain into the car. While it is claimed that many of these ventilators possess all of the desirable features, yet practical demonstrations have proved otherwise.

I want to relate some very interesting experiences I have had in the last two or three years in ventilating some all-steel interurban cars. It is hardly necessary to go into the detail of describing the various dimensions of these cars except to state that they were of the three-compartment, single-end type, approximately 60 ft. long and of about the average dimensions in height and width. The first winter that these cars were in service they were equipped exclusively with exhaust-type ventilators. I wish to add here that many ventilator experts are of the opinion that all that is necessary for the proper ventilation of the car is merely an exhaust type of ventilator. When the matter of fresh air is discussed the usual answer is that an ample amount of fresh air is obtained through the cracks at the windows and doors. This was the source of fresh air on our cars, much to our regret and to the discomfort of our passengers.

Our all-steel cars were provided with permanent storm sashes—that is, sashes that could be raised and lowered to meet the requirements of the season. It was found that it was next to impossible for passengers to sit beside the windows on account of the excessive air drafts that came in through the openings around the sashes. So much draft was created during periods of low outside temperatures that the passengers would pull down the curtains and wrap their overcoats about their heads. On the first impulse I was at a loss to understand such a pronounced difficulty of this kind. Upon investigation, however, I found there was no weather-stripping to fill in the gaps between the upper outside sashes and the storm sashes. The cars were immediately provided with weather-stripping, and while this reduced the draft to a certain extent, yet air crept in through the crevices and made sitting close to the window very uncomfortable.

The following winter I removed all of the interior sashes and fitted them with weatherstrips. This practically prevented any air from entering the car around

the sashes. After these had been thoroughly weather-stripped, however, the rear end of the car afforded the only means of furnishing the necessary amount of fresh air and, much to my surprise, frost formed around the corners of the rear bulkhead, and at times in sufficient quantity to roll a snowball. The rear bulkheads of these cars were equipped with sliding doors, the vestibules with swinging-type doors and the rear vestibule step wells were also inclosed with trapdoors. The excessive draft which came in through the rear vestibule doors and the bulkhead door made it simply impossible for passengers to sit in the rear four or five seats of the car when the weather was extremely cold. A common-sense analysis of this ventilating condition soon developed the conclusion that these exhaust ventilators were only acting like an exhaust fan in a closed room or a tight compartment. Air had to enter somewhere and it took the path of least resistance. After the possibility of air coming in around the sashes had been eliminated the air had to be supplied through the rear end of the car. In order to mitigate the effect of the draft at this point I put electric heaters under several of the rear seats.

Another objection to exclusive exhaust ventilation was found in the toilets. Here the air was also pulled up through the toilet chute, and it is needless to mention that the obnoxious odors that came through with it made the toilet room almost unbearable, even when most careful attention was given to its sanitary condition. The toilet chutes on these cars were not provided with a water flush, but the drains from the washbowl and the drinking fountain were piped into the closet chute, and thus it was flushed frequently.

After having this unsatisfactory experience I considered the ventilating problem in a common-sense light. It was evident that in order to obtain the proper kind of ventilation fresh-air intakes were absolutely necessary. There are many types of car ventilators which provide a means of bringing fresh air into the car, either by natural force or mechanical force, but the majority of these are so expensive that it is almost out of the question for the average railroad to consider the installation of such a system. Another important factor to be taken into consideration in the design of a car ventilator is that a ventilator which will work satisfactorily on one type of car is not always adaptable to all other types of cars. Practical observations and tests have shown that the air currents and the vacuum conditions which surround the single unit such as an interurban car, are decidedly different from those experienced in train operation. It has also been found that ventilators which would operate satisfactorily on city cars running at 20 m.p.h. were a total failure on interurban cars operating at 60 m.p.h. Practical tests have also been made on ventilators which have been pronounced very successful on a number of steam railroads, yet when the same ventilator was tested on an interurban car it proved to be a failure.

These thoughts on car ventilation are not based on theory but are the result of practical demonstrations under working conditions. Proper ventilation plays a very important part in car heating, because without circulation of the air throughout the car it is impossible

to obtain efficiency from any form of heating system. In this connection I have also found that where an exclusively exhaust-type ventilator is used it creates down draft in the stove and causes coal gases to enter the car, this being due to the fact that the exhaust ventilators, in this instance, created a greater draft than the flue on the stove. This also interfered with the proper combustion of the coal and in turn made it very difficult to keep the car warm. In conclusion, I might elaborate on the air requirements in proper ventilation, but the first thing to consider is the design of a ventilator that will admit fresh air and exhaust foul air. This must be done, however, in a manner that will prevent a car from being uncomfortable to passengers.

Experience with Bolted Flange-Bearings in Kansas City, Mo.

BY A. E. HARVEY

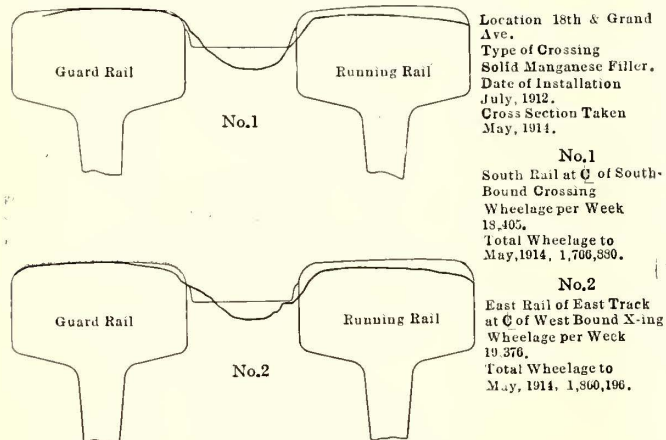
Superintendent of Way and Structures Kansas City (Mo.) Railways

On page 333 of the ELECTRIC RAILWAY JOURNAL of Aug. 31, 1912, appeared a description of a bolted flange-bearing street railway crossing which the Kansas City Railways installed at Eighteenth Street and Grand Avenue in July, 1912. In the same year and at about the same time a similar crossing was installed at Nine-

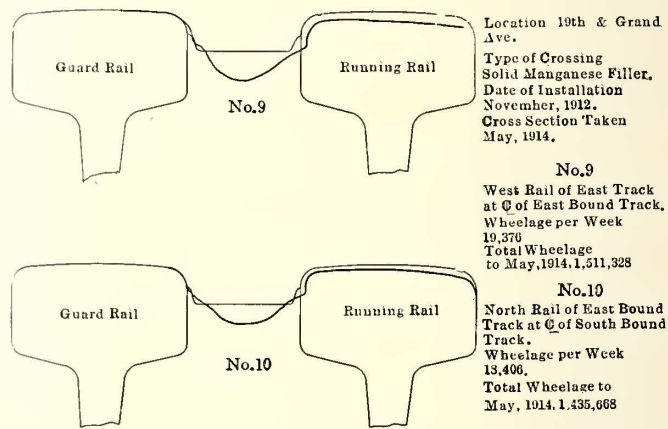
cast manganese fillers forming the flangeway floors. The depth of this flangeway was $\frac{3}{4}$ in., and the depth of the standard wheel flange was $\frac{7}{8}$ in. The parts of this crossing were bolted together with extra heavy knee braces and drive-fit bolts. In May, 1914, eighteen months after the crossing at Eighteenth Street and Grand Avenue was installed, sketches were made to show the character and extent of wear. These rail-wear graphs are shown in the accompanying illustrations. It is interesting to note the manner in which the manganese steel filler has flowed under the action of the wheels, as well as the amount of wear that has taken place on the head of the running rail.

A detailed examination of the crossing revealed the fact that in some places the manganese had peened up against the side of the rail head and could be broken off with a chisel. This condition, however, was not objectionable from an operating standpoint, nor so far as has been observed has it been of any disadvantage in the use of the crossing. At the time these rail graphs were taken 1,860,000 wheels had passed over the Eighteenth Street and Grand Avenue crossing, and 1,500,000 wheels had passed over the crossing at Nineteenth Street and Grand Avenue. Both of these are still in service and approximately 3,500,000 wheels have passed over them up to the present time.

Recent changes in the special work at Nineteenth



GRAPHS OF EIGHTEENTH AND GRAND AVENUE CROSSING

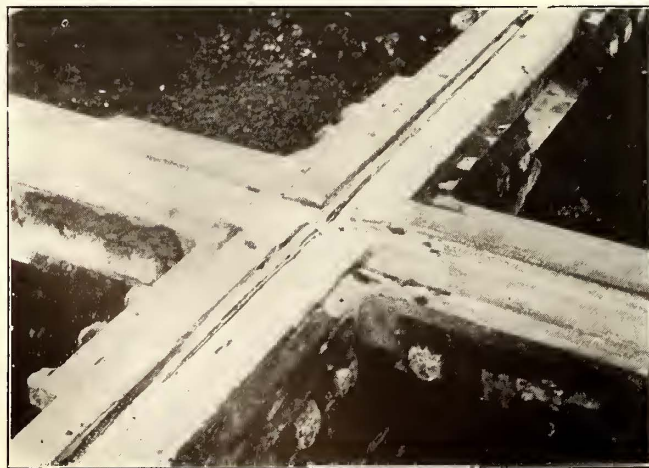


GRAPHS OF NINETEENTH AND GRAND AVENUE CROSSING

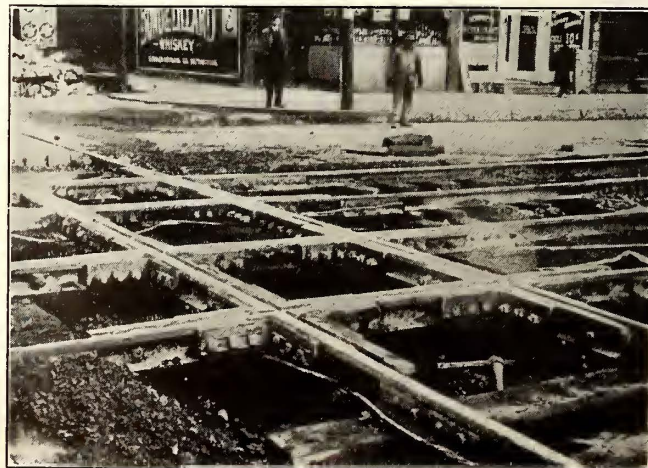
teenth Street and Grand Avenue. Recent changes at the latter point necessitated moving this crossing, and conditions were such that it may be of interest to the readers of this paper to know that the actual service has vindicated the use of built-up special work in paved streets.

This crossing is built of A.S.C.E. 100-lb. rail with

Street and Grand Avenue necessitated moving one of these crossings 10 ft. to one side. The crossing was stripped of the paving, and it was found that structurally it was in perfect condition. There was no indication of a loose bolt, in fact the crossing was so rigid that after all of the ties had been taken from beneath it, it carried the usual traffic. The crossing is shown in



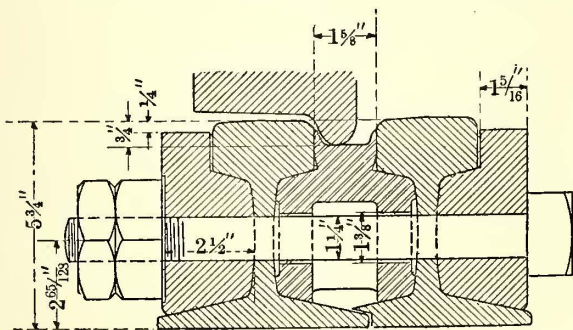
VIEW OF WORN INTERSECTION



VIEW OF SUSPENDED CROSSING

this suspended position in one of the accompanying half-tone illustrations where it will be noted that the suspended span in each direction begins outside of the joints connecting the crossing to the running rails. The only repairs necessary to this crossing at the time it was shifted was that of grinding down the head of the running rails in order to restore them to a flanged bearing and to obviate the cutting which had been produced upon the intersecting rails by worn wheel treads. The condition of this crossing before grinding is shown in one of the accompanying half-tones.

Another interesting feature in connection with this particular crossing that cannot be explained is that the crossing arched or humped up in the middle of both



SECTION THROUGH RAILS AND FILLER BLOCK

tracks. This result can only be attributed to the flow of the manganese which probably produced strains between the running and guard rails and tended to arch them about 1 1/2 in. in the middle of the crossing. It is also possible that the pressure of the manganese between the running and guard rails has kept the bolts perfectly tight in this crossing, although they were accurately fitted and driven in place when the crossing was built. In my opinion this crossing is in practically as good condition to-day as it was when it was installed, and many more years of service may be expected from it.

Since the installation of the two original crossings, more than twenty-five others of the bolted manganese flange-bearing type of construction have been built and put in service, and all of them are giving a very satisfactory account of themselves. In most cases, however, the detailed construction was changed slightly, and instead of manganese fillers being placed between the two rails, steel forgings have been used. Some of these forgings were fitted with an inserted rectangular bar of manganese, which takes the flange bearing of the wheels. In other crossings where a manganese flange-way floor was not available, steel cut from the head of the high-carbon rail was substituted for this purpose. Both types of construction have given perfect service, and the single defect which arose in connection with the original crossing, namely the arching at the middle, has not appeared.

In order to impress on the public the facts regarding the wearing out of car wheels the Detroit United Railway, through its *Electric Railway Service*, gave out the following facts: Last year the railway purchased more than 7000 cast-iron wheels and 1000 steel wheels. The average life of the former is five months and of the latter about two years. The useful mileage of 20,000 for a cast-iron wheel would enable it to make 1350 round trips between Jefferson and Woodward, and Log Cabin. Steel wheels, with a mileage of 100,000, would make 735 round trips between Detroit and Flint, 877 round trips between Detroit and Toledo, and 657 round trips between Detroit and Jackson.

Asphaltic Concrete Pavements

BY D. T. PIERCE

Barber Asphalt Paving Company, Philadelphia, Pa.

More than seventy-five cities are now laying asphaltic concrete pavements. Last year 4,700,400 sq. yd. of pavement of this type were constructed. Evidently a pavement that is growing so rapidly in popularity is one that those who are charged with the building and maintenance of pavements should know something about. There should be in the first place a clear understanding as to what is meant by asphaltic concrete. It is a very loosely used term. In one city it may be applied to a sheet asphalt surface mixture to which is added say 25 per cent of 1/4-in. and 1/2-in. stone. In another city the same name is given to mixtures consisting of 20 per cent of sand of no particular grading, the remainder of the aggregate being 1/2-in. to 1 1/2-in. stone with perhaps 7 per cent of bitumen. The latter mixture, more properly speaking, is an asphaltic macadam.

Rather than to describe in general terms what is and what is not asphaltic concrete, it will be more illuminating to give here a specification which has the approval of experts and which has produced pavements that have stood up well under service test. Such a mixture as the following may properly be designated as asphaltic concrete:

Sand: The sand shall be a natural bank or river sand, all of which will pass a ten-mesh screen. On sifting, at least 15 per cent shall be retained on a thirty-mesh screen and at least 22 per cent shall pass an eighty-mesh and be retained on a 200-mesh screen.

Stone: The crushed trap rock shall all pass a screen of two meshes to the lineal inch and shall all be retained on a ten-mesh screen, or run of crusher trap rock can be used provided the portion passing the ten-mesh screen is of suitable grading to serve as sand and filler, in which event only sufficient sand and filler shall be added to insure the proper proportion of sand and filler in the mineral aggregate.

Filler: If the screenings do not contain sufficient 200-mesh particles they shall be supplied by the addition of a suitable amount of ground limestone or any other mineral matter (or Portland cement) of sufficient density to produce a powder having a volume weight when ultimately compacted of at least 90 lb. to the cubic foot. It shall be so fine that at least 75 per cent shall pass a 200-mesh screen.

Combining Materials: The sand and rock complying with the above specifications shall be combined in such proportion that the finished mixture shall contain not more than from 8 to 22 per cent of aggregate passing a four-mesh and retained on a ten-mesh screen, and less than 10 per cent passing a two-mesh and retained on a four-mesh screen.

The main advantage of pavements of this type is their relatively low cost. Asphaltic concrete is not likely to rival sheet asphalt in durability, although all we know about it up to the present time warrants the conclusion that it is worth what it costs. The principal saving effected in the use of asphaltic concrete arises out of the fact that the binder course of the sheet asphalt pavement is eliminated, the wearing surface being laid in one course or layer, 2 in. or 2 1/2 in. thick. There is also a saving in the quantity of asphalt required, from 1 to 3 per cent, depending upon the amount of very fine material that is incorporated in the mixture.

It is a mistake to suppose that the making and laying of asphaltic concrete requires less care and skill than the laying of sheet asphalt, although it is true, of course, that a mixing plant will turn out and a street force will lay a larger yardage of asphaltic concrete than of sheet asphalt, owing to the fact that the latter pavement is composed of two different courses—the binder course and the wearing surface. A smaller and cheaper plant may be used for asphaltic concrete than is required for sheet asphalt. Prices vary greatly owing to local requirements, costs and conditions, but

the rough estimate may be made that 2-in. asphaltic concrete pavement will average 35 cents per yard less than sheet asphalt.

At its best asphaltic concrete consists of a high-grade sheet asphalt mixture to which there has been added about 8 per cent of 1/2-in. and about 20 per cent of 1/4-in. stone. It will throw considerable light on this subject to present a number of examples of good and bad formulas. Probably the highest type of asphaltic concrete pavement is that laid on Riverside Drive, New York, in 1913, from Seventy-second street to 114th street. This pavement is 3 in. thick and was rolled in two layers on a 6-in. concrete base, the wearing surface having the composition given below. In the table column A gives the average composition of the surface mixture as laid on the street; column B that of the finer portion, excluding the 1/4-in. and 1/2-in. stone and the 4 per cent of bitumen which is estimated as being sufficient to cover this portion of the aggregate.

Composition		A	B
Asphalt cement	110 lb.	Bitumen 8.9	11.1
Portland cement dust	110 lb.	200 mesh 11.9	16.5
Sand	312 lb.	80 mesh 14.5	20.1
Stone screenings	564 lb.	40 mesh 18.6	25.9
		10 mesh 18.9	26.4
		4 mesh 19.1	...
		2 mesh 8.1	...
	1,096 lb.	100.0	100.0

Closely approximating this formula is one under which a large yardage of very successful asphaltic concrete pavement has been laid in Rochester, N. Y.

A third mixture, used in Trenton, N. J., three years ago which has so far proved satisfactory, is this:

Composition		Original Mixture	Finer Portion
Asphalt cement	105 lb.	Bitumen 8.1	10.6
Dust	80 lb.	200 mesh 8.9	13.1
Sand	560 lb.	80 mesh 10.7	15.8
Stone screenings	370 lb.	40 mesh 25.3	37.3
		10 mesh 15.7	23.2
		4 mesh 13.0	...
		2 mesh 17.3	...
	Retained by 2 mesh	1.0	...
	1,115 lb.	100.0	100.0

As an example of asphaltic concrete from which good results have not been obtained and cannot be expected, may be instanced the following from a Georgia city:

Composition		Original Mixture	Finer Portion
Asphalt cement	160 lb.	Bitumen 7.7	9.6
Dust	60 lb.	200 mesh 6.8	10.1
Sand	9 cu. ft.	80 mesh 15.0	22.4
Stone screenings	9 cu. ft.	40 mesh 17.0	25.4
		10 mesh 21.8	32.5
		4 mesh 19.5	...
		2 mesh 12.2	...
		100.0	100.0

This mixture is evidently deficient in bitumen, while the following is deficient in filler and fine sand:

Composition		Original Mixture	Finer Portion
Asphalt cement	140 lb.	Bitumen 8.4	13.5
Stone screenings	400 lb.	200 mesh 3.4	5.5
Sand	600 lb.	80 mesh 2.5	4.0
		40 mesh 26.0	41.7
		10 mesh 22.0	34.3
		4 mesh 20.0	...
		2 mesh 17.7	...
	1,140 lb.	100.0	100.0

In all of the foregoing mixtures natural lake asphalt was employed, and it is not to be expected that the best service can be obtained from a pavement of this type unless there is used an asphalt with a cementing power which does not deteriorate. That a pavement is no better than its asphalt is a truism that applies as well to asphaltic concrete as to sheet asphalt. But despite this fact railways as well as municipalities are sometimes content with asphalt specifications which merely call for certain general characteristics, and do not as-

sure themselves that the asphalt will retain (after incorporation with the aggregate) the qualities which it shows under laboratory test. One simple but essential requirement is that the asphalt after combination with the sand and stone of the paving mixture shall not show a loss of more than 10 per cent in ductility.

The finer portions of asphaltic concrete mixtures may consist of properly graded sand, the finer portion of crushed stone of the proper grading, or a mixture of the two. According to Clifford Richardson, who is perhaps the highest authority on this subject, "the mixtures which have been constructed with screenings, including the fine material, are as satisfactory as those made with sand and clean stone free from the finer portion." The same authority has said that "where laid with skill and care they (asphaltic concrete pavements) present, in the light of the limited service to which they have been exposed, very desirable characteristics. From the writer's experience he is led to believe that there is a great future for this type of construction."

By the expression "limited service" is meant the comparatively short period during which these pavements have been laid, for as to yardage it can hardly be said that our experience is limited. While Rochester has pavements of this type now ten years old, the great increase in yardage has come about since the rendering of the decision of Judge Pollock of the United States District Court of Kansas. It was upon this decision that the so-called "Topeka specification" was based. This decision, it should be pointed out, did not pretend to determine what was a desirable paving specification; it simply held that a certain grading of aggregate did not infringe a patented pavement. Thereupon a number of engineers proceeded to lay pavements in accordance with a formula in behalf of which little more could be said than that it did not infringe a patent.

In the past four years the "Topeka" pavement has gone through an evolution in which it has lost its name and most of its other characteristics and become the asphaltic concrete, of which, as stated, the highest type is represented by the Riverside Drive pavement. This should not be confused with the haphazard mixtures laid under this name, nor with coarse-aggregate sheet asphalt pavements laid without a binder course. Whenever the latter construction has been attempted, notably in Milwaukee under the Socialist regime of three years ago, the result has been uniformly disastrous.

So far as the adaptability of asphaltic concrete in and about car tracks is concerned, it certainly has no advantages over sheet asphalt. Probably the effect of vibration on such pavements would be the same as upon sheet asphalt, while the latter might be expected to resist the effects of moisture better than could be expected from asphaltic concrete.

Bridge Timber Tests in Oregon

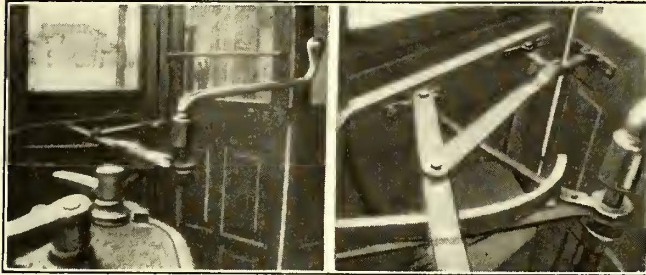
The West Coast Lumbermen's Association, which is made up of the lumber producers of the Pacific Northwest, has entered into a co-operative arrangement with the Oregon Agricultural College, located at Corvallis, for the testing of forty 7-in. x 16-in. x 16-ft. bridge stringers. The purpose of the tests is to establish a grade of bridge stringers to be known as "Selected structural Douglas fir bridge stringers."

The stringers are being broken on a Riehle testing machine of a rated capacity of 150,000 lb., under what is known as a "three-point" load. On account of an accident to the testing machine, the tests have been interrupted for a short time, but they will soon be completed and a report will be available. The tests are under the general direction of George W. Peavy, dean of the School of Forestry, Oregon Agricultural College.

Inexpensive Door-Opening Device

The accompanying illustrations are of a door-opening device which was designed by B. J. Singleton, master mechanic Trenton & Mercer County Traction Corporation, Trenton, N. J., and which has been placed in service on the cars of that company. Aside from its simplicity it has the virtue of being very inexpensive, having been made for about \$1.15.

The novel feature is the use of a wagon cover hinge attached to the door and vestibule frame, as shown.



SIMPLE DOOR-OPERATING DEVICE

This hinge consists of two plates, to each of which is hinged one end of a jointed connecting piece. A rod attached to the center of the hinge connects with an operating lever placed near the brakestaff. The lever is hinged to the vestibule frame and its weight is partly carried by a curved guide piece made of strap iron.

The motormen who have used the device have been well pleased with it.

Equipment Records on the Binghamton Railway

Recently there has been inaugurated on the Binghamton (N. Y.) Railway, of which C. S. Banghart is vice-president and general manager, a system of equipment records that is especially suitable to the needs of electric railway properties of moderate size, owing to its simplicity and to the ready availability of the equipment data therein collected. The basis is a card filing system, including the use of 8-in. x 5-in. cards which are kept in a single cabinet, differently colored cards being used to make the different records readily distinguishable.

The most important one, perhaps, is the record of individual mileage of each car, for which figures are entered daily upon a series of cards such as shown in part in the accompanying illustration. The entries are made in the general office, the figures being obtained from special mileage slips that are made out by each conductor at the end of each day's work. These mileage

MILEAGE RECORD						CAR NO.
DAY	JULY	TOTAL	AUG.	TOTAL	SEPT.	TOTAL
Frd						
1						
2						
3						
4						

CARD FOR TABULATING MILEAGE RECORD

slips give the number of trips that are made on each car, and the mileage is calculated in the office from the known length of each trip.

From these mileage records entries are made as re-

quired on the cards for the other records. The latter include an inspection and overhauling record in which entries are made daily in accordance with reports from the master mechanic regarding the cars that have been inspected and overhauled, the mileage being obtained direct from the mileage record card for the car in question whenever such an entry is made. These inspection record cards are filed according to consecutive car numbers, and the form ruling and lettering have been printed on both sides of the card to provide greater length.

A record for car body repairs is also maintained, these cards being arranged in accordance with the car numbers, as is the case with the cards for the record of car trucks. The compressor record cards, however, are arranged in accordance with the numbers of the compressors, and this applies also to the record cards for the controllers.

Cards for wheel records are kept filed in accordance with car numbers, on account of the necessity for having directly accessible mileage figures. The entries on the record card, therefore, apply to one wheel, showing the wheel number and data regarding the condition at application and at removal. On the reverse side of this card there is a form for the record of used and turned wheels, providing for wheels that are not returned to the cars from which they were originally removed, and such wheels are consequently located in the file only by their individual numbers.

The records of pinions and gears are kept on similar cards but of different colors. Entries are made covering the date in service, the date out of service, the car number, the truck number and the motor number, as well as remarks regarding the cause of removal. The mileage is figured from the above-mentioned car-mileage records, and to facilitate the mileage entries the cards are kept

No. or Size		Article		Location		Unit		Max.				
								Min.				
ON ORDER			RECEIPTS			DELIVERIES			DELIVERIES			
DATE	ORDER NO.	QUANTITY	DATE	ORDER NO.	QUANTITY	DATE	ORDER NO.	QUANTITY	DATE	ORDER NO.	QUANTITY	BALANCE

CARD FOR RECORDING SUPPLIES IN STOREROOM

in order in accordance with the car numbers, rather than the pinion numbers.

A record is also kept of the trolley wheels that are changed. This provides for the wheel number and other data, including the dates of installation and removal. The mileage is calculated from the mileage made by the car, and records are therefore kept in accordance with the car numbers to facilitate mileage entries.

An especially novel feature of the record system is the inclusion of permanent data covering every car that is operated on the system. This shows the general dimensions, the weight of various pieces of the equipment and the character of the various facilities installed on the car. The record cards are kept in the same cabinet with the other records, so that they may be available for examination at any time in case any question arises as to the details of the car equipment.

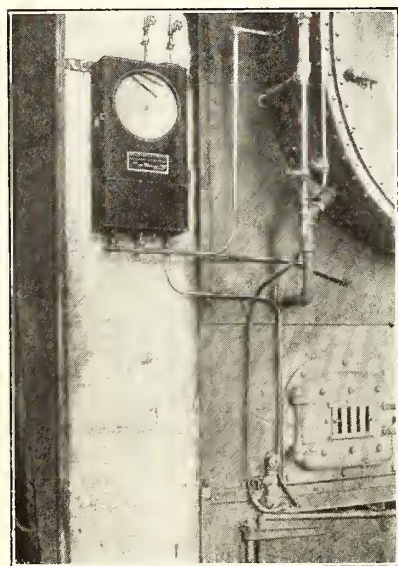
The same type of card has been adopted for the storeroom records, and the card index thus provided is used on the perpetual inventory basis, the storeroom record cards being ruled as shown in the accompanying illustration. All deliveries from stock are made upon requisition only, and the records are checked once every six months by taking a stock of the material on hand.

Another feature of the company's records is the application to the incandescent lamps installed on the cars, the desirability of this having arisen because of the very heavy renewals that were recently in evidence. All lamps are now numbered by a pasted sticker which has

a number printed upon it, and this identification mark permits the establishment of a record in which is entered the lamp number, the size, the date installed, the date removed, and the cause of removal, the latter being subdivided into four separate classes, namely: burned out, broken, stem broken, bad vacuum. As the old lamp or base must be returned before a new one is issued, this record will, in a short time, display the reason for the large number of lamp renewals and will also serve as a means for comparison between various makes of lamps.

Three Boiler Meters in One

A new boiler meter which records the rate of steam output from the boiler, the rate of air flow through the furnace, and the condition of the fuel bed has been put on the market recently by the Bailey Meter Company,



THREE-IN-ONE BOILER METER
INSTALLED

141 Milk Street, Boston, Mass. It is a combination of three separate meters in one casing, each meter drawing its own record in a distinctive color on a 12-in. circular chart.

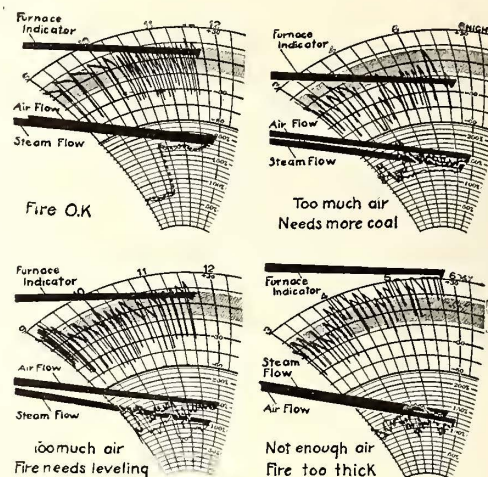
The steam flow is recorded by the "red" pen drawing a red record in the center section of the chart, the graduations being in per cent of the boiler's rated capacity on a uniform scale. This part of the meter is identical with the steam meter described in the April 1 issue of the *ELECTRIC RAILWAY JOURNAL*.

It operates upon the principle of measuring the pressure difference across a Monel metal orifice placed in the flange of the steam line.

The air flow is recorded by the "blue" pen, located so that it travels immediately in front of the "red" pen and, therefore, produces its record just ahead of the record of steam flow. It is operated by a draft differential between the firebox and the uptake, but instead of reading in terms of draft it reads in terms of steam output. In other words it gives the same reading and draws a record coincident with the steam flow so long as the right amount of air is used for combustion. If the air flow reads more than the steam flow it shows too much air and corresponds to low CO_2 ; if it reads less than the steam flow it means insufficient air and loss due to unburned gases. This is based upon the principle that air is a fuel just as much as coal is, and a certain evaporation should be obtained per pound of air. This standard is determined for each boiler and the meter adjusted accordingly.

The furnace indicator, drawing a record on the outer section of the chart, shows the condition of the fuel bed. The fire is of the right thickness when this pen is on the shaded band, too thick when above and too thin when below the band. This also is adjusted to individual conditions after extensive tests have been made to determine the best kind of fire to carry. This furnace indicator is operated by draft pressures and is in reality a measure of the resistance of the fuel bed to

the flow of air. It should not be confused with the drop in draft pressure across the fuel bed, for it includes the draft pressure in the uptake as well as the firebox and ashpit in such a way as to eliminate the effect due to the intensity of the draft or the rate of flow of air and responds only to changes in condition of the fuel bed. That is, the pen does not move when the damper opening or draft pressure varies from maximum to



CHARTS SHOWING CONDITIONS OF FUEL BED

minimum unless the fire changes, but when the fire burns too thin or develops holes, the recorder shows it regardless of the intensity of the draft.

Bureau of Standards Issued Paper on Concrete

The Bureau of Standards, Department of Commerce, has just issued Technologic Paper No. 58, dealing with the properties of concrete and Portland cement mortars, under the title "Strength and Other Properties of Concretes as Affected by Materials and Methods of Preparation." It includes the results of about 20,000 tests on about 300 aggregates consisting of limestone, granite, gravel and trap rock which are used for concrete materials in various sections of the United States. The results are of especial interest to contractors, engineers and others who use concrete, since it points out that with the same aggregates a variation in strength of as much as 100 per cent may result owing to the lack of proper precautions in mixing and placing the material. One of the most important conclusions to be derived from the results is that the use of too great an amount of mixing water, which is common in present-day construction, accounts for many concrete failures. The use of an excessive amount of mixing water may result in a reduction in strength as great as would result from a reduction of 50 per cent in the amount of cement used. The results indicate that proper methods of mixing and fabrication are as important as good cement and aggregate in producing a concrete of the best quality.

The Illinois Traction System, Peoria, Ill., has erected at Evans, Ill., what is said to be an innovation in country grain elevators. The structure is a concrete and steel tank elevator, the round steel tank, 26 ft. in diameter, 45 ft. high and weighing 40,000 lb., being divided into four bins, each containing 3000 bushels. The first story, or working floor, under the tank, is of reinforced concrete with steel support, and the entire structure is ratproof and mouseproof, as well as fireproof.

LONDON LETTER

The Trail Car a War Expedient—Progress of Electrification
on Two Lines Recorded—Opinions on Women
Workers Differ

(From Our Regular Correspondent)

The Metropolitan Electric Tramways, Ltd., which operates on the northern outskirts of London, is desirous of securing permission to use trail cars on its system. The company has already applied to the Board of Trade for such permission, and the Paddington Borough Council is supporting the application. It is becoming obvious that during the busy rush hours the traffic cannot be handled by ordinary means, and with the present shortage of labor it is impossible to put on more cars. Both the Board of Trade and the various councils of the boroughs through which the tramway system runs, are willing to permit the use of trail cars, such permission, however, to be granted as a matter of urgency during the continuation of the war.

Other cities in England are anxious to adopt the trail car, but feel compelled in certain instances to make experiments to find out whether it is suitable for use on their streets. The tramways committee of the Birmingham City Council is committed to an experiment of this kind, but has as yet arrived at no definite decision. A trail car has been prepared and is now in service, and an early report upon its working is expected. The difficulty of introducing trail cars in Birmingham is accentuated by the narrow gage of the tramways, the comparatively narrow and tortuous streets, and the extraordinarily heavy amount of tramway traffic in some of the thoroughfares. It is only possible to run trailers where there is a loop, and in many cases the running of trailers would involve a redistribution of the tramway terminals, and the provision of the necessary loop. Where impossible to form a loop, the necessity for shunting the trailers so as to bring them to the rear of the ordinary cars, would involve such delay that the purpose of their adoption might be prevented.

The Newcastle Corporation is also making an experiment for the purpose of relieving congestion on its tram routes, but is endeavoring to overcome the difficulty in a different way. Instead of using a trail car, two ordinary motor cars are coupled, after removing one motor from the inside axle of each car. The two cars, therefore, practically become one coupled unit, the controllers on the adjacent center platforms being also removed. One motorman controls the two cars, and each car has a woman conductor.

The progress of the electrification work on the London & North Western Railway's suburban lines is referred to in a recent report by the chief engineer. The section of the new line between Queen's Park and Willsden was opened for traffic on May 10, 1915, when the London Electric Railway service of trains running from Waterloo to Queen's Park via Charing Cross, Baker Street, and Paddington, was extended to Willesden Junction. The work between Chalk Farm and Queen's Park has been delayed by shortage of labor, owing to the war. The bridges and tunnels for the junctions between the new electric lines and the existing lines to Euston and Broad Street are in progress, and the driving of the iron-lined tunnels under Primrose Hill is proceeding steadily, half the length having been completed. The electric power station and repair shed at Stonebridge Park and the six electric substations are complete, and part of the plant has been installed. The carriage sheds at Willesden and Watford are nearing completion. Equipment of the new lines for electric traction between Willesden and Watford is in a forward state.

After experiments extending over some months, electric trains are now running on the Lancashire & Yorkshire Railway between Victoria Station, Manchester, and Bury. At present only a partial electric service is in operation, and the majority of the trains are of the ordinary kind. Each car is divided into two main passenger compartments with a center aisle, fixed and reversible seats being arranged alternately on either side. Timber has been entirely superseded by metal in the construction of the cars.

The Newcastle Corporation Tramway is not making money at present. The tramway committee contemplates increasing the fares for workmen. It seems that at present 186,000 workmen are carried at half fare morning and night, and in

some cases at even less than that. Sunday makes no difference in the fares, although the workmen receive extra pay for Sunday work, while the tramway employees have also to be paid an equivalent of time and a half for working the cars. Then, in addition, soldiers are permitted to travel at half fare, and more than 70,000 men in uniform use the cars every week. Thus a total of 256,000 persons enjoy the privilege of traveling at half fare week by week. Whether the proposed increase is necessary, it seems to be an anomalous state of things that a man who is earning good wages should pay half fare simply because he works in a factory, while the clerk or shopman has to pay full fare.

A special committee of the Tramways & Light Railways Association has been formed with a view to facilitating the supply of tramway rails. The March issue of the journal of the association states that negotiations are taking place with the rail manufacturers with a view to securing a supply during the next twelve months. For this purpose, members are asked to furnish the secretary with the minimum quantity of rails and fish plates which are absolutely required for keeping their undertakings going. Manufacturers will shortly quote prices, and it will then be necessary to apply to the Minister of Munitions for permission to roll the rails and grant licenses for delivery.

In a recent report from Mr. Dalrymple, general manager of the Glasgow Corporation Tramways, it is stated that after six months' experience with women drivers he has come to the conclusion that the women are doing very well indeed, and that they have fewer accidents than men. The Corporation has sixty-eight women driving or under training, and a few are being added to the number every week. Mr. Dalrymple states that the general opinion in the city of Glasgow is distinctly favorable to the women drivers, who take their turn of all the routes exactly as the men do. Notwithstanding the unusual conditions of darkened streets and country roads the women are regarded as having made a success of their new calling. The women who are employed by the Glasgow Corporation Tramways as drivers are being referred to generally as "motresses."

In view of the above, it is somewhat anomalous to find it stated by the Tramways & Light Railways Association, in reply to a request from the Board of Trade, that, as a result of circularizing all the company members of the association, women are actually employed as tramcar drivers by only four companies in Scotland and the West of England respectively. The total number employed so far is fifteen women, but as grades are light and the other working conditions generally favorable to the employment of women, the companies hope to increase the number up to 50 per cent of the total, provided the right type of woman can be secured. A few of the smaller companies are considering the matter where the traffic is light and the lines level, but in most cases it is thought unsafe to use women as drivers.

It is also interesting to note that representations have been made to the Board of Trade and the Ministry of Munitions on behalf of the Tramway & Vehicle Workers' Association, urging that women should not be employed as tram drivers. Proposals had been brought forward in some of the large towns that women should be so employed. Other towns would probably follow suit, and the tramway workers felt that strong representations should be made as to the undesirability and the danger of the suggested innovation. Not only male workers, but also the women employed as tram conductors, were opposed to it.

An interesting experiment is being made by C. J. Spencer, general manager of the Bradford City Tramways, in connection with the conveyance of goods over the regular tramway routes. The experiment differs from those of a similar nature in other cities in that the wagon adopted is of the railless traction type, and is fitted with a trolley pole and the usual motors so that it may be propelled along any of the streets where trolley lines exist. In addition, however, it is also equipped with accumulators, so that should it be necessary to depart from a tramway route it can readily do so for a distance of a few miles. The wagon was built on a chassis taken from a railless trolley car. It is driven by two 20-hp. electric motors. The accumulators can be charged when the vehicle is being propelled from the overhead trolley.

A. C. S.

NEWS OF ELECTRIC RAILWAYS

DECISION IN CHICAGO SERVICE ORDER CASE

Judge Thomas Taylor of the Circuit Court at Chicago, on May 27 denied the right of the Illinois Public Utilities Commission to issue orders affecting the service and equipment of the Chicago Street Railways. As a result of this decision it is expected that a permanent injunction will be granted in favor of the city restraining the commission from enforcing its order of Sept. 29, 1915, reviewed at length in the *ELECTRIC RAILWAY JOURNAL* of Oct. 9, 1915, page 775. This opinion was rendered in the suit for an injunction brought by Chicago to restrain the commission from enforcing its order. The opinion states that the commission's order invades some of the rights of the company and the city and that consequently it is a violation of their constitutional rights. In his opinion Judge Taylor says:

"It must be borne in mind that the commission has no jurisdiction over the streets of the city of Chicago; that it has no jurisdiction over the ever-changing traffic conditions; that it has no jurisdiction over foot passengers and vehicular transportation, which constitutes the major part of the use of the streets of Chicago. The street railway situation in Chicago is unique. The companies have had a long and checkered career. They have been affected by the constitution of the State, by many acts of the Legislature, by ordinances of the City Council and decrees and judgments of the court until now under a settlement ordinance they have constituted a coherent system of nearly 1000 miles of street railways paying into the city treasurer 55 per cent of their net earnings."

With reference to the city's claim as to the illegality of the formation of the Public Utilities Commission, Judge Taylor said:

"In the course of argument a number of questions have been raised as to the constitutionality of the act creating the Public Utilities Commission. All of these questions, advisedly, are here left unanswered. The Legislature of the State of Illinois has seen fit to pass the act which provides for the regulation of public utilities, and that act is presumed to be constitutional until it is proved beyond a reasonable doubt to be otherwise."

THOMPSON COMMITTEE RESUMES TRANSIT HEARINGS

After giving its entire time for about ten days to investigating the telephone wire-tapping charges, the Thompson legislative committee on May 31 again took up transit matters. The committee gave consideration to the rumor of a \$50,000 bribe hint in connection with the purchase of Brooklyn waterfront property for subway use. Among the witnesses called and questioned regarding this bribe hint were: Sigfried Cederstrom, real estate appraiser for the Public Service Commission; Fairfax Landstreet, chairman of the board of directors of the New York Dock Company; Charles E. Hotchkiss, counsel to the Dock Company; William B. Halm, president of the Dock Company; LeRoy T. Harkness, counsel to the Public Service Commission; and Frank de C. Sullivan, director of the Interborough Rapid Transit Company. Frank Moss, counsel to the committee, in his examination tried to bring out the names of the man soliciting the bribe, but was unsuccessful. On June 1 Joseph S. Auerbach was the first witness and was questioned regarding the bribe hint which was the subject of the hearing on May 31. Mr. Sullivan, who testified on May 31 regarding the bribe hint, was called again and questioned regarding the relations between the Interborough Rapid Transit Company and T. A. Gillespie, who received the contract for third tracking the elevated lines. Mr. Moss tried to get the witness to admit that the Interborough directors withdrew the Stevens contract because of hostile newspaper criticism. Mr. Sullivan denied it. He was opposed to it on general principles as were Mr. Freedman and Edward J. Berwind.

PLAN BETTER SERVICE ON THE KEY ROUTE

At a hearing in San Francisco before the Railroad Commission of California on the petition for permission to purchase new equipment, G. K. Weeks, president of the San Francisco-Oakland Terminal Railways, outlined the company's plans for improved service. The matter under discussion before the commission was the issuance by the corporation of \$180,000 of 6 per cent serial equipment notes, maturing semi-annually, in a period ranging from one to nine years, and their sale to underwriters, already secured, at par and interest. With the money thus obtained Mr. Weeks proposes to buy twenty convertible cars each with a seating capacity of fifty-two and twelve cars suitable either for street or interurban service. The former type are to cost \$6,000 each and the latter \$9,500 each. The total cost of this equipment will amount to \$234,000, and after a payment in cash the remaining sum necessary to liquidate the notes will be provided through the setting aside of \$200 a day out of the earnings of the road until the cars are paid for. With new interurban cars on a new routing and an express schedule, Mr. Weeks expects to cut down the running time between the Oakland and Berkeley terminals from thirty to fifteen minutes. Mr. Weeks said that during the height of the jitney competition in Oakland the traction company's receipts decreased \$1,000 a day, but since the regulatory ordinance had been enforced the revenues had returned almost to their normal average. He estimated that the Oakland jitneys are not taking in more than \$300 a day at present. The application has been taken under advisement by the commission.

TRENTON ARBITRATION BEGUN

After having gone over the ten cases of conductors dismissed by the Trenton & Mercer County Traction Corporation, Trenton, N. J., on the charge of "sniping" fares, Peter E. Hurley, general manager of that corporation, and C. Howard Severs, arbiters respectively for the company and union, have decided that a third arbiter is necessary to settle the differences. The third arbiter will be selected by Messrs. Hurley and Severs in a few days. It was at first thought that the dispute between the corporation and the union could be adjusted by the two arbiters that had already been named.

Mr. Severs and Mr. Hurley first met and went over the cases in a preliminary way. The company claims that its inspectors submitted truthful reports of each case. The union contends that the company seeks to disrupt the labor organization by preferring charges against its officers. The direct cause of the strike was the dismissal of David H. Coleman, president of the union. The company was asked to reinstate him, but refused. Then the union announced that the ten dismissed men would have to be reinstated or a strike would be called and later it sought to enforce its threat by calling the men out.

J. P. Shea, national organizer of railway employees, advised Mr. Severs on different points at issue. They also went over the new working agreement submitted to the company a few weeks ago and again asked the corporation for its reply at once. This agreement will not come up for arbitration at this time should the company object to any of its clauses, but will go over until the "sniping" charges have been settled. The men are now paid 27 cents an hour. They have demanded 34 cents and improved working conditions in the new agreement.

Mr. Hurley has been general manager of the company for several years. Mr. Severs has been a conductor in Trenton for about fourteen years. He was formerly president of the Mercer County Central Labor Union and president of Division No. 540 of the Amalgamated Association. He was recently appointed one of the New Jersey organizers of the American Federation of Labor.

TRACKLESS TROLLEY BILL PASSED IN MASSACHUSETTS

Governor McCall of Massachusetts has signed an act providing for the operation of trackless trolley cars by the Massachusetts Highway Service Company, by street railways or other corporations organized as provided in the measure. Five or more persons may associate themselves by written agreement with the intention of forming a trolley-motor or trackless trolley company. The corporate name assumed cannot be one in use or closely resembling that of any other trolley-motor company or in the judgment of the Public Service Commission so similar to it as to be likely to be mistaken for it. The agreement of association must indicate the object of the company; must specify the terminals of the proposed route, with the approximate length of the latter, and the names of counties and municipalities involved. The capital stock must be stated, and this is fixed at a minimum of \$2,000 per mile, or \$20,000 minimum total. In general, the laws governing the organization of street railways apply to these companies.

Before any company can operate equipment over such routes, a permit must be obtained from authorities having jurisdiction over public ways, the grant being subject to approval of the Public Service Commission. No such approval can be given for any line, any portion of which is, in the opinion of the commission, "so contiguous or adjacent to the line of any street railway company as to result in a competitive service injurious to the public and to such street railway if the latter is ready and willing and offers to construct and does construct within such reasonable time as may be fixed by the Public Service Commission a line or lines of street railway or a line or lines of trolley-motor or trackless trolley over such public way, which, in the opinion of the Public Service Commission will serve the public as well as would the proposed trackless trolley line described in the petition; and no such approval shall be granted in any event if the Public Service Commission shall be of the opinion that the granting of the same would be unduly injurious to any street railway or trackless trolley line covering the same or substantially the same territory."

Every corporation undertaking to perform the kind of service authorized in the act becomes thereby a common carrier, and the commission has general jurisdiction over it, having authority to permit the suspension or curtailment in whole or in part of the trackless trolley service of any company on account of weather, traffic or highway conditions, or season of year making such suspension or curtailment desirable for the safety of the public or to avoid loss in operation.

FORT WAYNE & SPRINGFIELD REHABILITATION

The Fort Wayne & Springfield Railway, Decatur, Ind., has surrendered its franchises in the city of Fort Wayne and in Allen County and is operating under the indeterminate permit section of the Indiana State laws. The franchise in Fort Wayne had twenty-five years to run and in Allen County forty years. A sale of the entire property has been agreed upon. Charles H. Worden, trustee, will deliver the property to Henry C. Paul, Fort Wayne, when the State commission gives its approval. A hearing on the sale has been held, but the decision of the commission has not yet been rendered because the city of Fort Wayne is opposing the surrender of the franchise, which required paving work and similar municipal requirements to be met. After the transfer of the property takes place it is proposed to change the system of electrical distribution from 6600-volt a.c. trolley to 1200-volt d.c. trolley. Energy will be purchased in bulk from the Fort Wayne & Northern Indiana Traction Company, stepped up from 4000 volts to 33,000 volts, three phase, 60 cycles, and transmitted over a 10-mile transmission line that will be built from Fort Wayne to the mid-point on the interurban line, where a new 1200-volt substation will be built. Four new cars will be required to operate the rehabilitated line.

The Fort Wayne & Springfield Railway operates 22 miles of line connecting Fort Wayne, Decatur, Monmouth and Midletown. Sam W. Greenland of the Fort Wayne & Northern Indiana Traction Company, has been managing the property for the trustee.

CINCINNATI-LOUISVILLE LINE PROPOSED

Negotiations are said to be under way between the Cincinnati, Indiana & Louisville Railroad, a new corporation, and Stanley Shaffer, the receiver of the Cincinnati, Lawrenceburg & Aurora Electric Street Railroad, by which the new company will use the lines of the latter for a route it expects to establish along the Ohio River through Indiana toward Louisville. This would mean the use of the tracks which the new West End Rapid Transit Company expects to build in Cincinnati to connect the Cincinnati, Lawrenceburg & Aurora road at Anderson's Ferry with the business district of the city. Whether the new company desires to purchase these properties or operate them under a leasing arrangement is not clear. Mr. Shaffer has refused to go into detail regarding the matter. The Cincinnati, Indiana & Louisville Railroad is controlled by Chicago and Cincinnati men, but their identity has not yet been divulged. It is said that the road, if built, will pass through Vevay, Rising Sun and other Indiana towns which are served at the present time only by river steamers.

Cincinnati Traffic Survey Considered.—Frank S. Krug, city engineer of Cincinnati, Ohio, has been directed by the Cincinnati Rapid Transit Commission to make an estimate of the cost of a traffic survey of Cincinnati.

Mr. Taylor Will Report on Pittsburgh Problems.—A. Merritt Taylor, president of the Philadelphia & West Chester Traction Company and former director of the department of city transit of Philadelphia, will begin on June 1 a survey of the transit problems of Pittsburgh.

Union Organizers Denied an Injunction at Columbus.—Judge Dillon of the Common Pleas Court at Columbus, Ohio, refused to issue an injunction to prevent the police department from interfering with organizers of the Amalgamated Association, who claimed that the police prevented them from attending a meeting of street railway men and otherwise interfered with their activities.

Peter Witt Returns Royalties.—On May 26 Peter Witt, former Street Railway Commissioner of Cleveland, returned to the Cleveland Railway a check for \$7,800 which had been sent to him as royalties on 156 motor cars of the type on which he owns patents. Mr. Witt wrote that the company and the people of Cleveland never would have to pay him royalties. He is receiving royalties of \$50 a car for those used in other cities.

Increase in Wages Granted in Akron.—The motormen and conductors of the Northern Ohio Traction & Light Company, Akron, Ohio, on May 7 decided to accept an offer made to them by Charles Currie, general manager, under which the employees of the Akron city lines will receive 27, 29 and 32 cents an hour, according to their terms of service. The men on the suburban lines will receive 28, 30 and 33 cents an hour and those on the interurban lines 29, 31 and 34 cents an hour. Next year the men on the three lines will receive an increase of 1 cent an hour.

Mr. Mitten Complimented.—T. E. Mitten, president of the Philadelphia (Pa.) Rapid Transit Company, was paid a well deserved tribute by the Philadelphia *Ledger* in its issue of May 18. In acknowledging Philadelphia's debt to Mr. Mitten the *Ledger* said: "It has been one of the conspicuous achievements of President Mitten's management of the rapid transit company that he has established amicable relations between the company and its men, that their pay has been substantially increased and that their hope of further additions to their compensation rests on the results of their own faithfulness and efficiency."

Maine Road Increases Wages.—Announcement was made on May 22 that the conductors and motormen on the lines of the Cumberland County Light & Power Company, Portland, Me., have been granted an increase in wages of 7 per cent, aggregating about \$17,000 a year. Men who have been in the employ of the road one year will, under the new schedule, receive 26 cents an hour; two-year men, 27 cents; three-year men, 28 cents, and four-year men and over, 29 cents an hour. Under the present scale the first-year men receive \$2.15 a day; two-year men, \$2.25; three-year men, \$2.35, and four-year men and over, \$2.45.

Strike Averted in Little Rock.—A threatened strike of conductors and motormen of the Little Rock Railway & Electric Company, Little Rock, Ark., was averted May 23 when an agreement was reached between officials of the company and the Central Trades Council. The demands of the men included recognition of the union, increase in wages and reinstatement of employees who were alleged to have been discharged because they joined the union. One of the concessions of the company was an increase in wages of 1 cent an hour. This will change the present rate from 19 to 26 cents an hour to one of from 20 to 27 cents an hour.

Wages of Omaha Employees Advanced.—The Omaha & Council Bluffs Street Railway, Omaha, Neb., effective on June 1, will increase the wages of practically all its employees. The scale which has been in effect began at 24 cents an hour for the first year and increased 1 cent an hour up to five years, after which 28 cents an hour was paid until nine years of service, when the maximum of 29 cents an hour was paid. The new scale provides for a minimum of 25 cents an hour and a maximum of 30 cents an hour, payable after five years of service. The wages of the employees in other departments will be raised in about the same proportion.

East Cleveland Franchise Matter Unsettled.—At a conference on May 26 Fielder Sanders, Street Railway Commissioner of Cleveland, Ohio, informed Mayor W. E. Minshall of East Cleveland that he would not approve a renewal of franchises of the Cleveland Railway in that city at a 3-cent fare. He wants the suburban city to accept a franchise similar to that granted by Lakewood on the west, where the fare within the suburb is 3 cents and between it and points in the city, 5 cents. The franchise on Hayden Avenue, East Cleveland, expires in about one year, but that on Euclid Avenue continues for five years. Mayor Minshall did not intimate that the suburb had changed its plans to oppose the matter.

Safety-First Talks in Toledo.—Victor T. Noonan, head of the safety department of the Ohio Industrial Commission, addressed a meeting of factory managers and foremen at the Commerce Club, Toledo, Ohio, on May 12 and later in the week talked to the foremen of the Willys-Overland Company and to the employees of the Toledo Railways & Light Company. E. R. Kelsey, manager of publicity of the Toledo Railways & Light Company, in a brief talk at the Commerce Club meeting, related the results of the safety work by the Doherty companies. Mr. Kelsey said that four men were now employed to travel over the country and talk safety first. He cited as a concrete example of safety-first work an appropriation of \$8,000 recommended to defray the cost of removing danger belts in the Central Avenue carhouse.

Stock for City Service Employees.—The directors of the Cities Service Company, New York, N. Y., have approved a plan by which an amount of the common and preferred stocks of the company have been set aside for sale under favorable terms to employees of the company and its subsidiaries. Each employee of the Cities Service Company or its subsidiaries may purchase stock up to the amount of his annual salary at the rate of two shares of preferred and one of common stock for \$300, the stock so purchased to be carried over a period of five years and payments made monthly. At present prices of the stocks the employees under this plan will obtain their securities well below the market. An investment company will be formed to handle the employees' investments owing to the accounting and because of the fractional shares involved. At present the Cities Service Company and its subsidiaries have about 6000 employees.

New Kansas City-Lawrence Line Opened.—The Kansas City, Kaw Valley & Western Railway began on June 1 operating cars on its new line into Lawrence, Kan., from Kansas City, 37 miles. The line is a continuation of that between Kansas City and Bonner Springs. One-hour service is established. The present service is local. The running time between terminals is two hours. Later express service will be added. A Kansas City ticket office and rest room has been opened at 7 West Tenth Street, near the corner where the Kansas City Western Railway has its

Kansas City terminus and past which the cars of the Kansas City, Lawrence & Topeka Railway run. The city ticket offices of the Kansas City, Clay County & St. Joseph Railway and that of the Missouri & Kansas Interurban Railway are three blocks south, at Thirteenth and Walnut Streets. The Kansas City, Kaw Valley & Western Railway, which has been locally known heretofore as the Bonner Springs Line, will handle freight, express and baggage in baggage sections of passenger cars temporarily, but will use the local freight station at Hird Street and Grand Avenue of the Strang Line. This station will also be used by the Leavenworth Line.

PROGRAMS OF ASSOCIATION MEETINGS

Central Electric Railway Association

Applications for staterooms and tickets for the mid-summer boat trip of the Central Electric Railway Association are coming in daily, and more than 150 tickets and reservations had been paid for up to May 31. John Benham, vice-president of the International Register Company and chairman of the committee on arrangements, expects that the association's guarantee of 225 will be exceeded, because most of the parties that reserved space for the boat trip last year have taken space for a greater number of people than on the previous trip. The cruise is practically a four days' trip, and will afford an unusual opportunity to see the Upper Lakes at a minimum cost on one of the finest lake cruisers. The committee is anxious to have all who intend to go make their reservations at the earliest possible date.

Illinois Electric Railway Association

The Illinois Electric Railway Association will hold a meeting on June 9 at the LaSalle Hotel, Chicago.

H. A. Johnson of the Chicago Elevated Railways will read a paper on the results obtained from tests of roller journal bearings and field control motors on the road with which he is connected.

O. Bruenauer of the Gurney Ball Bearing Company will present a paper on ball bearing journals.

D. C. Hershberger of the Westinghouse Electric & Manufacturing Company will read a paper on the history and performance of railway motor field control.

W. A. Clough of the engineering department of the General Electric Company will give an illustrated talk on the comparative economy of old and new motors.

H. B. Adams, safety supervisor of the Aurora, Elgin & Chicago Railway, will speak on the subject of safety. At the noon hour the usual association luncheon will be held.

Central Electric Railway Accountants' Association

The program has been announced for the meeting of the Central Electric Railway Accountants' Association at the Hotel Secor, Toledo, Ohio, on June 13 and 14. The executive committee will meet at 9 a. m. on June 13. The regular session will begin at 10 a. m. The presentation of the reports of the executive committee and of the standing committee on passenger and freight accounts will follow. At the afternoon session on June 13 the committee on electric light and power accounts and the question box committee will report. The presentation of these reports will be followed by these addresses:

"The Relation of the Accounting Officer to Other Members of the Official Family," by Ralph R. Bruster, associate editor of the *ELECTRIC RAILWAY JOURNAL*.

"Office Organization," by Robert H. Lindsey, comptroller of the Lake Erie, Bowling Green & Napoleon Railway, Bowling Green, Ohio.

On June 14 these addresses will be made:

"Storeroom Systems," by A. Swartz, vice-president of the Toledo & Western Railroad.

"Departmental Expense Statements," by L. T. Hixson, auditor of the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.

The subject "Taxation Problems" will also be discussed.

Financial and Corporate

ANNUAL REPORTS

Duluth-Superior Traction Company

The comparative income statement of the Duluth-Superior Traction Company, Duluth, Minn., for the twelve months ended Dec. 31, 1914 and 1915, follows:

	1915		1914	
	Amount	Per Cent	Amount	Per Cent
Railway operating revenues:				
Revenue from transportation	\$1,154,906	99.18	\$1,289,917	99.42
Revenue from other railway operations	9,539	0.82	7,525	0.58
Total	\$1,164,445	100.00	\$1,297,442	100.00
Railway operating expenses:				
Way and structures.....	\$141,685	12.17	\$131,433	10.13
Equipment	89,854	7.73	92,633	7.14
Power	155,617	13.36	170,268	13.12
Conducting transportation	308,481	26.48	304,530	23.47
Traffic	254	0.02	900	0.07
General and miscellaneous	145,787	12.52	160,225	12.35
Transportation for investment—credit	—672	—0.06
Total	\$841,008	72.22	\$859,992	66.28
Net revenue from railway operation	\$323,437	27.78	\$437,450	33.72
Taxes assignable to railway operation	69,831	6.00	66,519	5.13
Operating income	\$253,606	21.78	\$370,931	28.59
Non-operating income.....	15,515	1.33	16,121	1.24
Gross income	\$269,121	23.11	\$387,052	29.83
Deductions from gross income	172,699	14.83	177,372	13.67
Net income	\$96,422	8.28	\$209,680	16.16

The revenue from transportation during 1915 decreased \$135,011, or 10.4 per cent, as compared to the 1914 results. This showing was remedied a little by a saving of \$18,984, or 2.2 per cent, in operating expenses, the decrease being made in maintenance of equipment, power, traffic and general and miscellaneous in spite of increases in maintenance of way and structures and conducting transportation. Taxes showed an increase of \$3,312, or about 5 per cent, which was more than counterbalanced by a decrease of \$4,673, or 2.6 per cent, in deductions from income, most of this coming from decreased interest on unfunded debt. The net income suffered a loss of \$113,258, or more than 54 per cent. The company in 1915 earned 1.04 per cent on its common stock, as compared to 4.28 per cent in 1914, and paid 1 per cent, as compared to 4 per cent.

The loss in revenues was caused by the business depression during the first half of the year and the invasion of the jitney bus, which started in Duluth and Superior in March. This reduction amounted to nearly 20 per cent during the period between April 1 and Sept. 30, which period was theretofore the most profitable during the year. The revenue passengers during the year decreased from 25,912,155 to 23,185,970.

The new plant of the United States Steel Corporation, located about 3.5 miles beyond the western terminus of the company's lines in Duluth, was put in partial operation about Nov. 1. The operation of this plant, and other manufacturing enterprises which will in time be drawn to this vicinity, should add materially to the growth and business prosperity of both Duluth and Superior, in which the company will share.

Expenditures for additions to property and extensions aggregating \$92,898 were made during the year. There was expended for renewals and charged against depreciation reserve account \$35,016. The depreciation of the company's property during the year was computed at \$123,681, which was charged against operating expenses. Under the new classification of accounts depreciation is charged directly under the various operating expense headings, and is not shown separately as before. The 1914 items are, of course, adjusted accordingly.

New Orleans Railway & Light Company

The comparative income statement of the New Orleans Railway & Light Company, New Orleans, La., for the calendar years 1914 and 1915, follows:

	1915		1914	
	Amount	Per Cent	Amount	Per Cent
Operating revenue.....	\$6,951,587	100.00	\$7,012,124	100.00
*Operating expenses.....	3,410,773	49.06	3,428,871	48.90
*Net operating revenue....	\$3,540,814	50.94	\$3,583,253	51.10
Revenue deductions—taxes, etc.	776,077	11.17	770,223	10.98
Operating income.....	\$2,764,737	39.77	\$2,813,030	40.12
Miscellaneous income and outside operations.....	55,243	0.79	53,563	0.76
*Gross income.....	\$2,819,980	40.56	\$2,866,593	40.88
Income deductions—interest, etc.....	1,817,987	26.15	1,757,861	25.07
Net income before deducting charges for renewals and replacements.....	\$1,001,993	14.41	\$1,108,732	15.81
Charges for renewals and replacements	212,927	3.06	189,618	2.70
Net income	\$789,066	11.35	\$919,114	13.11

*Not including charges for renewals and replacements shown below.

The gross operating revenue of the company during 1915 decreased \$60,537, or 0.86 per cent, as compared to 1914. Owing to a decrease in operating expenses, the net operating revenue decreased \$42,439, or 1.18 per cent, while larger income deductions and charges for renewals and replacements made the net income drop \$130,048, or 14.15 per cent. The revenue showing was mostly the result of operations in the railway department, where the 1915 operating revenues at \$4,198,235 showed a loss of \$200,272 from the 1914 results, while the electric department revenues at \$1,489,015 and those of the gas department at \$1,264,337 displayed gains of \$61,720 and \$78,015 respectively. Moreover, with operating expenses at \$2,342,411 the railway department showed a slight increase of \$991, and the electric department expenses at \$573,406 an increase of \$12,179, whereas the gas department figures at \$494,955 represented a decrease of \$31,268.

The decrease in net income was due mainly to jitney competition in the railway department which started on Jan. 31, 1915, and continued during the year. The number of cars operated in the spring of 1916 was approximately 40 per cent less than last spring, which tends to bear out the impression that they cannot operate profitably under favorable conditions. On Sept. 29 the city was visited by one of the worst storms on record; the operations of the company were hampered and normal conditions were not restored in all departments until about three weeks after that date.

The amount charged to operating expenses for maintenance during the year was \$725,537. In addition to this \$244,309 was expended for renewals and replacements, making a total expenditure for maintenance and renewals and replacements of \$969,846. There was reserved from income for renewals and replacements \$212,927, which resulted in a net charge to renewal and replacement reserve of \$31,382. There was expended for construction, improvements and betterments, amounts totaling \$859,816, including \$229,969 for roadway and line and \$3,498 for rolling stock and equipment.

OREGON PUBLIC SERVICE COMMISSION REPORT

The ninth annual report of the Public Service Commission of Oregon states that the total operating revenues of the electric railways in Oregon amounted to \$4,663,388 for the year ended June 30, 1915. Of this total \$4,092,047 came from passenger traffic, \$388,666 from freight traffic and \$70,476 from other railway operations. The total operating expenses amounted to \$3,014,255, divided as follows: way and structures, \$322,236; equipment, \$426,983; power, \$232,341; conducting transportation, \$1,477,882; traffic, \$41,587; general and miscellaneous, \$513,458, and transportation for investment (cr.), \$184. For the combined roads, therefore, the operating ratio for the year was 64.06 per cent. The net operating revenue totaled \$1,649,134, and the deduction of \$723,879 for taxes left an operating income of \$925,255.

SAN FRANCISCO-OAKLAND REORGANIZATION

Committee Believes Franchise Conditions Must Be Bettered Before Sound Plan of Reorganization Can Be Offered

The committee appointed in the middle of 1915 to consider a plan of reorganization for the San Francisco-Oakland Terminal Railways, Oakland, Cal., under date of May 16 issued to security holders a statement saying that before the company can be reorganized on a sound financial basis and before investors can be induced to put new money into the property, there must be a change for the better in the fundamental conditions of the company. No considerable amount of new capital has been obtained since 1911, and it is not to be expected, it is said, that new capital can be obtained until the two following requirements have been met:

1. An adjustment or reorganization of the financial structure of the company. This should wipe out the present complex and conflicting bond issues, with sinking funds which cannot be earned; provide new issues of securities conforming to the standards of the California Railroad Commission which will be available for refunding outstanding securities and for sale from time to time in the future to provide for necessary new construction. Such a reorganization would have the effect of curing existing defaults, which interfere with the economical and effective administration of the property.

2. An improvement in the fundamental condition of the property which will make reasonably secure the investment in the property and therefore make it possible to sell new securities when securities of a proper type shall have been authorized. This involves: (a) Such conditions as will safeguard all capital properly invested in the property, and (b) earnings showing a safe margin over the interest requirements on securities to be sold.

In general, the committee states, the unfavorable conditions confronting this railway property are not materially different from those affecting street railway operation generally throughout California. It seems to the committee that three reforms which should be made are as follows:

1. Automobile competition must be dealt with on lines which are economically sound and permanent. The principal cities in which the San Francisco-Oakland Terminal Railways operate have dealt with the jitney problem in a way which is probably as satisfactory as could be adopted under existing charter provisions and State laws. Capital cannot be expected, however, to have confidence in the street railway business until all competing common carriers are, through the operation of uniform and statewide laws, made subject to the same regulations and charged with the same public obligations as the street railways.

2. Street railways companies in California must be relieved from the present excessive burden of taxation. These companies are required to pay to the State a direct tax amounting to $5\frac{1}{4}$ per cent of gross earnings. This tax, however, does not relieve them from the obligations of their local franchises, which usually require a payment to the municipality issuing the franchise amounting to 2 per cent of the gross earnings, plus an obligation to do street paving, which under existing standards absorbs approximately 5 per cent of gross earnings. The present city charters in Oakland and Berkeley go further and specify as a condition of new franchises, payments to the franchise-granting municipality beginning at 2 per cent of gross earnings per annum and running up to 5 per cent. It appears that the traction division of the San Francisco-Oakland Terminal Railways is paying to-day in excess of 12 per cent of gross earnings in taxes, licenses and enforced contributions for public purposes, and that in the case of a franchise taken out under the existing city charters this taxation would ultimately exceed 15 per cent of gross earnings. This is a burden which a street railway operating under a 5-cent fare, with universal transfers and paying present-day rates of wages and prices for material, cannot meet except possibly under unusual conditions which do not exist in this case.

3. The present unsound form of franchise must be modified. The existing franchises extend over a limited term only and contain no definite provision as to the disposition, at the end of the franchise term, of the property of the rail-

way company occupying the public streets. The consolidated company now owns and operates under 134 separate franchises maturing at different dates and containing various obsolete and conflicting conditions. For these there should be substituted as soon as possible a blanket franchise which will adequately protect the interests of the public, giving them, if desired, the right to acquire the property at a fair amount should they be so disposed, and in the meantime assuring present investors a fair return on their capital.

This committee had previously worked out a tentative plan of reorganization, but this, while acquiesced in, never was satisfactory to any member. Now it is the unanimous opinion of the committee that before any plan can be evolved which will find favor with the many interests connected with this complicated situation, the fundamental conditions of the company must be bettered. When the suggested changes of the franchises of the company shall have been effected, and the company's fundamental conditions thereby improved to such an extent as to attract the investment of new capital in the company's securities, there can then be submitted to the bondholders a plan of reorganization which will properly protect and preserve the present rights and priorities of all of the various classes of investors. In the meantime, the committee suggests, the company should continue to pay the interest upon its bonds as soon after this becomes payable as it is possible to accumulate funds for that purpose.

PRESIDENT LOREE ON SECURITY OUTLOOK

Although speaking primarily of steam railway securities, the following remarks by President L. F. Loree of the Delaware & Hudson Company, made in the annual report of the company digested in this paper for May 20, may be of interest to electric railway officials:

"A study of the yields upon railway and industrial securities, at recent market prices, indicates that the average investor is relatively still less willing now than formerly to forego the advantage of the somewhat higher yield of the industrials for the sake of becoming the owner of bonds dependent upon railway property. He is apparently unable to find in the railway situation any offset for the fact that, unlike the prices of the products of the industrials, the prices of railway services are closely limited by law and custom and returns to investors sharply restricted in practice, and he turns without reluctance to the field in which the laws of demand and supply are still unshackled and the rewards of economy and efficiency are restricted only to a just share of the gains which they secure. Capital for railway purposes has become more costly, and other capital less costly. The increasing ability of the industrials to make their demand effective is found in the increased earnings of those companies and the ability of many of them to retire securities before maturity. These facts and the large amounts that the industrials have been able to spend to extend their facilities for the purpose of taking care of war orders and increased domestic business contrast sharply with the fact that at the same time, for want of funds, the railroads have been practically unable to extend their facilities. Capital can be obtained only from investors who are confident of receiving a fair return, and adequate earnings can alone give this confidence."

Chicago (Ill.) Elevated Railways.—An extension of the \$14,000,000 of two-year 5 per cent notes of the Chicago Elevated Railways has been arranged with the National City Bank, New York. The interest rate will be increased to 6 per cent. The National City Bank and the Insull syndicate, which hold a majority of the notes, have reached an understanding providing for a three-year extension, the National City Bank to take care of the notes presented for payment when they mature on July 1.

Chicago (Ill.) Railways.—The gross earnings that were reported for the Chicago Railways for the first four months of the present year showed a marked increase over those for the same period in 1915. Although this company will have additional fixed charges this year on account of the interest rate on \$4,073,000 of purchase money bonds automatically advancing from 4 per cent to 5 per cent, this increase will be offset by a rise in the

company's proportion of the residue receipts which under the operating agreement with the Chicago City Railway increases from 59 per cent of the gross receipts of the surface railways to 60 per cent. The basis for this division of the residue receipts of the Chicago Surface Lines was estimated at the time the operating agreement was consummated on Feb. 1, 1914. For the first two years the division was to be 59 per cent for the Chicago Railways and 41 per cent for the Chicago City Railway. At the end of the second year, or Feb. 1, 1916, this ratio was automatically changed to 60 per cent for the Chicago Railways and 40 per cent for the Chicago City Railways. While the earnings are showing satisfactory gains and prospects point to still further increases, the advance in wages to employees, which became effective on May 1, 1915, will increase the operating expenses approximately \$1,000,000 during the current year. Under the 1907 ordinances, the Chicago Railways agreed to retire its Series C bonds, maturing in 1927. On Feb. 1, 1916, only \$1,399,000 of these bonds were outstanding, having been reduced to this amount by the expenditure of \$250,000 annually from the company's sinking fund. It is expected that these outstanding Series C bonds will be further reduced during the current year by about \$260,000 if they can be purchased in the open market at as favorable prices as prevailed in 1915.

Cincinnati, Dayton & Toledo Traction Company, Hamilton, Ohio.—The hearing on the application for a receiver for the Cincinnati, Dayton & Toledo Traction Company, filed by Albert D. Alcorn, was completed before Judge Murphy of the Butler County Common Pleas Court at Hamilton, Ohio, on May 27. Arguments will be heard on June 5. Former Governor Judson Harmon testified on the preceding day that he had advised the Cincinnati, Dayton & Toledo Traction Company and the Ohio Electric Railway to adjust the finances of the two in the matter of rentals and the payment of the bonds and interest. Walter A. Draper, vice-president of the Cincinnati, Dayton & Toledo Traction Company, testified that it has \$2,700,000 of bonds outstanding and that a bondholders' committee was organized to protect the bondholders. Interest on one issue of \$250,000 of bonds will be due on July 1, and the agreement between the two companies will expire on Aug. 1. Mr. Draper said the outstanding capital stock of the company was reduced to \$500 in order to reduce its franchise tax to the State. Another officer stated that the assets of the company consist of the property operated under lease by the Ohio Electric Railway and that its only income was the rental paid by the leasing company. Leo J. Van Lahr, vice-president of the Provident Savings Bank & Trust Company, Cincinnati, testified regarding the 5 per cent consolidated underlying bonds of the company. He was not required to state the amount owned by the bank. He is a member of the bondholders' committee. F. A. Healy, secretary of the company, also testified. The suit for a receiver for the Cincinnati, Dayton & Toledo Traction Company, filed by Attorney Oscar P. Grischy, was dismissed by Insolvency Judge Kelley on May 23 on motion of Mr. Grischy. Mr. Grischy expects to file an intervening petition in connection with the Hamilton case filed by Attorney A. D. Alcorn, as described above.

Dominion Power & Transmission Company, Ltd., Hamilton, Ont.—The initial dividend of 2 per cent on the common stock of the Dominion Power & Transmission Company will be paid on \$7,714,500 of stock, including the limited preference stock converted into common stock about six months ago, when the 10 per cent dividends to which the latter was entitled were paid up. The dividend just declared was announced as for the six months ended May 30 and is taken as establishing the stock on an annual dividend basis of 4 per cent.

Gary & Interurban Railroad, Gary, Ind.—A cross-complaint in the suit of the Central Trust Company of Illinois and William T. Abbott against the Gary & Interurban Railroad and the Baltimore Trust Company has been filed in the Federal Court at Indianapolis by the Baltimore Trust Company. The company alleges it holds notes against the road and asks foreclosure. It also asks an extension of the receivership to cover the notes and collection of all tolls and

revenues, with a view to settling the principal and interest on the notes. Sale of the road is petitioned. The complaint of the Central Trust Company and William T. Abbott alleges the road, which was recently consolidated, has failed to carry out provisions of its merger, and asks it be declared bankrupt.

Interborough Consolidated Corporation, New York, N. Y.—The Interborough Consolidated Corporation on July 1 next will retire \$500,000 of its ten year 6 per cent notes dated Jan. 1, 1915. This will bring the amount outstanding down to \$2,000,000. At the time these notes were issued, provision was made for a sinking fund of \$300,000 a year to provide funds to pay off the bonds at maturity.

Middle West Utilities Company, Chicago, Ill.—The Middle West Utilities Company is prepared to redeem at 100 and accrued interest \$3,500,000 of three-year 6 per cent collateral gold notes and certificates which reached their date of maturity on June 1.

Monterey & Pacific Grove Railway, Monterey, Cal.—As a result of the investigation of the California Railroad Commission on its own motion to determine the various elements entering into the value of the property of the Monterey & Pacific Grove Railway, it has been determined that the reproduction cost of the operative physical property as of June 30, 1914, was \$137,109, and that the reproduction cost less depreciation of this physical property on this date was \$102,541. Allowances of 5 per cent for engineering and 3 per cent for interest during construction were deemed amply sufficient to cover such items. The original cost of the property could not be ascertained, because the books were in such shape as a result of the relations of the various owning companies and this railway that it was impossible to make definite statements of fact.

Northwestern Pennsylvania Railway, Meadville, Pa.—The Public Service Commission of Pennsylvania has approved the application of the Northwestern Electric Service Company for permission to acquire a controlling interest in the capital stock of the Northwestern Pennsylvania Railway. The incorporation of the Northwestern Electric Service Company was noted in this paper March 18, page 581.

New Orleans Railway & Light Company, New Orleans, La.—Meetings of the stockholders of the New Orleans City Railroad, Orleans Railroad, New Orleans & Carrollton Railroad, Light & Power Company, St. Charles Street Railroad, New Orleans & Pontchartrain Railway and the New Orleans Railway & Light Company were held on May 22, and the necessary resolutions were adopted authorizing the agreement for consolidation of the companies in accordance with the plans outlined in the *ELECTRIC RAILWAY JOURNAL* of May 13, page 925. Immediately thereafter the holders of a small amount of stock of the New Orleans City Railroad served an injunction, which prevented the execution of the agreement for consolidation. In the event that the injunction is set aside, the agreement for consolidation will be executed and the consolidation thereupon will become effective.

Seattle, Renton & Southern Railway, Seattle, Wash.—Judge Frater, in the King County Superior Court, on May 25, ordered the Seattle, Renton & Southern Railway sold under the reorganization plan offered by the bondholders' committee, represented by Attorney John C. Higgins. Judge Frater directed that the bondholders and common claimants pay approximately \$150,000 to cover liabilities incurred by the receivers. June 2 was fixed as the date when the deal is to be consummated and the order confirming the sale entered. The bondholders and a number of the common claimants bid \$1,200,000, and Attorney F. J. Carver, representing undisclosed clients, also bid \$1,200,000 when the road was offered for sale on May 12. The offer of Attorney Carver for his undisclosed clients was held by Judge Frater not a bid in fact, inasmuch as it would be of no force and effect if not accepted by the bondholders and stockholders. In addition to the \$150,000 required for the payment of claims mentioned previously, prospective owners will advance \$225,000 for improvements deemed necessary. The property has been in the hands of Scott Calhoun and Joseph Parkin as receivers since 1912.

BAY STATE FARE HEARINGS CONTINUE

In the Bay State Street Railway fare hearing before the Massachusetts Public Service Commission on May 18, cross-examination of the company's valuation expert, R. M. Feustel, was resumed by E. Gerry Brown, Brockton, Mass. The witness said that P. F. Sullivan, president of the Bay State Street Railway, had been the final authority in fixing the rate of 7 per cent as the return to be allowed upon the company's capital. Clients of the firm of Sloan, Huddle, Feustel & Freeman uniformly decide this matter for themselves, the engineers uniformly refraining from expressing opinions as to a fair rate of return. Personally Mr. Feustel said that he did not feel that 7 per cent return was too great on the value of the property assigned in the company's case, especially in view of the fact that in the development of the system there was a substantial amount of property which the company had apparently been unable to write off. This represented certain outlays associated with the change from horse to electric traction, certain power station property and rolling stock. There were also expenditures for public highway construction which could only be partly covered in the inventory. The witness said that practically all his work had been on cases where 7 per cent had been considered the minimum amount of return on the property by the commission. About \$2,600,000 should be provided yearly in the case of the Bay State company to provide for maintenance and depreciation, maintaining the present value of the property. The historic cost of the property totalled about \$42,000,000, and the estimated accrued depreciation was 31 per cent. The witness stated that the determination of the actual value of the property for rate-making purposes rested with the commission. Taking the original cost new and deducting what had disappeared through wear and tear and obsolescence, the cost less accrued depreciation became \$30,260,347 on the Massachusetts property. The estimated reproduction cost new was \$43,929,721. The tributary population on the company's 931 miles of track in Massachusetts was estimated at 1,300,402. About 200,000 passengers were carried per mile of track. It was estimated that the company's revenue in Brockton would be increased about \$31,000 a year by the new rate schedule, allowing for the use of nine-for-50 cent tickets and loss of traffic due to the installation of the 6-cent fare unit. The population of the Brockton district was 118,000. About 4,360,000 passengers a year were carried on the Brockton city lines.

SERVICE STANDARDS PROPOSED IN WASHINGTON

The Public Utilities Commission of District of Columbia will hold a hearing on June 14 to discuss standards of car loading. A memorandum, giving the results of investigations so far conducted, has been issued to the companies within its jurisdiction. The present suggestion of the commission is to establish a rush-hour standard of 7 sq. ft. per standing passenger, averaged over one-half hour periods, and a non-rush standard of 100 seats per eighty passengers, averaged over one-hour periods.

In computing the number of square feet of standing area of each car, front platforms with no railing behind motor-men are not considered as standing area. Only such space of the front platforms equipped with a rail behind motor-man as is located behind the rail, assumed extended transversely across the platform, is considered as standing area; the total unincumbered floor area of the car body, exclusive of 10-in. knee room alongside of each longitudinal seat, is considered as standing area. The total unincumbered floor area of back platforms is considered as standing area, except for cars of the prepayment type having a swinging exit door, where the area behind the conductor's railing has been excluded to permit opening the exit door. In computing the seating capacity of cars equipped with continuous longitudinal seats, 17 in. is allowed per passenger. Only such seats as are simultaneously available are included.

For lines operating cars on long headway, it is proposed to extend the standard so that the period of time shall include not less than ten cars. It is also proposed that the companies check the service and submit their records to the

commission not less often than once a month, the observations to be made during three consecutive mid-week days. The memorandum states that, from past observations, the railway companies are at present practically complying with the proposed standards, except that during non-rush hour periods, on some lines, during short periods, the service would have to be improved to comply with the proposed standard.

HEARINGS BEGUN IN ILLINOIS TO STANDARDIZE BAGGAGE METHODS

Complaints filed with the Illinois Public Utilities Commission regarding excess baggage charges and the baggage handling practices of steam and electric roads operating within the State have resulted in the steam railroads being summoned by the commission to present evidence. The specific complaint under which action is being taken was filed by the Travelers' Protective Association. Rates for excess baggage in Illinois are cited as higher than those in Indiana. The electric interurban roads have also been summoned before the commission to offer evidence and arguments on the question of reasonable rules, rates, regulations and practices governing the handling of baggage on their lines.

Hearings were held in the commission's rooms on May 25 and 26, but owing to the unavoidable absence of representatives of some of the electric railways another hearing will be held on July 12. The evidence presented by representatives of the electric railways in attendance brought out the fact that most of them were organized under the railroad act which provides for 100 lb. of free baggage with each first-class passenger fare. It was averred, however, that electric railways were unknown in 1888, when the law was passed, and furthermore that the rates of fare charged by them did not permit the handling of baggage free. It was also brought out that a number of the electric railways did not handle baggage at all, others handled it simply as express matter, and still others made a uniform charge of 25 cents per piece of baggage. Witnesses also stated that if electric railways were forced to handle baggage free, they would have to provide space for it on the present cars and perhaps secure additional equipment. Station facilities at the present time were also inadequate. Some roads did not have any waiting stations, while others had made no provision in their stations for handling baggage.

Portland Experimenting with Transfer Machine.—The Portland Railway, Light & Power Company, Portland, Ore., is testing a new device for printing and issuing transfers to passengers.

Hoboken Fare Hearing Postponed.—The hearing on the application to require the Public Service Railway to operate for a 3-cent fare in Hoboken, N. J., set for May 24 and 25 before the Board of Public Utility Commissioners, was postponed until June 23.

One-Man Cars in Vancouver.—L. Clark, district manager of the North Coast Power Company operating in Vancouver, Wash., has announced that the company has decided to operate a one-man car on the Capitol Hill run. If the change meets with success, one-man cars will be placed in service on other lines in the city.

Baltimore Service Standards Under Consideration.—The Public Service Commission of Maryland has under consideration standards of service with respect to the loading of the cars of the United Railways & Electric Company, Baltimore, but no order has yet been entered in connection with the matter.

Curbing the Buffalo Spitter.—At the request of officials of the International Railway, Buffalo, N. Y., the police are vigorously enforcing the city ordinances prohibiting spitting and smoking in street cars. A number of arrests have been made and fines ranging from \$5 to \$50 have been imposed by City Court judges for violations of this section of the penal code.

Company Publication Started in New Orleans.—*Energy* is being published monthly by the associated employees of

the New Orleans Railway & Light Company. The first issue appeared in April. The editor is M. B. Trezevant. The paper is 7 in. wide by 10 in. high. The issue for May contains thirty-two pages and cover. The paper seeks to reflect the many activities of the employees. It has a circulation of 4000 copies.

Jitney Operation Ordered Stopped.—The Illinois Public Utilities Commission, following its recent order declaring jitney buses public utilities when they competed directly with street cars, has ordered Alphonso Snyder, Quincy, to cease operating a jitney line until he has secured a certificate of convenience and necessity. Mr. Snyder was running on a regular schedule and in competition with the cars of the Quincy Railway.

New Jersey Jitney Law Attacked.—The jitney operators of Asbury Park, N. J., have secured from Justice Kalisch of the Supreme Court a writ of certiorari to test the legality of the ordinance passed in that city. As the ordinance was based upon the so-called Kates State law, the attack is indirectly on that statute. Counsel for the jitney men contend that under the law the jitney men will find it impossible to operate their buses, and thus will be deprived of their property without due process of law.

Protest Against One-Man Cars.—A petition has been filed with H. W. Carroll, city clerk of Seattle, Wash., by property owners along the Greenwood Street line of the Puget Sound Traction, Light & Power Company, in the Ballard District, protesting against the proposed adoption of one-man cars on that line. Some time ago the company petitioned the City Council for the right to operate one-man cars on three separate lines, among which is the Greenwood line, and the matter is being investigated by that body.

Buffalo-Queenstown Fast Service.—The International Railway, Buffalo, N. Y., is now operating a fast through passenger service between the Buffalo terminal and Queenstown, Ont., via Niagara Falls, N. Y., and the upper bridge across the Niagara Gorge, returning via the Gorge Route. This service will continue throughout the summer, making direct connections with lake boats at the Queenstown dock for Toronto and other Canadian ports. No intermediate stops are made between Buffalo and Niagara Falls. The trip is made in two hours.

Through Freight Schedules Asked.—A petition has been filed by patrons of the Boise Valley Traction Company, Boise, Idaho, with the Public Utilities Commission of Idaho asking the commission to compel the company to file with the commission through-rate schedules which enable shippers on the company's lines to make interstate shipments without the necessity of reshipping, rebilling, or transferring freight to the cars of the Oregon Short Line at points where the Oregon Short Line and the cars of the Boise Valley Traction Company connect.

New Rerouting Plan in Toledo.—The special committee of the City Council of Toledo, Ohio, will shortly complete another rerouting plan. The original plan was defeated through the influence of merchants on Summit Street, who objected to the removal of four lines from that thoroughfare. The new plan will call for the removal of three lines instead of four and the elimination of several stops on other lines. Members of the committee say their duty is to plan for the benefit of all the people instead of a few merchants or others who are not willing to be discommoded temporarily for the public good.

Derby Day Traffic Handled Expeditiously.—Eighteen thousand people were hauled each way from downtown sections to Churchill Downs, on Derby Day, the big spring racing event in Louisville, without an accident. In past years there has been serious delay in the downtown section on the Fourth Street line, which makes a loop on Main Street, next the river. This year traffic policemen cooperated in favoring the north and south traffic on the big day. Wherever it was possible, special efforts were made to put the Fourth Street cars over the intersections ahead of east-bound and west-bound traffic.

Topeka Ordinance Keeps Jitneys Off Car Streets.—The City Commissioners of Topeka, Kan., adopted on May 22

an ordinance requiring license fees of \$300 to \$400 for jitneys operating on streets that bear street car tracks, except that jitneys may operate on the unpaved portions of such streets and may run on Kansas Avenue, the main street, an unusually wide thoroughfare. The law is not to go into effect until June 19. Meanwhile the jitney owners and drivers have formed an organization, are establishing routes and giving transfers in an effort to show the quality of service they can render and in the hope of securing a change in the ordinance. Three of the commissioners voted for the ordinance, two against it.

Jitney Bills in Massachusetts.—The bill of the Massachusetts Street Railway Association, which authorized street railways to use motor vehicles to supplement their service by street cars and for supervision by the Public Service Commission of common carriers by motor vehicles has been referred to the next legislative session. The bill authorizing the licensing by cities and towns of motor vehicles carrying passengers for hire was in a conference committee of the Senate and House recently for consideration of amendments. The bill carries a referendum for town voters and is dependent in cities for its acceptance by the City Council. It holds licensees strictly responsible, through the deposit of a bond or other security, for injuries or damages due to the negligence or unlawful acts of jitney drivers.

Hearing on Jitneys in Albany.—At the conclusion of the hearing before the Public Service Commission of the Second District of New York on the application of Chauncey L. Butler and George W. Gallien, Jr., for a certificate of public convenience and necessity for a motor bus route from the United Station to West Albany both of the interested parties were directed to file briefs. Commissioner James O. Carr, who presided at the hearing, suggested that the local business of the buses might be limited to a section to be specified. W. A. Glenn, for the petitioners, believed that there would be practical difficulties in the way of enforcing such an order. John A. McLean, attorney, and Charles F. Hewitt, general manager of the United Traction Company, insisted that without these limitations, the certificate should not be granted.

New Publication at Reading.—The Reading Transit & Light Company, Reading, Pa., is publishing *The Pretzel* for distribution among its patrons. The paper is 3¼ in. wide by 6 in. high. In the first issue the company said: "Do you enjoy a social chat as you ride? Of course you do. Then let us tell you a few of our joys and sorrows. Then you tell us some of yours. Sometimes we may be able to give you a little gossip, but if we do you mustn't tell. Of course we know you won't, 'cause nobody ever does. For a long time we have wanted to know you and have you know us. Once we get acquainted we are sure to enjoy a wonderful friendship and feel free to talk over many things of interest to both of us. You ride. Do you know what we are doing to make your ride comfortable, convenient and enjoyable? Do we know what you think we should do? Won't you tell us about things as you see them? We are open to suggestions."

Long Island Resumes Active Safety Campaign.—Diligent efforts are being made again this year by the Long Island Railroad to prevent motorists from committing suicide by running past signals at grade crossings. A pictorial campaign for the education of the public has been started, the first two posters of which have just been put up in cars and stations. This is an enlargement of the campaign started last year which resulted in a reduction of one-half in fatalities from the record of 1914, when twelve persons went to death on grade crossings. In addition to the posters, of which there will be four, prominently displayed wherever the public may see them, the railroad plans a newspaper campaign which will reach everyone who reads. The posters are done in five colors and are so graphic that anyone seeing them is immediately struck by the lesson they are meant to teach. There are two which are directly applicable to motorists and depict the most common causes of accidents. Many of the daily newspapers have aided in the campaign by reproducing the posters as illustrations in their news columns.

Personal Mention

Mr. W. E. Boileau, general manager of the Scranton (Pa.) Railway, has been elected president of the Rotarians at Scranton.

Mr. David S. Ross has resigned as assistant superintendent of the Cincinnati (Ohio) Traction Company to enter business for himself in Vancouver, B. C.

Mr. E. E. Lillie has been appointed superintendent of the Spokane & Inland Empire Railroad, with headquarters at Spokane, Wash., vice Mr. A. J. Davidson.

Mr. Walter M. Brown, superintendent of the Central Illinois Traction Company, Mattoon, Ill., has become identified with the Seattle, Renton & Southern Railway, Seattle, Wash.

Mr. F. W. Whitridge, president of the Third Avenue Railway, New York, N. Y., returned on May 21 on the American liner St. Louis after spending two months on his estate in Scotland.

Mr. H. L. Mountney has resigned as general manager of the Slate Belt Electric Street Railway, Pen Argyl, Pa. Mr. Joseph T. Hamilton, Wilmington, Del., will succeed Mr. Mountney on July 1.

Mr. Bion J. Arnold, Chicago, has been engaged by the Chamber of Commerce of Rochester, N. Y., to survey the needs of the city with respect to local transportation facilities and report to the Chamber.

Mr. N. Wickersham, superintendent of the Walnut Hills division of the Cincinnati (Ohio) Traction Company, has been appointed assistant superintendent of transportation, succeeding Mr. David S. Ross, resigned.

Mr. M. White, an inspector of the Cincinnati (Ohio) Traction Company, has been made assistant instructor in place of Mr. W. E. Weitzel, who has been promoted to the superintendency of the Walnut Hills division.

Mr. E. W. Weitzel has been appointed superintendent of the Walnut Hills division of the Cincinnati (Ohio) Traction Company, to succeed Mr. N. Wickersham, who becomes assistant superintendent of transportation. Mr. Weitzel was formerly assistant instructor.

Mr. E. W. Ehrke has been appointed a special car construction inspector of the Kansas City (Mo.) Railways by the Board of Control. Mr. Ehrke will supervise the construction of the fifty new cars recently purchased by this company from the St. Louis Car Company.

Mr. W. W. Storey has been appointed commercial agent of the Puget Sound Electric Railway at Puyallup, Wash., to succeed W. P. Ellingwood, who was killed recently in an automobile accident as noted in the *ELECTRIC RAILWAY JOURNAL* of May 27. Mr. Storey has been commercial agent of the company at Kent. He has been with the company about sixteen years.

Mr. A. N. Dutton, formerly vice-president and general manager of the West Virginia Traction & Electric Company, Wheeling, W. Va., who was compelled to resign from that position last fall on account of ill health at that time, has gone to Baltimore to undertake some transportation work for the Baltimore & Ohio Railroad, under Mr. J. R. Kearney, general superintendent of transportation.

Mr. C. O. Jenks, general manager of the United Railways, Oregon Electric Company and the North Bank Railroad, has been appointed general manager for the Great Northern Railway, with headquarters at St. Paul, Minn. He succeeds Mr. G. H. Emerson, who has been appointed a member of the railroad managers' committee to confer with trainmen on the eight-hour day controversy. Mr. Jenks' successor has not yet been selected.

Mr. Henry W. Trumbower, assistant professor of political economy at the University of Wisconsin, Madison, has been appointed a member of the Wisconsin Railroad Commission to succeed Mr. Halford Erickson, resigned. Mr. Trumbower was born in 1882 and is a graduate of Lehigh University.

Later he took a special course in political economy at Princeton and at the University of Munich. His term of office began on June 1 and will end in February of next year.

Mr. Frank R. Fisher has been appointed engineer in charge of subway construction under the City Hall by Mr. W. S. Twining, director of the department of transit of the city of Philadelphia. Mr. Fisher was in charge of the field work in the construction of the Market Street subway when Mr. Twining was chief engineer of that undertaking. Mr. Fisher is a graduate of Lehigh University, and has been engaged in engineering work in Philadelphia for many years.

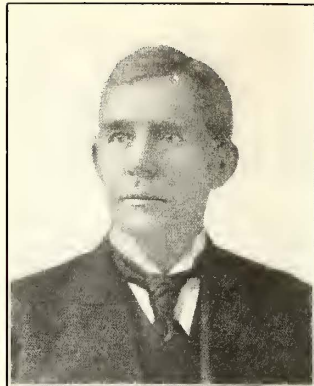
Mr. F. W. Brooks, vice-president and general manager of the Detroit (Mich.) United Railway, was elected president of the company on May 31 to succeed Mr. J. C. Hutchins, who has become chairman of the board. Mr. Brooks will continue as general manager of the company. He has been connected with the Detroit United Railway system since 1895. A portrait and a biography of Mr. Brooks were published in the *ELECTRIC RAILWAY JOURNAL* for Jan. 22, 1916, in connection with his election as vice-president of the company.

Mr. Herbert H. Vreeland, director of welfare work and chairman of the welfare committee for the Interborough Rapid Transit Company, New York, N. Y., and the New York Railways, and formerly president of the Metropolitan Street Railway, New York, has been elected a director of the Vitagraph Company of America, one of the largest motion picture producers in the United States. Mr. Vreeland becomes an associate on the board of Mr. B. B. Hampton, vice-president of the American Tobacco Company, and Mr. G. J. Ryan, son of Mr. Thomas Fortune Ryan, who represent new capital in the enterprise.

Mr. R. A. Moore, who has been appointed general manager of the Aurora, Plainfield & Joliet Railway, Joliet, Ill., entered railway work with the Ledgerwood Electric Railway, Spokane, Wash., in 1902. He served two years as conductor and motorman, one year as lineman and electrician, and one year as superintendent, until the Ledgerwood Electric Railway was taken over by the Washington Water Power Company. Mr. Moore then entered the employ of the Northern Pacific Railroad, and worked in the train service for ten years. From the Northern Pacific, he went to work for the Peninsular Railway of California as conductor and motorman. After serving three and a half years in these capacities he was promoted to train dispatcher. He held that position for six months and was then advanced to equipment inspector and instructor of trainmen. A year later he was made first assistant to the superintendent of the Peninsular Railway and the San Jose Railroads. He continued in that capacity more than five years. Mr. Moore was recommended by Mr. F. E. Chapin, general manager of the Peninsular Railway and San Jose Railroads, and Mr. Paul Shoup, president of the Southern Pacific electric lines in California, for appointment to the Aurora, Plainfield & Joliet Railway.

Mr. John Bauer of the bureau of statistics and accounts of the Public Service Commission for the First District of New York, has been selected by Princeton University as the head of its new department in accounting, corporation finance and public utilities. Mr. Bauer is to enter upon his new duties in September, but will remain with the commission for most of the intervening time. Mr. Bauer joined the bureau on June 16, 1914, leaving Cornell University where he had charge of the department of accounting and elementary economics. He has acted in a consulting capacity in rate and capitalization cases, interpretation of the rapid transit contracts and general accounting. He was detailed by the commission to the bridge department to make a report upon the railway traffic on the Williamsburg Bridge, in a rental case in which that department was interested. He has in hand the preparation of a report to Commissioner Hervey on accounting methods under the dual contracts when in operation. While with the commission Mr. Bauer published a number of articles on accounting subjects in connection with matters pertaining to public utilities, one of which, "Relieving the Investor's Uncertainty," appeared in the *ELECTRIC RAILWAY JOURNAL* of March 11, 1916, page 491. Mr. Bauer received the degree of Doctor of Philosophy from Yale in 1908.

Mr. J. C. Hutchins resigned as president of the Detroit (Mich.) United Railway on May 31 and was elected chairman of the board of directors of the company. Mr. Hutchins has been connected with the Detroit United Railway and its subsidiaries since 1894. He was born in Carroll Parish, La., on Oct. 13, 1853. His boyhood was spent in Lexington, Mo., where he was educated in the public schools. After a course in civil engineering he commenced his railway career as construction engineer on the Missouri, Gulf & Lexington Railway, and for a number of years continued this work on various Missouri and Texas railroads. From 1876 to 1881 he was a reporter on the *Waco Examiner*. The following thir-



J. C. HUTCHINS

teen years he served on the engineering staff and in other capacities with the New Orleans & Pacific, Missouri, Kansas & Texas, Louisville, New Orleans & Texas, and the Illinois Central railroads. In 1894 he was elected secretary and treasurer of the Detroit Citizens' Street Railway, and when the Detroit United Railway was acquired he was elected to similar positions with that company. Later, upon the organization of the Detroit United Railway, he was made vice-president and general manager, and on Jan. 21, 1902, he was elected president of the company. Largely through his initiative and under his management the city lines and the interurban systems radiating from Detroit, comprising in all more than 800 miles of electric railway, were brought under one control. Mr. Hutchins is a past president of the American Electric Railway Association, having served as chief executive of that body in 1903 and 1904.

Mr. William von Phul, who has been appointed to succeed Mr. Charles N. Black as vice-president and general manager of the United Railroads, San Francisco, Cal., was graduated from Tulane University in 1891 with the degree B. S., and two years later as mechanical engineer. He was subsequently employed as general superintendent of the Louisiana Electric Light Company and of the Edison Electric Company, New Orleans, until 1902, when he became associated with Sargent & Lundy, engineers of Chicago. He represented that firm as engineer in charge of construction for the Cincinnati Gas & Electric Company, later becoming general superintendent of that company until 1905, when he was employed by Ford, Bacon & Davis. Since 1907 Mr. von Phul assisted in the firm's engineering and operation of the street railway and lighting companies in a number of large Southern cities comprised in the American Cities Company, including the Birmingham Railway, Light & Power Company, Memphis Street Railway, Nashville Railway & Light Company, Little Rock Railway & Electric Company, Houston Lighting & Power Company, and later the New Orleans Railway & Light Company. In 1912 he became a member of the firm of Ford, Bacon & Davis. Mr. von Phul is a member of the American Society of Mechanical Engineers, the American Society of Civil Engineers and the Louisiana Engineering Society, and is responsible for a number of important inventions which have made possible the construction, at greatly reduced cost, of the large cotton warehouse terminal which Ford, Bacon & Davis designed and are now constructing at New Or-



WILLIAM VON PHUL

leans for the Board of Port Commissioners of the State of Louisiana. A farewell dinner was tendered to Mr. Black a few days ago at which the heads of departments of the United Railroads were present. Mr. Black delivered a farewell address and Mr. von Phul was introduced as his successor. Mr. von Phul asked for the same co-operation that Mr. Black had received and promised in return the same consideration of common interests. President Jesse W. Lienthal and all the other local officials of the company were present.

OBITUARY

Edward J. Davis, auditor of the Terre Haute division of the Terre Haute, Indianapolis & Eastern Traction Company, Terre Haute, Ind., died suddenly in his room at the Claypool Hotel, Indianapolis, on May 24. At the time of his death he was in Indianapolis to testify in a rate hearing before the Public Service Commission. Mr. Davis was forty-eight years of age. He had been employed by the company for more than twenty years, and had served as auditor for the last sixteen years. He entered the service of the company as a conductor. He is survived by a widow and three children.

Maj. N. C. Pilcher, general manager of the Sherbrooke Railway & Power Company, Sherbrooke, Que., who went to the front in July, 1915, with the Fifth Mounted Rifles, as noted in the *ELECTRIC RAILWAY JOURNAL* of Aug. 7, 1915, is reported killed in action on May 19. Major Pilcher applied for service in the first contingent, but owing to his wife's ill-health he decided to await the leaving of the second contingent. Joining a unit of mounted rifles, with the rank of captain, he was promoted major at Valcartier, went to England and thence to France. Major Pilcher was born in England thirty-six years ago, but had been a Canadian citizen for twenty-four years. At the time of the Boer war he enlisted in the Canadian contingent from Toronto, being then employed with the Canadian General Electric Company. On returning to Canada he was for a time manager of the Port Arthur & Fort William Electric Railway, going thence to take the post in Sherbrooke, which he held until leaving for the front. Major Pilcher is survived by his widow and a young son.

MR. DOHERTY IN TOLEDO

Henry L. Doherty is in Toledo, Ohio, working with the sub-committee of Mayor Milroy's street railway commission on a plan of settlement that will allow local citizens or the municipality to take over the railway property of the Toledo Railways & Light Company, as outlined in the *ELECTRIC RAILWAY JOURNAL* some time ago. N. D. Cochran of the Toledo *News-Bee* and N. C. Wright of the Toledo *Blade*, both members of this committee, will be absent from the city, attending conventions, for the next three weeks, but President Johnson Thurston and Secretary E. P. Usher, together with Judge Ralph Emery, the commission's counsel, will meet with Mr. Doherty and proceed with the work in the hope that it will be in shape for a full report to the commission as a whole on the return of Messrs. Cochran and Wright. At a conference on May 29 Mr. Doherty said that he had taken up the matter of improvement of East Broadway and that the company had concluded to pay its share within five years, although the original arrangement had been for a ten-year period. He also explained that the fund now being accumulated in the hands of the Federal Court for improvements amounted to about \$12,000 a month. During the next year, he explained, about \$44,000 of this will be devoted to improvements and the other \$100,000 will be retained to pay for the proposed paving. The expenditures for improvements between Nov. 1, 1915, and April 30, 1916, were shown to be \$46,261.

At a recent meeting of the London County Council, the chairman of the finance committee said it was expected that there would be a loss of about £74,000 on the tramways undertaking in the last financial year. Some satisfaction might be derived, however, from the fact that the results of the year just closed were likely to show an improvement upon the original estimate. The strike in May, 1915, occasioned a loss of £100,000. If it had not been for the strike there would have been no loss during the last financial year.

Construction News

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

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

RECENT INCORPORATIONS

***Red Lake Northern Railway & Construction Company, Bemidji, Minn.**—Incorporated in Minnesota to build, maintain and operate railways with steam, electric or gasoline power from Alida, Minn., in a northerly direction past the west end of Red Lake to the Canadian boundary at or near Lake of the Woods and from Alida south past the Itasca State Park to the Twin Cities. Capital stock, \$150,000. Incorporators: Jens J. Opsahl, Leo J. Opsahl, John Moberg, George H. French and A. M. Bagley, all of Bemidji, Minn.

FRANCHISES

Riverside, Cal.—The Riverside, Rialto & Pacific Railroad has filed an application with the Railroad Commission of California for authority to construct a switch or spur to connect its line with the Riverside-San Bernardino line of the Pacific Electric Railway, under a franchise granted by the Council of Riverside.

Santa Monica, Cal.—The Pacific Electric Railway has asked the Council for permission to remove its tracks from Ocean Avenue.

Eldora, Iowa.—The Iowa Railway & Light Company has asked the Council for a franchise in Eldora.

Nashville, Tenn.—The Nashville Railway & Light Company has asked the Board of Commissioners for an extension of its franchise to enable it to use certain tracks of the Nashville Traction Company. The board was asked to grant rights-of-way on Fourth Avenue from Broadway to the Sparkman Street bridge, across the bridge and on Shelby Avenue to Eleventh Street, on Fifth Avenue from Broadway to Mulberry Street, on Mulberry Street from Sixth to Third Avenue, through private property to Second Avenue, on Second Avenue to Lafayette Street or the Murfreesboro Road and on the Murfreesboro Road to the corporation line.

TRACK AND ROADWAY

Fort Smith Light & Traction Company, Fort Smith, Ark.—It is reported that plans are being considered by this company for the construction of an extension of its line in Van Buren to the Rea Addition, thence east along Alma Road to Arkebaur Lane.

Municipal Railway of San Francisco, San Francisco, Cal.—The passage of a bill calling for the preparation of plans and specifications for the construction of tracks of the Municipal Railway through the Twin Peaks Tunnel from Seventeenth and Market Streets to the junction of the Junipero Serra and Sloat Boulevards was practically assured when the Supervisors of San Francisco approved the printing of the measure on May 22. The bill authorizes the Board of Public Works to purchase material and enter into a contract for construction. The estimated cost is \$275,000. An amendment was later added to the bill authorizing the preparation of plans for a continuation of the road from Sloat Boulevard to the beach via Taraval Street.

Columbus (Ga.) Railroad.—This company will reconstruct its double-track line on Broad Street from Twelfth to Fifteenth Streets.

***Blackfoot, Idaho.**—Plans are being considered for the construction of an electric railway from Pocatello to Idaho Falls, via Blackfoot, about 50 miles. Charles E. Harris, receiver of the United States Land Office, may give further information.

Metropolitan West Side Elevated Railway, Chicago, Ill.—It is reported that this company contemplates the extension of its Douglas Park branch to Berwyn.

People's Traction Company, Galesburg, Ill.—This company is leveling its tracks and making other improvements

to its line on South Prairie Street, Galesburg, between Simmons and Tompkins Streets.

Gary & Interurban Railroad, Gary, Ind.—Plans are being considered by this company for the rehabilitation of its lines to Gary and the construction of a new line on Buchanan Street, Gary. It is expected that the cost will be about \$300,000.

Des Moines (Iowa) City Railway.—This company will completely rehabilitate 3 miles of track in the business district of Des Moines this year. This reconstruction includes twenty special-work layouts varying in design from a simple turnout to a partial grand union. Solid manganese steel tongue switches and renewable manganese steel insert mates and frogs will be used throughout the special-work installations, and 7-in., 114-lb. girder-guard and 7-in., 93-lb. girder-grooved rail laid on 6-in. x 8-in. x 7-ft. white oak ties on a 6-in. concrete foundation will be used in the track structure. The work will be done by the North American Construction Company, Chicago, Ill. It is planned to rebuild between 5 and 6 miles of track in the outlying district, where 7-in., 80-lb. plain girder rail laid on 6-in. x 8-in. x 7-ft. white oak ties on 6-in. rolled crushed-stone ballast will be used. All track will be laid with continuous joints fitted with heat-treated bolts. The joints will be bonded with Electric Railway Improvement Company's bonds.

Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan.—Operation has been begun on this company's extension from Bonner Springs to Lawrence.

Arkansas Valley Interurban Railway, Wichita, Kan.—This company contemplates the construction of a reinforced concrete bridge over Sand Creek.

Louisville (Ky.) Railway.—Operation has been begun on this company's Chestnut Street extension to Shawnee Park, via Twenty-seventh and Madison Streets, construction of which was begun last summer.

Newport & Alexandria Interurban Railroad, Newport, Ky.—Negotiations have been completed whereby the Newport & Alexandria Interurban Railroad will use the tracks of the Fort Thomas line of the Cincinnati, Newport & Covington Railroad as far as West Grand Avenue, where it will continue to Ross' Corner, through Fort Thomas over the Fort Thomas car line tracks to the Alexandria Pike at a point beyond St. Stephens Cemetery. Work of surveying and making the new roadbed will be begun at once. Capt. Gottlieb Hartweg, Cincinnati, is interested. [May 6, '16.]

Orleans-Kenner Electric Railway, New Orleans, La.—Surveys have been begun by this company for a 6-mile extension from Hanson City to Rost. A movement is on foot to submit to the voters of the Third Ward in St. Charles parish a proposal to levy a 5-mill tax as a bonus to the Orleans-Kenner Electric Railway and provide also for the donation of all the needed rights-of-way. It is estimated that the cost of the proposed extension will be about \$100,000.

Kansas City (Mo.) Railways.—This company, which is reconstructing its single track on Eighteenth Street from Main to Woodland Streets, Kansas City, Mo., is laying the track north of the center of the widened street and will lay another track next year, the roadbed being prepared previous to the paving of the street. The company has also been asked by the city of Kansas City, Kan., to lay double track on Eighteenth Street from Central to Kansas Streets, Kansas City, Kan., and this improvement will be completed by Sept. 1.

Southwest Missouri Railroad, Webb City, Mo.—Work will be begun at once by this company on the construction of new track and roadbed on Main Street, Chicago.

Great Falls (Mont.) Street Railway.—Work of establishing the grade for this company's extension down Fourth Avenue from Thirty-sixth Street to be made by the Montana Power Company, has been begun. It is reported practically all track material for the extension is on the ground, and the construction crews will be laying the track early in the summer.

Omaha & Council Bluffs Street Railway, Omaha, Neb.—Extensive improvements are contemplated by the Omaha &

Council Bluffs Street Railway, involving an expenditure of about \$250,000. Extensions to several of its lines are being planned.

Trenton & Mercer County Traction Corporation, Trenton, N. J.—This company will begin work on June 16 rebuilding its double-track system for a distance of 3400 ft. on West State Street.

International Railway, Buffalo, N. Y.—Work is progressing rapidly on the new fast line being constructed by the International Railway between Buffalo and Niagara Falls, via North Tonawanda. Ground is being leveled and rails are being laid at the Buffalo end of the route and steel overhead towers to carry the wires are being erected near a point where the line enters Tonawanda from the south. These towers have concrete bases. Contractors are leveling the big hill in the north end of North Tonawanda which has been bought by the company to be used for making fills at several points along the right-of-way.

Interborough Rapid Transit Company, New York, N. Y.—The Public Service Commission for the First District of New York has approved the contract to be made between the Interborough Rapid Transit Company and Snare & Triest Company, New York, for the work of connecting up the Second Avenue elevated line in Manhattan with the new elevated lines in Queens to Astoria and Corona. The contract amounts to \$55,760.

New York (N. Y.) Municipal Railway.—The Public Service Commission for the First District of New York has awarded the contract to MacArthur Brothers Company, New York, for the construction of Section 5 of Route No. 8, the Fourteenth Street-Eastern District subway.

Cleveland, Ohio.—Street Railway Commissioner Sanders of Cleveland is planning a number of rapid transit lines to relieve the congested condition of the local lines. One of these would start at Lindale, south of the city, and follow the Big Four Railroad right-of-way to Walworth run at West Sixty-fifth Street and follow this run to Fulton Road. The other would start at Lake Avenue and West 117th Street, skirt Edgewater Park, follow Bulkley Boulevard to West Twenty-fifth Street and cross the new high-level bridge to Superior Avenue. Mr. Sanders said the same or similar provisions should be made for the East Side, although the Cleveland & Youngstown line will provide rapid transit to a portion of the city and the hills to the south-east. The Cleveland Railway has the right to the use of its tracks between East Thirty-fourth Street and the Public Square.

Columbus, Delaware & Marion Railway, Columbus, Ohio.—Plans are being considered for the relocation of this company's line to the center of North High Street from the north corporation line of Columbus to the Delaware County line.

Portsmouth Street Railroad & Light Company, Portsmouth, Ohio.—The Ohio Valley Traction Company, a subsidiary of the Portsmouth Street Railroad & Light Company, has placed in operation its extension between Portsmouth and Wheelersburg. It is proposed to extend the line to Ironton.

Lehigh Valley Transit Company, Allentown, Pa.—Harrison R. Fehr, president of the Lehigh Valley Transit Company, announced May 26 that his company plans to expend \$1,000,000 a year during the next five years for the improvement of the system. The most expensive item will be the double-tracking of the Philadelphia division from Allentown to Sixty-ninth and Market Streets. It is also planned to build a line between Bethlehem, Pa., and Coopersburg or Quakertown, Pa., for a fast hourly express between Philadelphia and Easton.

Chester (Pa.) Street Railway.—The Public Service Commission of Pennsylvania has approved the application of the Chester Street Railway for an extension to its turnout on Edgemont Avenue and the construction of three carhouse branch-offs, also the construction of connections at Seventh and Potter Streets, Chester.

Monongahela Valley Traction Company, Fairmont, W. Va.—A contract has been awarded by the Monongahela Valley Traction Company to Keely Brothers, Clarksburg, for the construction of an extension of its line beginning at the

west end addition near Clarksburg, extending down Limestone Creek for a distance of about 1800 ft. to the junction with the Fairmont and Clarksburg interurban line. The new line will cost about \$18,000.

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—Work will be begun at once by this company on the construction of a new carhouse at Watts.

Waterbury & Milldale Tramway Company, Waterbury, Conn.—This company will construct a new carhouse at the corner of Meriden and Frost Roads, Waterbury. The building will be 150 ft. x 35 ft., and will be of modern construction. A workshop will also be provided for repairs and maintenance of the company's rolling stock.

Iowa Railway & Light Company, Cedar Rapids, Iowa.—Plans have been made by this company for the construction of a 40-ft. extension of its general repair shop building and the rearrangement of the interior of the erection shop.

Alexandria (La.) Municipal Railway.—Work will soon be begun by the Alexandria Municipal Railway on the construction of a new carhouse at Tenth and Lee Streets. The building will be 53 ft. x 108 ft., and will be of brick construction.

Detroit (Mich.) United Railway.—Work has been begun by this company on the construction of a new office building at Dix and Livernois Avenue, to serve as the office for the Baker carhouse.

Interborough Rapid Transit Company, New York, N. Y.—Bids for the construction of station finish on Sections Nos. 7 to 11, inclusive, of Route No. 5, the Lexington Avenue subway in Manhattan, were opened by the Public Service Commission for the First District of New York during the past week. This part of the line extends from Forty-third to 106th Street, and stations are located at Fifty-first Street, Fifty-ninth Street, Sixty-eighth Street, Seventy-seventh Street, Eighty-sixth Street, Ninety-sixth Street and 103rd Street. The contractor must complete the work within six months from the delivery of the contract. The lowest bidder on this work was John B. Roberts, New York, at about \$266,000.

Ardmore (Okla.) Railway.—It is reported that this company will construct a new carhouse in Ardmore.

Monongahela Valley Traction Company, Fairmont, W. Va.—Work will be begun by this company on June 15 on the construction of a new interurban station at Clarksburg. The building will be 80 ft. x 80 ft., three stories, and will be of reinforced concrete and brick with composition roof. The cost is estimated at \$65,000.

POWER HOUSES AND SUBSTATIONS

Connecticut Company, New Haven, Conn.—The J. G. White Engineering Corporation states that work will begin at once on the first section of the addition to the Connecticut Company's power plant in New Haven. The plant, as stated in last week's issue of the *ELECTRIC RAILWAY JOURNAL*, will have an ultimate capacity of 100,000 kw. The present addition will have a capacity of from 10,000 to 20,000 kw.

Fishkill Electric Railway, Beacon, N. Y.—A report from this company states that it has placed an order with the Westinghouse Electric & Manufacturing Company for a new rotary to be erected in its power house at Beacon in July. The a.c. side of the new machine is two-phase, 2300 volts, 60 cycles; the d.c. side is 600 volts, 500 kw.

Northern Ohio Traction & Light Company, Akron, Ohio.—Work will soon be begun by this company on the construction of a new substation to be located in the vicinity of Brittain, just beyond East Akron. This will be both a power and light distributing station and will cost about \$70,000.

Rhode Island Company, Providence, R. I.—The board of trustees of the Rhode Island Company recently voted to appropriate \$45,000 to build and equip a substation in Burrillville on the Pascoag-Woonsocket line and also a similar sum to build a substation in the Harmony section of Smithfield for the Providence-Chepachet line.

Manufactures and Supplies

SPECIAL WORK GIRDER RAIL MARKET SLUGGISH

Except for a few special companies contemplating the rerouting of cars, special work purchases, insofar as the electric railway industry is concerned, have been few in number, although in some instances large in quantity. On the other hand, the manufacturers, owing to the increased cost of all materials including steel and ferromanganese, have been forced to increase their prices. It is also understood that the prices for plain and grooved-girder rail sections, largely used for track in paved streets, will be advanced in the same proportion as were those for standard sections. The small quantity of special work being purchased at the present time is attributed, first, to the fact that the track is the first to feel the effect of a retrenchment policy and the last to receive the benefit of prosperity, and second, because prices have advanced and deliveries are slow. During the business depression which began in 1913, many railways resorted to the welders as a means of carrying special work over the regular period of renewals. This is also true of air and to some extent joints. Superimposed upon this situation was that of the lack of track extensions, a condition which in many localities is just beginning to become normal.

Steam railroad companies have purchased largely for their requirements throughout this year and during the first part of next year. Some electric railway companies also have placed orders for their present requirements and for the first four months of 1917. Under the prevailing rushed conditions at the mills, it will probably be difficult to secure prompt deliveries of girder rails in any quantity before the last quarter of this year, and then only in limited tonnages. Moreover, small orders for the plain and grooved-girder rail sections are being delayed more than in the past, because the tonnage for these sections is accumulating slowly, and it is necessary for the mills to withhold rolling until a sufficient tonnage has been ordered to warrant changing the rolls. Occasionally small orders for certain sections may be filled within a few days, and at other times an interval of several months may elapse before a sufficient number of orders for the particular section have been received at the mill. This delay, of course, could be materially decreased and the electric railways could secure more prompt shipments, if the number of sections was reduced and real steps were taken toward standardization.

ROLLING STOCK

Albany (Ga.) Transit Company has purchased a single truck pay-as-you-enter all-steel one-man car for delivery about Sept. 1.

Havana Central Railroad, Havana, Cuba, will purchase five motor coaches and one trolley car, in addition to steam equipment.

Cumberland County Power & Light Company, Portland, Me., is in the market for four 36-ft. semi-convertible single-truck pay-as-you-enter passenger cars equipped with Brill Radiax trucks.

Cincinnati, Lawrenceburg & Aurora Electric Street Railroad, Cincinnati, Ohio, will lease or purchase five cars to replace those lost in a fire at the North Bend carhouses, as noted in the *ELECTRIC RAILWAY JOURNAL* of May 27.

Lakeside & Marblehead Railroad, Marblehead, Ohio, has purchased from the McKean Motor Car Company a 200-hp., 55-ft., steel gasoline motor car with which it will replace its steam locomotive train passenger service between Lakeside and Marblehead.

Monongahela Valley Traction Company, Fairmont, W. Va., noted in the *ELECTRIC RAILWAY JOURNAL* of April 29 as having ordered eight cars from The J. G. Brill Company, which are to be of the closed prepayment type and delivered by Aug. 1, has specified the following details for this equipment:

Seating capacity.....28	Fare boxes.....International
Length of body.....20 ft. 0 in.	Gears and pinions.....West.
Length over vestibule.....29 ft. 5 in.	Gongs.....Brill
Width over sills.....7 ft. 6 in.	Hand brakes.....Brill handle
Width over all.....7 ft. 9 in.	Peacock type A brake
Height, rail to sills.....2 ft. 7 1/4 in.	Heaters.....Peter Smith electric
Height, sill to trolley base.....8 ft. 9 1/4 in.	Headlights.....G. E. Incandescent
Body.....Semi-steel	Journal boxes.....Brill
Interior trim.....Cherry	Motors.....West. 323 V, inside hung
Headlining.....Birch veneer	Paint.....Chas. Moser Co.
Roof.....Plain arch	Registers.....International
Underframe.....Metal	Sanders.....Brill Dumptit
Bumpers.....Brill	Sash fixtures.....Brill
Cables.....West.	Seats.....Longitudinal
Car trimmings.....Brill polished bronze	Seating material.....Cane
Control.....West. K.	Springs.....Brill
Couplers.....Brill-Hovey draw bars	Step treads.....Mason Safety Tread
Curtain fixtures.....Curtain Supply No. 88	Trolley base.....U. S. No. 14
Door-operating mechanism.....Brill	Trucks.....Brill 21 E
	Varnish.....Murphy Varnish Co.
	Ventilators.....Brill
	Window fixtures, Brill—renitent post construction

TRADE NOTES

Valley Steel Company, East St. Louis, Ill., has been incorporated for \$250,000 and will specialize in heat treated axles.

Westinghouse Lamp Company, New York, N. Y., announces the removal of its executive offices on June 1 to the City Investing Building, 165 Broadway.

J. Ed. Erickson has joined the sales organization of the Packard Electric Company, Warren, Ohio, and will cover the territory formerly in charge of Benjamin Smith, who has retired.

M. J. Fox, formerly assistant signal engineer Chicago, Burlington & Quincy Railroad, has become connected with the signal department of the Railroad Supply Company, Chicago, Ill.

C. T. Anderson, who has been in charge of the sale of rail bonds and third-rail insulators for the Ohio Brass Company, Mansfield, Ohio, has resigned to become vice-president and sales manager of the Hartman Electrical Manufacturing Company, Mansfield, Ohio, manufacturer of rail bonds and electrical specialties.

Oscar F. Ostby, general sales agent of the Commercial Acetylene Railway, Light & Signal Company, New York, has resigned from that position, effective June 1. Mr. Ostby is president of the Railway Supply Manufacturers' Association, and has been active in its affairs and those of the International Acetylene Association for many years.

Arthur D. Little, Inc., Boston, Mass., announces that a Dominion Charter has been granted to Arthur D. Little, Ltd., a corporation organized and equipped for the service of Canadian industry and the study and development of Canadian resources. The special facilities of the new corporation will be supplemented by the entire staff organization and equipment of the Boston firm.

Railway Improvement Company, New York, N. Y., has received an order for 153 Rico coasting recorders from the Stone & Webster Engineering Corporation. Of this number 143 were ordered to equip the lines of the Houston (Texas) Electric Company and ten for the Northern Texas Traction Company, Fort Worth, Texas, where the Rico coasting recorder has been used for several years past.

Stanley H. Rose, until recently in charge of the New York office of the Bureau of Foreign and Domestic Commerce of the Department of Commerce, has been engaged by the Barber Asphalt Paving Company to direct its foreign trade department. The Barber Company's export trade in paving materials, roofing and other asphaltic products will hereafter be in Mr. Rose's charge, with headquarters in Philadelphia and New York.

Smith-Ward Brake Company, New York, N. Y., has received orders to equip with brake adjusters the following cars: People's Railway, Dayton, Ohio, ten cars; Altoona & Logan Valley Electric Railway, Altoona, Pa., five cars; Harrisburg (Pa.) Railways, three cars; Buffalo & Lake Erie Traction Company, Buffalo, N. Y., fifteen cars; Connecticut Company, New Haven, Conn., forty-eight cars; Puget Sound Traction, Light & Power Company, Seattle, Wash., ten cars; Worcester (Mass.) Consolidated Railway, ten cars, and ten additional cars for the Rhode Island Company, Providence, R. I. This company did not receive orders from the Mahoning & Shenango Railway & Light

Company, Youngstown, Ohio, and the Scranton (Pa.) Railway, as noted in the *ELECTRIC RAILWAY JOURNAL* of May 27.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has recently placed on the market a new grade of insulating transformer oil called "Lectroseal." This oil has its chief application as an insulating and cooling medium for use with all classes of oil-insulated distributing and power transformers. It is also used with such apparatus as induction-type feeder regulators and electrolytic lightning arresters. "Lectroseal" is a pure mineral oil obtained by the fractional distillation of petroleum and is free from moisture, acid, alkali and sulphur compounds. It has a high dielectric strength as an insulating medium. The average test is said to be 40,000 volts on a 0.15-in. gap between spheres $\frac{1}{2}$ in. in diameter. It is claimed to be particularly well adapted as a cooling medium, the viscosity being approximately 36 and 40 deg. Saybolt method. If water should accidentally enter a transformer tank it should sink to the bottom of the tank as quickly as possible, as a small percentage of water thoroughly mixed with the air reduces its dielectric strength very rapidly. Various grades of oil differ greatly as to their ability to separate from water with which they have been mechanically mixed, but "Lectroseal" oil, it is claimed, possesses this quality in a marked degree. The other characteristics claimed for this oil are freedom from deposits, satisfactory flash and fire points, low rate of evaporation and light color.

ADVERTISING LITERATURE

Western Electric Company, New York, N. Y., has issued an illustrated catalog on its inter-phones and accessories.

William B. Scaife & Sons Company, Pittsburgh, Pa., has issued a booklet describing and illustrating its copper-brazed high-pressure tanks for air, gas and liquids.

Trussed Concrete Steel Company, Youngstown, Ohio, has issued a booklet on Kahn pressed-steel construction which describes and illustrates the use of Kahn pressed steel joists and studs with Hy-Rib, for floors, roofs, walls and partitions.

American Carbon & Battery Company, East St. Louis, Ill., has issued Catalog 20 on its carbon, graphite and metal graphite motor and generator brushes. A summary of the physical and electrical characteristics of these brushes and prices of all grades are given.

Protective Signal Manufacturing Company, Denver, Col., has issued Bulletin No. 4, which gives the details of its Model "C" oscillator and describes its construction and operation. This company has also issued Bulletin No. 5, which describes and illustrates its a.c. and d.c. relays.

E. I. du Pont de Nemours & Company, Wilmington, Del., has issued a book bound in du Pont Fabrikoid entitled "Du Pont Products." This book contains data on explosives, blasting supplies, Fabrikoids, chemicals and pyralin. A complete list of their products and the industries that use them is also given.

Sprague Electric Works of General Electric Company, New York, N. Y. have issued Bulletin No. 48,907 describing and illustrating their 500-lb. electric hoists, type I-5. Bulletin No. 49,600 has also been issued, describing and illustrating flexible steel armored conductors, flexible steel conduits and stamped steel boxes, fittings, and tools.

Electric Service Supplies Company, Philadelphia, Pa., has just issued a 400-page catalog on mining and industrial electrical supplies. This book lists and illustrates a complete line of equipment for electric haulage in power, mining and large industrial plants, as well as a very complete line of miscellaneous electrical supplies for such concerns.

Ohmer Fare Register Company, Dayton, Ohio, has issued an illustrated pamphlet entitled "Ohmer Register Equipments for One-Man Operation," which describes the adaptability of Ohmer fare registers and operating equipments for either one or two man operation. Ohmer registers are now in use on one-man cars of the Wausau (Wis.) Street Railway, Menominee & Marinette Light & Traction Company, Menominee, Mich., and the Southern Public Utilities Company, Charlotte, N. C.

Indianapolis Switch & Frog Company, Springfield, Ohio, has issued a pamphlet entitled "Conservation of Track and Roadway, or The Prevention and Cure of Track Disease."

This booklet reprints the paper entitled "Track Joining and Bonding," presented by E. C. Price, vice-president and secretary of the Indianapolis Switch & Frog Company, at the 1915 summer outing meeting of the Central Electric Railway Association. It also contains instructions regarding the use of the Indianapolis electric arc welder, and the application and tests of this company's "Simplex" and "Apex" joints.

Tubular Woven Fabric Company, Pawtucket, R. I., has published a binder of wiring diagrams and conduit specifications showing the possibilities of "Duraduct" for car wiring. A particular feature is the comparison of the weight of Duraduct and ordinary conduit for each lay-out illustrated. The sheets of this binder are reproductions of advertisements originally published in the *ELECTRIC RAILWAY JOURNAL*. Taken together, they form the most extensive series of wiring lay-outs ever gotten together on different types of city, interurban and rapid transit cars. Several hundred electric railways are now using Duraduct both for car and miscellaneous wiring. One of its latest applications has been to the new one-man cars of the Stone & Webster Management Corporation.

Crane Company, Chicago, Ill., prints in the May issue of the "Valve World" a table showing the development in the process of rail manufacturing according to materials used. It is shown that wrought iron was the company's first material for rails, but, being very soft, it did not give long service. By the year 1880, Bessemer steel constituted the chief material for rails owing to the greater wearing qualities embodied in the more general uniformity, strength and hardness of steel. During recent years rails were made of greater and greater strength and hardness to keep pace with the rapidly increasing weight, speed and frequency of railroad trains, steel being susceptible to much modification of properties. In 1912 another important transition took place in rail materials, the chief material having become at that time open-hearth steel instead of Bessemer steel.

NEW PUBLICATION

Sound Investing. By Paul Clay. Moody's Magazine & Book Company, New York, N. Y. 371 pages. Limp leather, \$2 postpaid.

Too many books that purport to give to the average man clear information on the subject of investment principles, fall short of their aim because they are not written by men with a knowledge of the field broad enough to cover all topics in which this and that reader may be interested; because the point of view of the bond seller is kept in mind instead of that of the bond buyer, or because in general the treatment is too technical. Mr. Clay's book, however, has avoided these faults, and as a result it is one which should be in the library of every man who desires to know for himself the fundamentals of investment. Primarily the book is intended for reference, the idea being in the main that a person considering an investment should first read the chapter on investments suitable for people like himself, and then the chapters on the classes of securities in which Mr. Clay advises him to invest. We would go further than this, however, and urge every reader to peruse the whole book carefully and then study the parts dealing with his own case. We suggest this method because we believe that the book contains a wealth of information with which every investor should be generally acquainted.

The plan of the book is first to give general but necessary information as to how to invest money; second, to present broad and comprehensive descriptions of each important class of securities; third, to name the types of securities best adapted to each particular class of persons, and fourth, to answer the practical, every-day questions of how and where to find the desired security, how to select an investment house and how to ascertain the yields of securities. One may well venture the opinion that a great deal of money could have been saved to investors in the last two years if such a book as Mr. Clay's had been studied. It will, of course, not make a wise investor out of a person incapable of good judgment, but it will do much toward developing thinking men and women along lines where in many cases instruction is sorely needed.