

Electric Railway Journal

Published by the McGraw Publishing Company Inc.
Consolidation of STREET RAILWAY JOURNAL AND ELECTRIC RAILWAY REVIEW

Vol. XLIX¹

NEW YORK, SATURDAY, JANUARY 20, 1917

No. 3

ELECTRIC RAILROADING IN THE ORIENT

If an American should suddenly be transported to an oriental city he would find conditions very different from those at home as regards dress, customs and housing and social conditions; in fact, in nearly everything which goes to make up the daily life of the individual. Almost the only familiar object would be the trolley car. It is perhaps because electric traction is so recent in origin, or it may be because Americans have taken such an active part in the financing and operation of these lines, but it is a fact that electric railway practice does not differ very much wherever it is found in all parts of the globe. The needs for transportation are omnipresent wherever the community; and the electric railway is necessary even where jinrikishas and sedan chairs abound. So much of the apparatus comes from America or is made along American lines and the industry has developed to such a greater extent in this country than elsewhere that it is not surprising to find American transportation practice followed so far as it is not inconsistent with local operating conditions. In view of these facts, we believe that our readers will be interested in the interview in this issue with C. Nesbit Duffy, vice-president Manila Electric Railroad & Light Corporation, who has a wide first-hand acquaintance with both oriental and American railway conditions.

ORIENTAL AND AMERICAN RIDING

Although the riding and receipts per capita, and consequently the trackage of the system, are not as large in an oriental city as in a city of corresponding size in this country, they are by no means so much less as one might possibly assume. Thus, in Manila, while the rides per capita per year on the railway are only about fifty, it should be remembered that much of the travelling is done by other conveyances, as described by Mr. Duffy. When to the receipts of the railway are added the receipts from these other means, it will be seen that the expenditures rise from, say, \$1.50 to about \$6 per year per capita for urban transportation in public conveyances. In explanation, it must be remembered that while the per capita wealth of an oriental city is not large, the climate is such as to stimulate riding, and many cities of considerable population cover a large area on account of the absence of tall buildings. Altogether, the receipts per mile of track, as determined by the figures given in the interview, are about \$10,000, not a bad showing. From an operating standpoint difficulties and expenses are undoubtedly met in any city so far away from the source

of supply, but the lower cost of platform labor should tend to balance the higher material expenses in the operating report. It is interesting to note that Mr. Duffy reports that private automobile competition, from which the railways in this country have suffered, is felt even in Manila.

WARNING AUTOMOBILE DRIVERS

In an effort to co-operate with steam railroads to secure a decrease in grade-crossing accidents, Secretary of State Hugo is mailing out 400,000 "safety-first" pamphlets with the 1917 certificates of registration for New York autoists. These folders, which are furnished by the railroads, direct attention to the increasingly serious character of the grade-crossing problem and urge each motorist to observe more strictly all warning signs. Some autoists, like those whom the Long Island Railroad has found recklessly smashing through safety gates, will probably cast the warning aside with a sneer. The foolhardy, without doubt, can only be completely protected by compulsory means or by threat of heavy penalties. We imagine, however, that the average autoist will be impressed with the apparently official character and personal application of the warning and will bear it in mind at least for a time. At any rate, another move has been made by common carriers to extend the safety-first movement, and thus to lessen the number of unused means by which there is any chance of automobile drivers being brought to a realization of their responsibility for safe operation.

THE LABOR PROBLEM AND EXECUTIVES

We have been much impressed by a recent remark of John D. Rockefeller, Jr., in regard to the modern executive. According to a statement made by him on Founder's Day at Cornell University, the chief executives of important industrial corporations have heretofore been selected largely because of their capacity as organizers or financiers. In his opinion, however, the time is rapidly coming when the important qualification for such positions will be a man's ability to deal successfully and amicably with labor. We firmly believe that this holds true just as much for electric railway executives as for industrial leaders. The day is passing, if it has not gone already, when an electric railway executive can subordinate the labor question to all others and deliberate on it only when he is compelled to do so through the outbreak of industrial trouble. The electric railway industry is confronted now, and will be more seriously confronted in

the future, with the difficult tasks of fixing wages on a more scientific basis, of solving the complex questions of proper hours of labor, of seeing that the public right to uninterrupted service is respected and of trying in general to direct social legislation along sane lines. Electric railway executives must give careful thought to these subjects, for the industry can ill afford to depend on men in other fields to do its thinking for it in order to determine the proper course to follow. The labor problem is nothing more or less than a human problem—the bringing of men with muscle into amicable relationship with men of money for their mutual betterment—but it is a most important one. The electric railway executive will be best suited for his position who realizes to the greatest extent the need of constructive and lasting policies in handling such a problem.

REGENERATIVE BRAKING FOR CITY SERVICE

The fact that stands out most strongly in R. E. Hellmund's remarkably comprehensive treatise on regenerative braking, which was read before the Institute of Electrical Engineers last week and is abstracted on another page of this issue, is that there is an almost infinite number of ways to produce the desired result. In fact, the list of possible systems submitted by Mr. Hellmund for effecting regeneration with direct-current motors alone is fairly bewildering, and one can hardly avoid wonder at the thought of the almost insignificant extent to which the principles have been commercialized at present.

In the discussion that followed Mr. Hellmund's address, the consensus of opinion seemed to be that this present limited number of practical applications is due solely to a lack of refinement in motor design in the past, and one is left with the more or less definite impression that regenerative braking is expected soon to become practically universal. There is, no doubt, reason for much enthusiasm on the subject since the operations on both the Norfolk & Western and Chicago, Milwaukee & St. Paul installations have been such an unqualified success. Yet it is a long cry from these two applications (which, with the addition of a single locomotive on the Lake Erie & Northern Railway and the three-phase engines on the Cascade Tunnel, constitute the only ones in this country) to the use of the principle on the motor cars of city and interurban railways.

Any such adaptation must, of necessity, be of the direct-current type, and direct-current regenerative systems seem to suffer inherently from the complication of separate excitation, this being necessary because of the instability of the universally-used series motor when it is operated alone as a series generator. Simplicity, of course, is of far-reaching importance to motor-car equipment. Indeed, simplicity that can keep at a minimum the vital factors of first cost and maintenance (to say nothing of liability to breakdown) is almost priceless. Complication, apparently, cannot survive, even when relatively great returns or important operating flexibility accompany it, as witnessed by the

failure of the really wonderful engineering conception of combined a.c.-d.c. apparatus to perpetuate itself in interurban service.

Of course, the idea of regenerative braking for city cars opens up a marvelous vista of possibilities. Given the hypothesis that complication of apparatus may be altogether neglected, it is unquestionably possible, with a negative booster and regenerative control, to brake down to zero speed and to return practically all of the kinetic energy of the car to the line at every stop. It would then be possible on a large city system to save something like 60 per cent of the power originally used, and to effect an economy amounting roughly to \$1,000 per car per year, because in normal city service practically two-thirds of the energy is devoted to acceleration, only to be dissipated immediately afterward at the brake shoes.

Regenerative braking for city cars, in brief, would furnish another answer to the old problem of horse-car days wherein a means was sought by thousands of inventors to eliminate the large effort required of horses when starting a car. The problem to-day is no different except, perhaps, that the pot of gold at the rainbow's end has grown to many times its original size. Then, as now, a remedy for the waste of energy is obvious enough if one neglects the element of complication. But since this is something that cannot well be done in actual practice, we feel that only a conservative attitude may properly be taken, and that any application of regenerative control for motor cars should be preceded by a long and elaborate series of service tests.

BETTER PAY FOR THE MASTER MECHANIC

We have been planning for some time to say a word or two on behalf of a group of men most essential to the prosperity of the electric railway who are by the nature of their work in a difficult position when increases in salary are in question. To come right to the point we think that the master mechanics are, on the average, underpaid, but we have hesitated to say so while so many influences were at work to drain the electric railway's resources. However, we must face the fact that with the increasing complexity of equipment and the necessity for economy in maintenance good men must be held in this class of work and better men developed for it. To this end reasonable pay is necessary, and prospect of ultimate promotion to other departments is desirable. There is no doubt that good work in the shop is appreciated higher up, but the appreciation in many cases does not take the form of cash.

The position of master mechanic in these days calls not only for a high grade of intelligence and all round experience, but there must also be executive ability of no mean order. There was a time, not far back, when almost any good mechanic of foreman timber could be put in charge of rolling stock and its equipment. This time has now passed, but the tradition that the master mechanic should receive a mechanic's wages has not altogether disappeared. The name of the job, honor-

able as it is, rather tends to continue the tradition. In the wage-drawing ranks of the electric railway there has been a more or less steady rise in wages to meet the increasing cost of living. This is necessary to keep the men contented and to meet competition. It is reasonable to expect that the men higher up should be similarly advanced even if they do not assert their rights or threaten to leave their posts for more lucrative positions.

THE PASSING OF A GREAT ENGINEER

The untimely death, on Monday last, of Henry Gordon Stott, superintendent of motive power of the Interborough Rapid Transit Company, removed from the ranks of the engineering profession one of its most useful and eminent members. His technical achievements form an imposing array, so much more extensive were they than it falls to the lot of most successful men to accomplish. Such results could not have been produced by an ordinary man, which he was not in any aspect of his character and acquirements.

Mr. Stott was a natural leader in administrative affairs, as well as technical ones. Although retiring in disposition rather than otherwise, he somehow was obliged to assume positions of responsibility and influence in any organization to which he was attracted by the possibility of rendering himself useful. He had no patience with societies or individuals which were accomplishing no worthy purpose, but unsparingly gave himself to any project, however difficult, which appealed to him as worth while. His counsel was sought because he treated every question as a problem to be solved in the scientific spirit—that is, with sincerity of purpose, broadness of vision and thorough attention to detail. He believed thoroughly in analysis as the basis of progress.

As a place for the training of young engineers the motive power department of the Interborough was a veritable school for post-graduate work. One element in Mr. Stott's success was his ability to attract, train and enthuse a group of assistants able and eager to carry out his technical ideas. His requirements were severe, as he expected deeds not words, but once he found a man with the right attitude toward work and life in general there were no limits to his ambitions for that man. From his assistants he insisted upon having correct results but was always reasonable in his demands, and made all possible allowance for the limitations imposed by the state of the art, by the experience of the investigator and by the facilities at the disposal of the latter. When results of value to the profession were secured, the man responsible for them was encouraged to incorporate them in technical papers for presentation before the appropriate national or other societies.

That Mr. Stott was a mechanical engineer in a very broad sense is indicated by his interest also in electrical and civil engineering. He was recognized as an authority in all three engineering branches. This was natural, in view of the fact that in attacking problems

he insisted upon going to their root. Railway men may well feel pride in the fact that he was one of their number.

IMPROVING THROUGH SERVICE

The improvement of through interurban service is essential in some competitive districts if the volume of traffic is to be increased to a point yielding larger net revenue. No general indictment is intended, but a few observations derived from a recent attempt in the East to make an interstate journey of between 200 and 300 miles by trolley are pertinent. In a nutshell, the betterments which seem desirable chiefly have to do with raising the schedule speed (not the maximum speed) and with the articulation of connections at the terminals of individual car service so that long waits are avoided under normal conditions.

A limited-stop service in entering and leaving large cities en route appears essential to the best results. Efforts to carry on a local business with through and fast interurban cars operated for a few miles on large urban traction systems are apt to militate against a satisfactory inter-city journey. What might be called a preferential right-of-way should be given to the interurban cars wherever possible. The use of electric track switches at important junctions passed over by such cars, the discouragement of purely local patronage and the clearing of the line in front of such movements when feasible, as in the holding back of service cars, coal and express matter from obstructing the through unit, are important. Often it is possible virtually to clear a line for through service considerably in advance of the scheduled passing points and without skimping on the local facilities. Those extra quarter hours mean a great deal when the electric road is trying to compete for business with parallel steam lines.

Circuitous entrances into cities for the purpose of getting local business on interurban cars result in saving pennies but in losing dollars, except in those where there is no competition. On a line where forty-five minutes of a two-hour trip between terminals 40 miles apart is consumed in entering and leaving the two principal cities concerned, it is hard to reap the full benefits of the interurban section of the trip, in competition with a parallel steam service covering the distance in an hour, even although the steam fare is double that on the electric, or nearly so. If, by keen study of the terminal situation, from fifteen to thirty minutes can be cut off the trip, the resulting schedule is sure to appeal to business men more than the longer running time quoted above. The extra 50 cents does not measure the value of a busy man's hour in the middle of the day. Finally, the practice of routing incoming through cars slowly around a central park or common before allowing the passenger to reach the principal transfer points is of doubtful benefit. It would seem almost axiomatic that as short an entrance as is consistent with good service should be made into a terminal city and that connections of through cars on trunk lines should be planned with due regard to the possibilities of rapid through service.

Old Cars Remodeled at Portland, Me.

The Cumberland County Power & Light Company Is Converting Its Old City Cars for Prepayment Service with Installation of Folding Doors and Steps—The Work is Being Handled at the Company's Shops Without Additional Facilities

AT the present time the Cumberland County Power & Light Company, Portland, Me., is reconstructing its old city cars for prepayment service, including the removal of bulkheads and the installation of folding steps and doors with manual control, so as to provide them with thoroughly modern facilities. Concerned in the change are six single-truck cars with 20-ft. bodies and fourteen double-truck units with 28-ft. bodies. These cars are of the box type, with longitudinal seats, and before alteration they were equipped with fixed steps and interior bulkheads. In addition, two semi-convertible cars of somewhat more modern type have been included in the job. All of these cars are being equipped with combined fare boxes and registers, so placed as to permit pay-within operation.

No specifications or drawings for the job have had to be prepared by the railway company, since the manufacturers of the folding door and step mechanism have been held responsible for measurements, the standard drawings of the latter being filled in from field data secured at Portland and used by the reconstruction force of the railway company in installing the control stands, levers and fittings. The manufacturer ships rods and fittings built for specific cars in stenciled boxes, so that when the parts arrive at Portland their application to the right rolling stock units is assured without delay.

Work was begun on the job at the St. John Street shops in Portland on Oct. 4, 1916, and at present it is about half done. On account of maintenance work on other rolling stock, the reconstruction has had to be temporarily slowed down or suspended at times, the company considering it inadvisable to concentrate a specialized force on work of such limited extent.

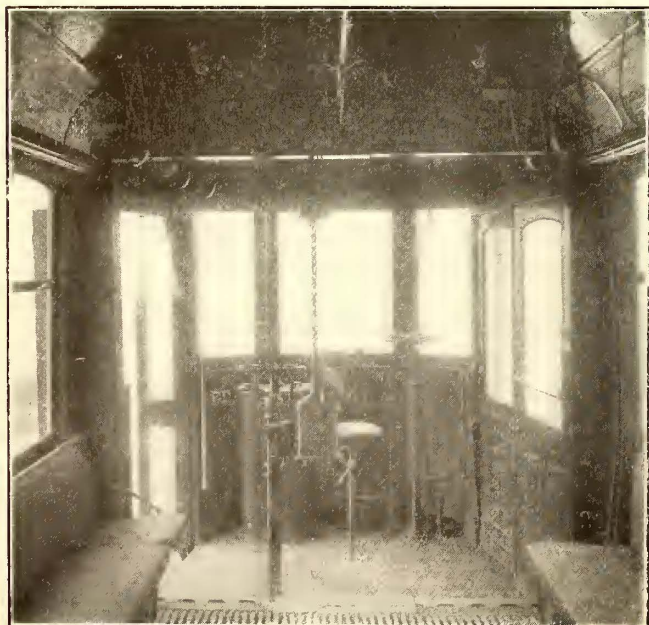
In the case of the single-truck cars with 20-ft. bodies, which are representative, the bulkhead door was 21¾ in. wide in the clear before reconstruction, and on these

smaller cars the bulkheads have not been wholly removed, but have been cut down to a height of 3 ft. 6 in., the width of the passage into the car from the vestibule being increased to 27½ in. This leaves in place a section of the bulkhead 18½ in. wide on each side of the passage, which affords an arm rest 4½ in. wide at the top.

One of the accompanying illustrations is an interior view showing the "set-up" of one of these cars for one-man service, and although no immediate plans for the operation of one-man cars have been announced at Portland, these remodeled 20-ft. cars can readily be so used if necessary. As shown in an accompanying illustration, the fare box is mounted just behind the right-hand forward bulkhead for one-man operation, the entering passengers passing between the motorman and the box. The motorman controls the entrance door, which is shown open in this view, from an operating handle at the right of the controller.

With two-man operation this door is, of course, used as an exit that is controlled by the motorman, the fare box being located at the other end of the car in a location corresponding exactly to that shown in the illustration. In the latter case the conductor stands between the fare box and the nearer door, which is closed, and passengers enter via the door shown at the left, this being controlled from an operating stand just behind the right-hand bulkhead. The doors are operated in synchronism with the steps below them on all the cars involved in the job. The fare box, which is of International Register Company's make in all cases, is carried 2 ft. 10 in. above the platform.

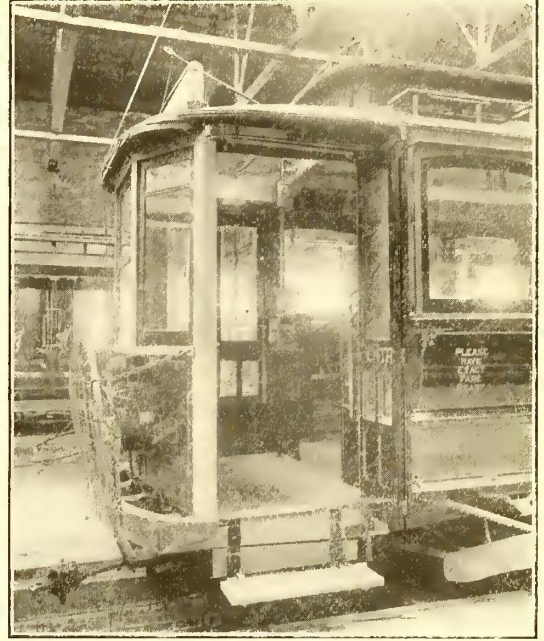
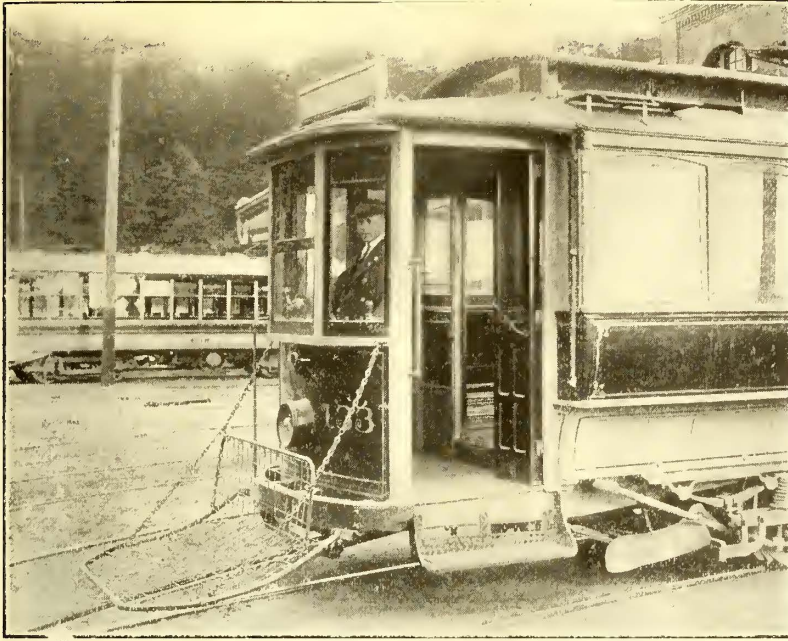
The doors of the single-truck cars are in two sections, the inside section being guided by a case-hardened steel roller, and the doors are arranged to fold outward and hang on 1-in. round steel rods. The outside door opening is 35 in., and the steps are each 2 ft. 7½



REMODELED PORTLAND CARS—INTERIOR OF RECONSTRUCTED SEMI-CONVERTIBLE CAR.



REMODELED PORTLAND CARS—INTERIOR OF SINGLE-TRUCK CAR BODY AFTER RECONSTRUCTION



REMODELED PORTLAND CARS—VESTIBULE OF SINGLE-TRUCK CAR BEFORE AND AFTER REMODELING

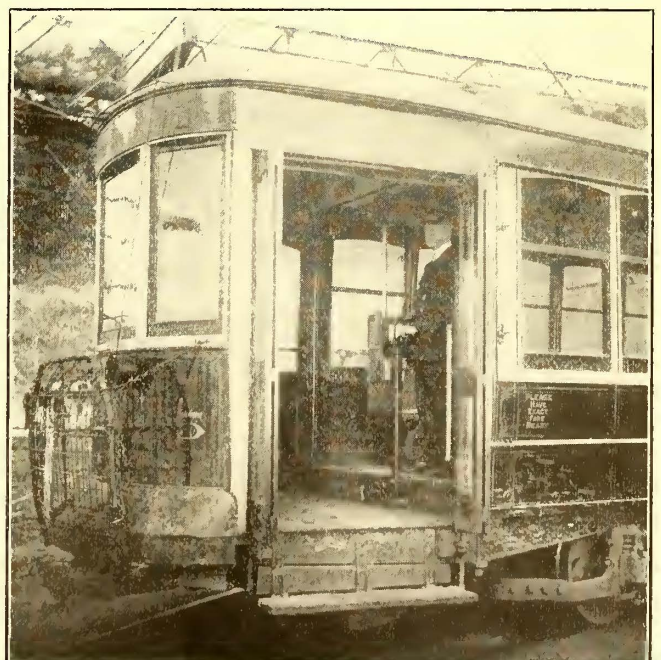
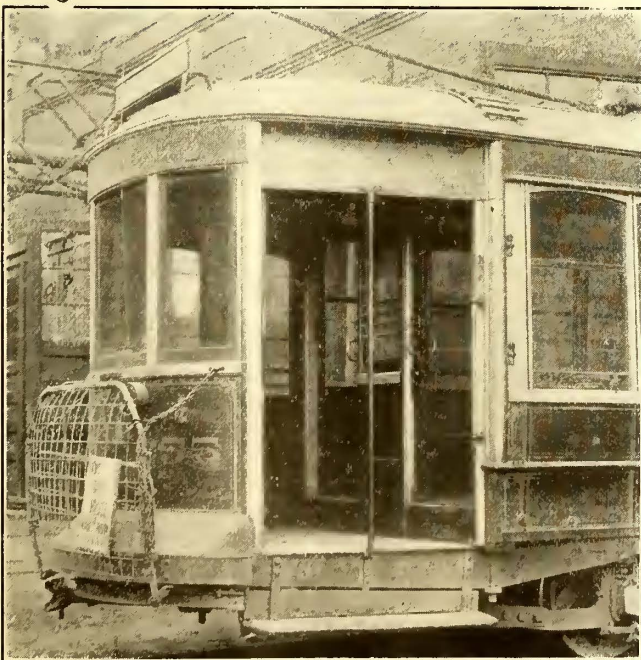
in. long, $9\frac{1}{2}$ in. wide, being hung from the sill by two wrought-iron hangers. All doors are rendered weather-tight when closed by the use of interlocking joints and rubber packing. Both exit and entrance openings are of the same width, and the doors are provided with three glazed panels each, two of the formerly-used lower blank panels being glazed to enable the motorman and conductor to see the conditions existing outside the step when the door is closed. Four grab-handles are provided in each vestibule, two of these having been added in the reconstruction.

On the 20-ft. cars the snow scrapers have had to be moved back about 8 in. and the drawbars lengthened about 5 in., with an offset of about $4\frac{1}{2}$ in. to clear the door and step-operating mechanism beneath the body. The steps when down are $13\frac{1}{2}$ in. above the rail, the platforms being 13 in. above the steps and the car floor $5\frac{1}{2}$ in. above the platform. Mason safety treads are

being used on all steps, which are made of $1\frac{1}{2}$ -in. birch.

The car interiors are lighted by five 23-watt tungsten incandescent lamps, and in the reconstruction work these lamps have been fitted with Ivanhoe-Regent shades. In addition, the interior lighting has been greatly improved by applying a coat of white enamel paint to the vestibule ceiling and to the ceiling of the car body proper, including the headlining. Also two 23-watt lamps are installed side by side in the vestibules, and these greatly facilitate alighting and boarding at night. They are mounted directly in line with the passageway from the car interior to the vestibule.

An improvement in effect on all the reconstructed cars is the provision of a motorman's curtain of striped canvas in each vestibule. On the 20-ft. cars the curtain occupies about two-thirds of the width of the vestibule when in service, at other times being folded back at the side and held in place by straps. The curtains



REMODELED PORTLAND CARS—LONG-PLATFORM, SEMI-CONVERTIBLE CAR AS ORIGINALLY DESIGNED AND AS CHANGED FOR PAY-WITHIN OPERATION

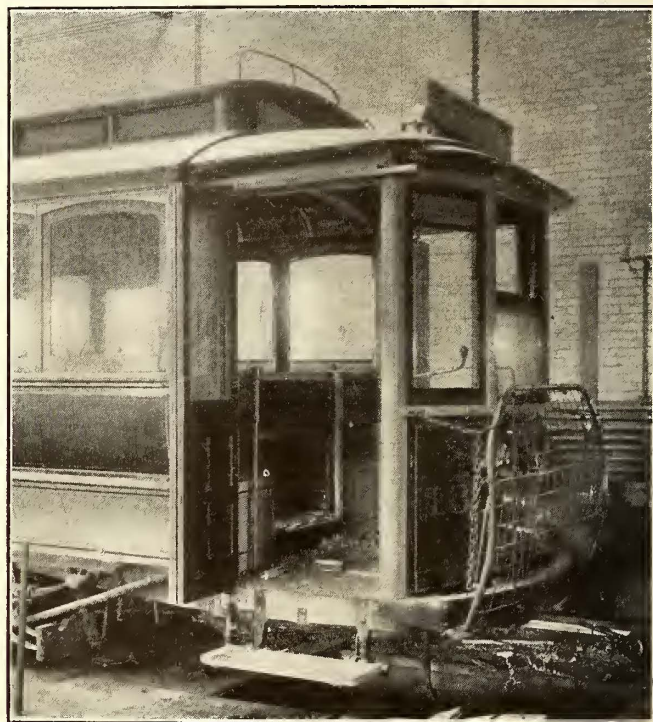
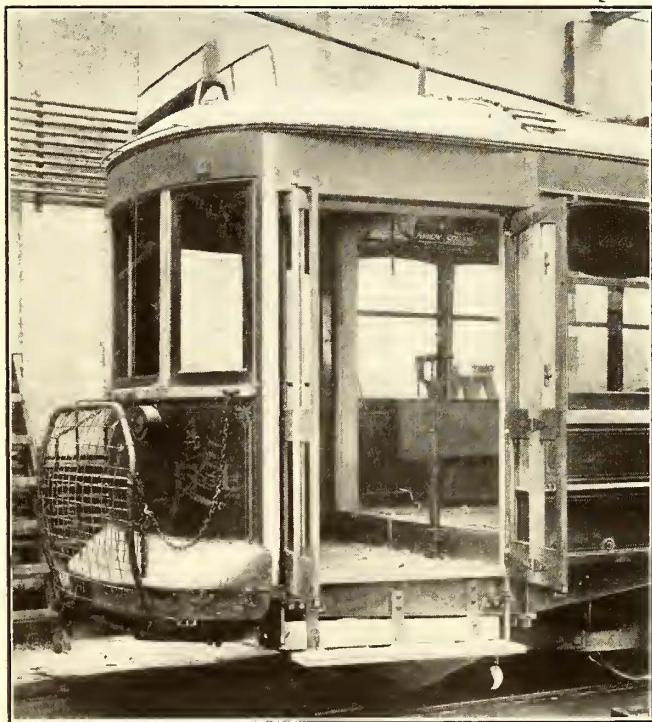
are hung on rings carried on a $\frac{3}{8}$ -in. curved rod, and they terminate at a height of 4 ft. above the floor, thus economizing in material and making their use more convenient for the motorman.

All cars are either retouched or repainted before being placed in service, and the work includes the necessary lettering for prepayment operation as well as painting to improve the diffusion of light within the car body.

Among the illustrations are views showing the vestibule of one of the double-truck, 28-ft. body cars and the vestibule of one of the semi-convertible cars before alteration. The removal of the bulkheads in these two types is complete, as before stated, and although none of the 28-ft. longitudinal-seat cars has been finished at this time, the interior view of the altered semi-convertible car gives an excellent idea of the improvement in both types resulting from the removal of the bulk-

the doors are not split in this way, but are fitted with new hinges and rubber stops. The two semi-convertible cars originally were equipped with folding steps, but these had never been used until the reconstruction made it necessary. In general, the control of doors and steps by motormen and conductors follows the broad lines of design described under the single-truck cars, with the difference that in the large cars the fare box, with one controlling stand, is located nearer to the center of the bulkhead arch than in the smaller cars.

All of the reconstruction work is being carried on by nine mechanics. Ordinarily two men work on the doors, four on the car bodies, and the others on mill-work and mechanical installation. Cars arriving at the shop are stripped of doors, bulkhead and old steps; the old doors are then rebuilt, including cutting down and the addition of new stiles. New headers, backing pieces and steps are gotten out, and the inside casing is fin-



REMODELED PORTLAND CARS—CONSTRUCTION VIEWS

head and bulkhead doors. The interior view of the vestibule of a reconstructed semi-convertible car also gives a good idea of the appearance of the two types when completed. In the semi-convertible type the exit door at the right of the motorman's position consists of a fixed and sliding combination leaving about one-half the opening for the use of passengers, but in the 28-ft. city type of box cars the doors are all of the same size and of the folding type.

The reconstructed semi-convertible car has an entrance door opening 4 ft. in width, and the width of the bulkhead arch is 6 ft. 4 in., the vestibule being 5 ft. 6 in. long and the step dimensions on the entrance corners 10½ in. x 3 ft. 11 in. The heights from rail to step, from step to platform and from platform to floor are respectively 18 in., 14 in. and 9 in.

The rebuilt 28-ft. box cars have a bulkhead arch 6 ft. 3 in. wide in place of the former door opening of 2 ft. 4 in. The steps will be 3 ft. long x 10½ in. wide, and the heights from rail to step, step to platform, and platform to floor will be 18 in., 15 in. and 8 in. respectively. For the 28-ft. cars the doors are sawed in two and fitted with new stiles in the alteration to the synchronously controlled type. On the single-truck cars

ished around the bulkhead location. The fare-box mountings are then put on, and the control stands and the door mechanism and step-operating rods beneath the car, which are furnished complete by the National Pneumatic Company, are installed by the forge and equipping departments. The openings that are cut in the door panels are then glazed and the car is painted so far as may be necessary.

In all types the seating capacity remains the same after reconstruction, but the removal of the bulkheads increases the standing capacity somewhat, and even the smallest cars remodeled are singularly easy of access as a result of the changes effected. No changes are necessary in the brake rigging. In general, also, the platform lengths remain as before alteration of the bulkhead opening.

The cost of the modifications, exclusive of the fare-box installation, is estimated to be not in excess of \$200 per car, or to approximate \$320 per car, including the combination fare box and register. The work is being performed under the direction of E. W. Elgee, master mechanic of the railway company, G. S. Brush being general superintendent of the railway department with headquarters at Portland.

Regenerative Braking*

In a Paper Presented Before the American Institute of Electrical Engineers the Author Has Explained in Detail the Advantageous Features and Limitations of Many Possible Methods of Obtaining Regeneration with Different Types of Motor, and an Outline of His Conclusions Is Given

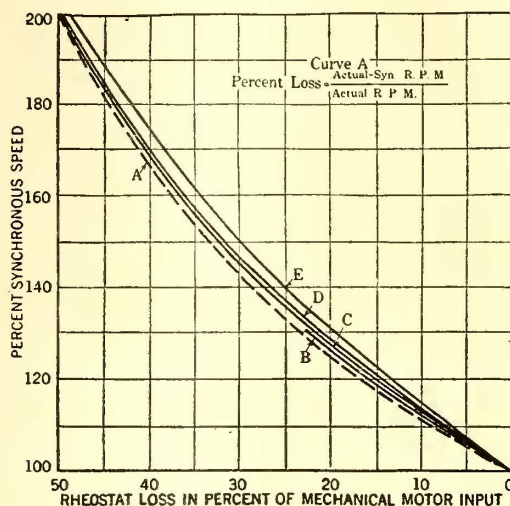
By R. E. HELLMUND

Westinghouse Electric & Manufacturing Company

IN view of the great efforts that have been made to reduce energy consumption by other means, it is rather surprising that regenerative control has not been used to a greater extent in the past. The only reason for this must be that the increased complication and decreased reliability have been considered as outweighing the advantages. With the present advanced state of the art this condition has changed, and although some difficulties have to be overcome with the various operating systems for electric traction, there is no doubt that ordinary requirements for reliability and safety can now be successfully met in spite of some additional complications.

REGENERATION WITH INDUCTION MOTORS

With regard to the provision of the regenerative feature on a three-phase propulsion system, it may be said that the induction motors that are there used will auto-



REGENERATIVE BRAKING—FIG. 1—RESISTANCE LOSSES FOR INDUCTION MOTORS AT SPEEDS OVER SYNCHRONISM WITH VARIOUS REGENERATIVE LOADS

matically give regeneration so long as they are connected to the line, whether or not such a condition is desired. Regeneration in this case does not introduce any complication whatsoever, and to obtain satisfactory results it is necessary only to provide electrical equipment of sufficient capacity to take care of the regenerative current. In case rotary converting apparatus is used in the system, a certain amount of danger is introduced by the possibility of such apparatus overspeeding if the main power supply is interrupted for some reason or other where there is a train on a down grade to furnish power for the converting apparatus. In such case the train may, of course, accelerate and increase with its own speed the speed of the converter.

The proper balance of the regenerative load between the different motors (in case of slight variations in wheel diameter) can be taken care of by the means provided for the same purpose during motoring. Some additional slight complication may be introduced whenever a locomotive is required to descend a grade with a train that involves tractive effort in excess of the locomotive's adhesion. In such a case the air brakes must be worked in conjunction with the regeneration of the engine, and since air brakes cannot be made to exert a uniform torque, it is necessary to introduce a variable resistance into the rotor circuit, which readily permits increases from synchronous speed to speeds of 5 m.p.h. or 10 m.p.h. higher. This involves a loss of energy through its dissipation in the resistance, but that the amount is within reason is shown in Fig. 1. This indicates the rheostat losses in regeneration, the curve A covering an approximate general rule while the curves B, C, D and E apply respectively to conditions where the actual torque is 75, 150, 225 and 340 per cent of full-load torque.

The increased tendency toward voltage variation that always exists with regeneration is of no great importance in connection with polyphase systems, because all parts of the system can easily stand a voltage increase for the short interval of time during which it commonly exists. In fact, an increase in voltage adds to the torque of the motors and does not impair the reliability of service. At times high voltage will unfavorably affect the power factor, but since it exists only at times of light loads this condition is of no great consequence.

The maximum braking torques are usually limited only by the slipping point of the wheels, since it is possible to keep the pull-out torque of the motors safely above this point. In fact, regeneration tends to bring about increased voltage and increased maximum braking torque, which is, even with equal voltage, larger than the maximum motoring torque, as indicated in Fig. 2. Here the curve A covers the condition where the rotor is short-circuited, while curves B, C, D and E apply to cases where the rheostat resistance is respectively three, nine, nineteen and twenty-nine times the rotor resistance.

Where slipping of the wheels is liable to occur it can easily be avoided by introducing automatic current-limiting or torque-limiting devices that prevent an increase in braking torque above the slipping point.

With the three-phase system, however, the possibilities for reducing the speed below the synchronous speed of the motors are either very limited in scope or necessitate the installation of cumbersome equipment, and their application in practice does not seem to be very likely in the near future.

The conditions prevailing with a phase-converter system employing a single-phase line and a phase-converter locomotive are practically the same with regard to regenerative braking as with the three-phase system.

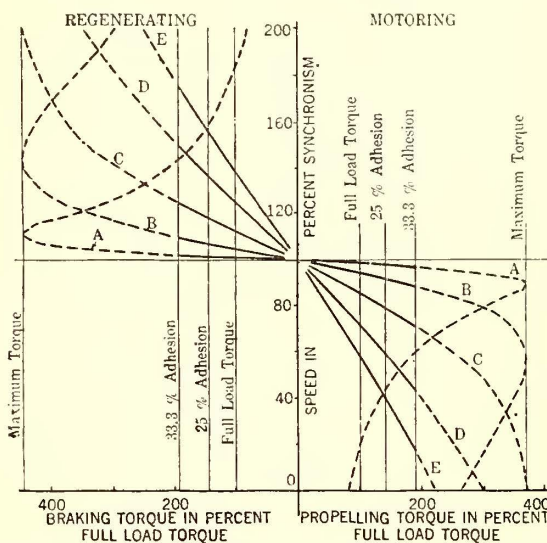
*Abstract of a paper delivered at the Pittsburgh meeting of the American Institute of Electrical Engineers Jan. 12, 1917.

This means that regenerative braking at synchronous speed or slightly higher may be accomplished with ease and safety and without requiring complication of any practical importance, but that the use of regeneration for retardation below synchronous speed is at present either limited in scope or complicated.

REQUISITES FOR DIRECT-CURRENT REGENERATION

The present-day direct-current railway motor lends itself less readily to regeneration than the polyphase induction motor. The series motor, which has generally been introduced in railway work on account of its superiority for propelling purposes, cannot, without additional apparatus, be used as a generator under railway conditions. It is too unstable. In consequence, separate excitation offers the most promising possibility for successful regeneration, even though the addition of a separate source of current for excitation introduces an undesirable complication.

Many different connections and methods of excitation and, consequently, many different characteristics for the generators are made possible by separate excitation.



REGENERATIVE BRAKING—FIG. 2—INDUCTION MOTOR CHARACTERISTICS FOR VARIOUS AMOUNTS OF RESISTANCE IN ROTOR GIVING VARIATIONS FROM SYNCHRONOUS SPEED

Before discussing them, six of the more important requisites for regeneration that have to be considered in all cases may well be outlined.

REQUISITES FOR DIRECT-CURRENT REGENERATION

The first of these requisites is the necessity for avoiding excessive armature currents, especially at higher speeds. With direct-current motors running as generators, high armature currents, even of very short duration, introduce a tendency toward flashing. This is caused by high voltage between commutator segments, the maximum value for which is largely determined by the distortion of the field by the armature current.

With a separately excited generator that runs at high speed with a fixed motor voltage, the field strength must be of necessity very low. But at high speed, and consequently weak field, relatively large armature currents are required to exert an appreciable braking torque under normal operating conditions. This will tend to maintain a material distortion of the weak field, and further increases in field distortion caused by sudden rises of regenerative current in the armature are very liable to lead to flashing. There are two principal causes for such sudden increases of regenerated cur-

rent. The first of these is the taking of steps in the control. The second and much more important cause is the tendency toward sudden changes in the line voltage. Hence it is very desirable to have such regenerative characteristics as will inherently avoid excessive armature currents.

The second requisite that must be met in all separately excited systems for direct-current regeneration is the question of relative ease or difficulty with which the motors can be connected to the line when regenerative control is desired. Automatic means for producing this result require relays that have to be very exact unless the system that is used is inherently such as not to require a very careful balancing of the voltages before the connections are made. This point is important in the choice of the proper system for regenerative control.

The third general requisite in connection with direct-current regeneration is that the regenerative load must be properly distributed among the various motors of the locomotive. For instance, a slight difference in the air gap of the motors, or a difference in the wheel diameters, will cause a very uneven distribution of load if the armatures of several motors are to be connected in parallel. A good system of regeneration, therefore, has to afford means for balancing the load fairly well between the various motors under practical conditions.

TORQUE-SPEED CHARACTERISTICS

The fourth requisite to be fulfilled is that the braking effect of the vehicle shall not materially decrease with increased speed, nor materially increase with decreased speed, in so short a time that the operator, in case of manual control (or the relays of an automatic control) cannot follow the changes. Sudden large changes of braking torque should also be avoided when changes occur in the line voltage. A case to be considered is that of a train that reaches a section of steeper grade and speeds up to some extent. If, in this case, the generator characteristics should give a decreased torque with the increased speed, the train speed will unduly increase on account of the combined effect of the increased grade and the decreased torque, and this speed increase may reach serious proportions before the engineer has a chance to readjust the control or the air brakes or both. Unfortunately, the desirable condition that the braking torque should decrease with decreased speed, and vice versa, cannot be combined with the machine characteristic that is best for the avoidance of field distortion and motor flashing. On the other hand, the characteristic that is ideal for flashing conditions involves a highly undesirable torque characteristic, and a compromise between the two has to be made.

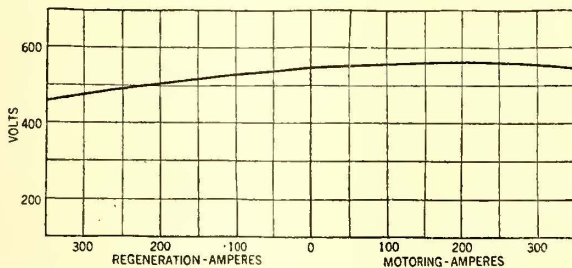
Still another requisite, the fifth to be considered in connection with the various direct-current systems, is the danger of over-voltage on the motors in case the power supply should be interrupted for some reason or other. The natural tendency with most systems fulfilling the previous requirements is, in case of power interruption, for the voltage of the generators to rise until saturation is reached, because the voltage is no longer limited by the line voltage. Since railway motors that operate at high speed as generators are always far from being saturated, it is quite possible to obtain voltage rises of two or three times the normal voltage, leading to flashovers and even to insulation breakdowns. Hence the inherent characteristics of the system should be such as to introduce a time element permitting the over-voltage relays to act before the over-voltage becomes excessive and dangerous. Unfortunately, it is also a fact that those systems which are the quickest to act in avoiding excessive armature current are

usually the ones which are most liable to set up over-voltages quickly in case of power interruption when running at high speed. It is, therefore, again necessary to strike the best compromise.

Finally, in the case of the sixth requisite to be met in connection with direct-current regenerative control, it is necessary to pay much attention to the proper characteristics for the auxiliary exciting apparatus in order to have the system free from troubles. The principal danger is that the auxiliary exciter set, especially the driving part, is subject to flashovers unless precautions are taken in that direction.

POSSIBLE SYSTEMS FOR DIRECT-CURRENT REGENERATION

Subject to the foregoing six general requisites it now becomes possible to discuss the principal characteristics of the source used for separate excitation and the consequent characteristics of the main generator. A great number of arrangements may be devised, but to most of these exist objections on the grounds of unsatisfac-



REGENERATIVE BRAKING—FIG. 3—TEST CURVE FOR STANDARD DIRECT-CURRENT RAILWAY MOTOR SHOWING RELATION OF VOLTAGE AND CURRENT WITH CONSTANT FIELD AND CONSTANT SPEED

tory characteristics. For example, the undesirability of an increase of field excitation with increased regenerative current has already been pointed out. Also, an inherent increase of excitation voltage with decreased line voltage is undesirable because a decreasing line voltage means increased regenerative load, and this load would, of course, be further increased if the excitation was raised at the same time. Practically constant excitation, which might be obtained, for example, with a battery, does not give very desirable characteristics with regard to the limitation of the armature current. Thus, if the line voltage drops suddenly, the regenerative voltage will be much in excess of the line voltage, and there will be practically nothing that will inherently prevent excessive currents. From the test curves of a medium-sized railway motor shown in Fig. 3 it will be seen that, with a voltage drop of only 10 per cent, the regenerative current increases 100 per cent and the ratio of armature to field current goes up in practically the same ratio.

An arrangement in which the excitation voltage varies in proportion to the line voltage provides a very satisfactory system for taking care of variations in the voltage of the line, but it is less so with regard to the steps of the control, because the speed-current and the speed-torque characteristics are essentially those of a shunt machine. Another handicap of this system is that, when the motors are connected to the line, excessive currents are liable to be set up unless the voltage balances rather exactly or unless other precautionary steps are taken, such as the temporary introduction of resistance into the circuit.

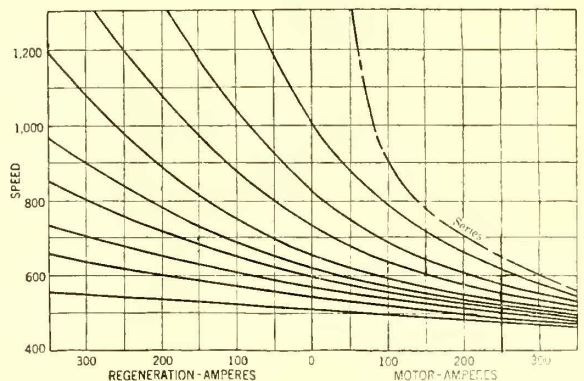
The type of system shown in Fig. 5, however, fulfills practically all of the previously enumerated requisites. In this system arrangements are made so that the sum

of the regenerative current and the field excitation current of each main generator passes through a common resistance. The circuits are further arranged so that the voltage of this resistance subtracts from the exciter-generator voltage to give the result in voltage of the main generator fields. With this arrangement, if the line voltage suddenly drops, causing an increase in regenerated current, it is evident that the current in the resistance must increase. The voltage of the resistance also increases, and since the voltage of the small exciter either is constant or is beginning to drop with the line voltage, it is evident that the main field voltage (this being the difference between the exciter and resistance voltage) must certainly decrease and cause the field current as well as the field to decrease. This gives a very quick readjustment and a desirable, negative-compound characteristic.

This system is particularly advantageous with regard to connecting the generators to the line. During tests generators have been put on the line with the no-load voltage regulated to 100 per cent higher than the line voltage, yet the maximum current obtained was well within permissible limits. The adjustment of relays, therefore, does not require any great degree of refinement. Also, since each motor has a separate compound effect the system will tend to distribute the load evenly between the motors.

SPEED RANGE FOR REGENERATION

This system, as well as those previously mentioned, are, of course, limited to a certain range of speed over which regeneration can be accomplished. The maximum possible operating speeds are usually limited only by the maximum operating speed of the vehicle, but the minimum speeds are given by the maximum possible saturation of the motors. It is evident that regeneration cannot be effected unless the regenerated voltage is slightly higher than the line voltage. If, therefore, the speed is such that even with fully saturated main fields a voltage above the line voltage cannot be induced, regeneration will be impossible. Since most standard railway motors are fairly well saturated at the one-hour rating, it is usually not possible to effect



REGENERATIVE BRAKING—FIG. 4—CHARACTERISTIC CURVES FOR VARIOUS CONTROL STEPS OF DIRECT-CURRENT REGENERATIVE SYSTEM SHOWN IN FIG. 5

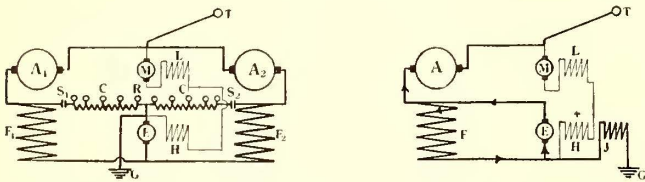
regeneration for speeds much below the standard hourly rating speed. The range of regeneration below this speed can be extended only by reducing the voltage across each motor. This may be accomplished in the same manner as during acceleration, by series-parallel control, or still further by parallel, series-parallel and series control.

The fundamental principles illustrated in Fig. 5 have been very successfully applied to series-parallel con-

trol during regeneration whereby the range for regeneration has been extended from the maximum speed down to about 40 per cent of the hourly-rating speed. The system has also been worked out for manual control with automatic maximum torque requirements, the same connections, without alteration, being used for motoring and regenerating, and one locomotive thus equipped has been in successful operation on the Lake Erie & Northern Railway for the last seven months. In this case no difficulties have been found with main-motor or auxiliary-motor flashing, nor have control failures of any kind occurred, although the operating voltage is 1500 with an occasional maximum of 2000 volts attained during regeneration. The line is 15 miles long and had only one substation at the center during the first four months of operation. [This regenerative scheme was described in the *ELECTRIC RAILWAY JOURNAL* for Oct. 7, 1916, page 730—EDS.]

MINOR FEATURES INVOLVED WITH DIRECT-CURRENT REGENERATION

Aside from the essential features to be met by an ideal system of control, a great many minor features have to be considered. Among other things it is, of course, desirable to keep the exciter as small as possible in order to reduce the first cost and weight. In this connection three different principles of excitation may be considered. One of them involves having the exciter



REGENERATIVE BRAKING—FIGS. 5 AND 6—SCHEMATIC DIAGRAMS FOR DIRECT-CURRENT REGENERATIVE SYSTEMS IN ACTUAL USE

carry the sum of the exciting current and the regenerated current, as shown in Fig. 6. This gives, of course, a very large exciter with large commutators and numerous brushes. The principal advantage of this system, which has been applied on the locomotives of the Chicago, Milwaukee & St. Paul Railroad, seems to be that it avoids the necessity of connecting the motors to the line as generators. The arrangement is such that the motors are connected to the line in the regular way, at first as motors. Subsequently the exciter is connected across the field and raises its excitation until the motor voltage overcomes the line voltage and regeneration takes place. This requires the manipulation of two separate handles and does not permit series-parallel control without interrupting the braking torque. The second general principle of excitation is that wherein the exciter set carries the field current only, giving an exciter of small current capacity. This principle is used in the system shown in Fig. 5. The third principle makes use of an exciter set carrying the difference between the field current and the regenerated current, which provides a further opportunity for reducing the average current in the exciter, but which involves disadvantages such as that the exciter works at times as a motor, this leading to difficulties with flashing in the driving machine.

A great many other possible systems for direct-current motors are available, even with the fixed voltages herein considered, and there are further possibilities for regeneration if motor voltage is made to vary from that of the line, this permitting regenerative braking down to zero speed. Such voltage variation is easily made

possible through the use of booster armatures connected in series with the main armatures and arranged so that the voltage subtracts from the line voltage. Booster equipments provide several advantages, such as the opportunity for acceleration without rheostatic loss, but there are numerous disadvantages that tend to offset this.

In general, it may be said that the result of regeneration upon direct-current lines may at times be rather disadvantageous with regard to fluctuations in line voltage. With low-voltage systems having a low density of traffic, voltage rises of 15 per cent above the maximum voltages otherwise obtained are not at all unlikely. Regeneration may also be disadvantageous where non-commutating pole apparatus is installed in existing substations. Such machines depend upon a certain shifting of the brushes to commutate successfully, and when the current reverses, the brush shift is in the wrong direction and rather bad commutating conditions will be obtained.

ALTERNATING-CURRENT COMMUTATOR MOTOR SYSTEMS

Since alternating-current commutator motors are always provided with cross field-winding to prevent armature distortion, and since they always have relatively low commutator voltage, the flashing difficulty is largely eliminated and the danger of over-voltage is minimized. The existence of a transformer on the car or locomotive makes variation of the voltage on the motor very easy, so that weakened fields at high speeds are not a necessity and regeneration at all speeds down to a standstill can be accomplished. On the other hand, additional problems are introduced because the characteristic of the regenerating voltage must be right, not only with regard to its size but must also be correct in phase. Another difficulty is to obtain proper commutating characteristics for all speeds during regeneration, this latter problem being generally identical with the commutating problem of single-phase motors during acceleration. A practical application of a system in which exciting current was furnished by an alternating-current generator was made on a locomotive built several years ago for the Midi Railway in France. This machine was equipped with only two large motors, one of which was used as an exciting generator for the other motor during regeneration. The system worked very satisfactorily, but was later abandoned by the railway company in favor of dynamic resistance braking because there was an abundance of water power available and because no saving whatever could be effected by the use of regenerated current.

The difficulty of connecting alternating-current generators to the line is materially reduced as compared to direct-current motors, because the inductive effect of an alternating-current system materially reduces the tendency toward current peaks. The introduction of a certain amount of compound characteristic by the means previously described will, of course, further assist in keeping down current peaks. As a rule, satisfactory commutation can be obtained in all cases during regeneration, although certain complications in the control may have to be introduced for this purpose.

[In Mr. Hellmund's paper no less than twenty-one different possible systems for regeneration were described and illustrated by diagram. Unfortunately, space limitations prevented the publication of these descriptions with the exception of the two most prominent, of which one displays the principle adopted by the Chicago, Milwaukee & St. Paul Railway and the other that installed on one of the Lake Erie & Northern Railway's locomotives.—EDS.]

A.I.E.E. Discusses Regenerative Braking

At the Pittsburgh Meeting of the American Institute of Electrical Engineers the Entire Session Was Devoted to R. E. Hellmund's Treatise on This Subject

THE 328th meeting of the American Institute of Electrical Engineers was held in Pittsburgh, Pa., on Jan. 12, 1917, under the auspices of the Pittsburgh section of the Traction and Transportation Committee. The session was called to order by President H. W. Buck, who introduced R. E. Hellmund, Westinghouse Electric & Manufacturing Company, as the speaker of the evening. Mr. Hellmund then gave a forty-minute abstract of his paper on regenerative braking for electric vehicles, which is published in condensed form on the preceding pages.

Robert Lundell, consulting engineer, New York City, opened the discussion by telling of some of the pioneer work with which he had been connected. In 1895 he experimented with a small compound-wound motor having two armature windings and two commutators. It was possible to connect the commutators of each motor in series or in parallel and thus he got great flexibility of control for regenerative purposes. He also described tests made in 1902 at Newcastle in which the regenerative equipment used 25 per cent less energy than the standard equipment. During the test he was acting as motorman and was following a car having the standard equipment. This car suddenly stopped and Mr. Lundell threw his controller to the braking position so quickly that the regenerated current exceeded the 200-amp. for which the breakers were set and they opened, thus destroying the braking effort and causing a collision, which, however, did not prove to be serious.

He had hoped to find in Mr. Hellmund's paper some actual data on the amount of energy saved, and gave some figures which showed that a regenerative equipment had accomplished a net saving of 30 per cent over the energy used by standard equipments. The tests showing this saving were made in Germany in 1906.

E. W. Alexanderson, General Electric Company, said the work that had been done on regeneration had proved the fundamentals he had laid down when he took up the work. These were that the proper dynamo to use where regeneration was to be accomplished was one having a volt-ampere characteristic which would give electrical stability, and a speed-torque characteristic which would give mechanical stability. He defined stability as a condition such that the result of a change would not tend to produce a greater change but would tend to reduce or resist the change itself. Several sets of curves were displayed to illustrate the mechanical and electrical characteristics of different motors with various methods of regeneration.

David Hall, Westinghouse Electric & Manufacturing Company, in his discussion emphasized the importance of designing the master controller so that both acceleration and regeneration would be established gradually, and that the transition from motoring to regeneration should be accomplished without opening the circuit. He said that the problems of control had been chiefly responsible for keeping out of practical operation most of the systems of regeneration except those on three-phase lines. A discussion written by R. E. Ferris, was then read in which it was pointed out that the improvements in railway motors had reached such a stage that it was necessary to provide for regeneration in order to go on with the work of making more efficient motors.

W. V. Turner, chief engineer Westinghouse Air Brake Company, said that regenerative braking would not replace air brakes, and that while regenerative braking is needed for economy, air brakes are necessary for safety. He pointed out that with regenerative braking and no air brakes it would take as many locomotives to take a train down a grade as to pull it up the same grade. In other words, the pusher locomotives could not be cut off after ascending a grade when a descent of a similar grade was to follow. He also showed that even if the helper locomotives were left on for regenerative purposes they would not be in the proper position in the train for braking since the proper pushing and braking positions were not the same. He said that the regenerative braking system should be so interlocked with the air brakes that, should the regenerative braking fail or should the speed tend to exceed that which would be safe for air-brake operation, the air brake would be automatically applied.

H. M. Hobart, of the General Electric Company, described in an interesting manner the history of the regenerative braking developments. He said that much of the early work was done in England, and that the first successes were attained there. Due credit, he said, should be given to Frank J. Sprague and E. H. Johnson for their pioneer work in the field.

F. R. Phillips, superintendent of equipment, Pittsburgh Railways, was then called on as representing the American Electric Railway Association. He said that car developments in recent years had caused reductions in the car weight of 45 per cent, and that electric railways had come to learn that this meant a material saving in their power bill. Consequently, the railways would look with suspicion on any plan which called for such an increase of car weight as those outlined at the meeting. Each ton added to the weight of a car cost about \$70 per annum for power alone.

As opposed to this view Prof. C. A. Adams, of Harvard, remarked that this extra energy necessitated by extra weight would be returned to the line during the braking. Following this a discussion by C. F. Fortescue was read. His plea was for the constant speed motor for heavy electric traction. This type of motor lends itself most readily to regenerative control and made it easier to maintain a higher average schedule speed. However, regeneration was possible on any system except those using mercury arc rectifiers.

N. W. Storer, Westinghouse Electric & Manufacturing Company, then read a discussion by W. B. Potter, General Electric Company, which took up the problems of d.c. regenerative systems, since, as he said, the a.c. problems had been pretty well solved. He called attention to the fact that a machine such as a series motor having good and stable characteristics, when worked as a motor, had poor and unstable characteristics when worked as a generator. He concluded saying that Mr. Hellmund's paper could be amended by saying that the developments of regenerative braking had reached a point where the new method of operation was of great commercial importance. Mr. Storer then discussed the subject himself, stating that the standard series motor must always be used on account of its inherently good motoring characteristics. The early experiments in regenerative braking had been unsuccessful mainly because the engineers were using shunt motors. Ways could be found of making the series motor more stable as a generator, and if it did give insufficient braking occasionally, with the air brakes there was nothing to worry about. In other words, air brakes should take care of the emergencies. By a series of curves he showed in a striking manner the economy of regenerative braking, at what speeds it was practical to use re-

generation and the amount of energy that could be saved.

Mr. Hellmund in closing the discussion said that the co-operation of the railway men with the manufacturers was essential in working out the problem, and that he believed that the railroads would come to see that the constant speed motor was what they want.

Electric Railway Transportation in Manila

C. N. Duffy Explains the Problems Which Differentiate Street Railway Service in the Orient from That in the Occident

C. NESBIT DUFFY, vice-president, Manila Electric Railroad & Light Corporation, who is now in the United States for a short stay, gave a very interesting talk recently to the editors of the *ELECTRIC RAILWAY JOURNAL* on some of the peculiar conditions surrounding the operation of the Manila electric railway system. Some of the most important points which he touched upon are given in the following paragraphs.



C. NESBIT DUFFY

In the first place it should be understood that the orientals had solved their transportation problems in a fairly satisfactory manner long before electric railways were even dreamed of. In Manila the very moderate requirements for local transportation was met by street rigs, principally of the two-wheeled variety, drawn by

native ponies. In Japan the jinrikisha met a similar need. When, therefore, the J. G. White Company decided to enter the transportation field in Manila, they found the population fairly well satisfied with the facilities for getting about. The company required a vision of the future development which modern railway equipment in Manila would bring about in entering this already occupied field. Now the city has a modern system which it supports reasonably well.

SPECIAL DIFFICULTIES HAD TO BE SURMOUNTED

One of the difficulties incident to the necessity for providing for two classes of the population is the division of the car space into first and second-class sections. This has been solved by dividing each car into two sections by means of a barrier, a suitable proportion of the space being reserved for each class of passengers. The practice is for the first-class passengers to enter and leave the front, while the second-class passengers use the rear.

A more serious matter is the safe operation of the cars in the narrow, crooked, congested streets. Not only are the streets narrow, but the sidewalks are correspondingly narrow at times, forcing pedestrians to walk in the roadway. The density of population in some parts of the city is also very great, resulting in crowding of the streets and the use of the roadways as playgrounds for children. In spite of these adverse operating conditions, the number of street accidents in Manila is very small, which fact is recognized by the population as very creditable to the native motormen.

Climatic conditions in this region are favorable for the transportation in some respects, but impose difficulties in others. While the average minimum temperature is about 72 deg. Fahr. and the maximum 88 deg., the rainy season extends for three months between

July and October, and the typhoons bring terrific winds with the rain. It is quite a problem to provide cars which will be comfortable in respect to temperature and at the same time provide protection from the typhoons. During the storms the wind also causes obstruction of the track by blowing down branches of trees, and interference with power transmission. In spite of these special difficulties, however, the company is able to maintain reliable service by adapting its equipment to the local needs. The entire train force is recruited from the Filipino population with the exception of the superintendent and assistant superintendent of transportation. Many of the men have been in service since the road was opened in 1905, and as operators they compare favorably with motormen and conductors in cities of the United States.

A rather peculiar situation faced the company in connection with the eating habits of the natives. The Filipinos are small but active, and they make excellent linemen as well as platform men. However, they are inclined to eat at all times of the day, and have a fondness for sweets. The management realized that good food is the basis of good service and accordingly made provision for a company restaurant. This was particularly needed in the rainy season. Accordingly a section of a carhouse was fitted up for restaurant purposes and leased to a Chinese at a nominal rent. The company controls the standards of service and food, so that the men now get excellent food under proper conditions and at reasonable rates. This restaurant is operated twenty-four hours a day every day in the year.

TRANSPORTATION COMPETITION IN MANILA

There are more automobiles in Manila than in any other city in the Far East, including quite a number in public service. In addition there are the pony-drawn rigs already referred to. The total number of street rigs competing more or less with the railway is about 4000, and these are estimated by the company to have carried 17,000,000 passengers in 1915. This total is about the same as the electric railway business. The street rigs will accommodate about three times as many persons as can be seated in the street cars. The street rigs are estimated to have collected in fares in 1915 about two and one-half times as much as the railway. These estimates are made by the railway management partly on the basis of the taxes on receipts paid by the street rigs.

The street rigs vary in size from the two-wheel vehicle seating two persons to buses seating twenty or more. The municipality prescribes the rates which can be charged for rigs. By the hour the charge is 40 cents in gold for first-class, and 20 cents per hour for second class. The drivers will haul single passengers for less than a mile for 5 cents gold and from one to two miles for 10 cents, additional passengers being carried at reduced rates. The average fare per passenger is probably about 10 cents.

In comparison with the fares charged by the street rigs, the railway fares are as follows: The first-class cash fare is 6 cents, ticket fare is 5.5 cents. The second-class cash fare is 5 cents and the ticket is 4 cents. A 3-cent fare without transfer privilege, a voluntary concession by the company, is accepted up to 7 a. m. The average fare per revenue passenger is approximately 4 cents, and with transfer passengers included approximately 3 cents. All of these fares as quoted are in gold.

At present about one-half of the cars are of the open type, but the preference is for closed cars. The reasons for this will be clear from the statements already made and also when the difficulties of fare collection are considered.

The company is using every opportunity to utilize its equipment efficiently. Bi-weekly company confer-

ences of officials and department heads are held for the purpose of discussing general problems, and in the intervening weeks departmental conferences are conducted with special attention to details.

The joint company section of the American Electric Railway Association and the National Electric Light

Association is of great value in promoting a company spirit. The section in Manila has now 118 members and is doing excellent work along educational and constructive lines, as is evident from the reports appearing from time to time in the columns of the ELECTRIC RAILWAY JOURNAL.

Maintaining a Continuous Property Inventory

Such a System Makes Value Figures Readily Available for Various Uses—Substitutes Facts for Guesswork in Figuring Operating Costs

By HAROLD BATES

Assistant Construction Engineer The Connecticut Company, New Haven, Conn.

THERE are very few electric railways on which improved methods and decreased annual expenses could not be secured if sought for in a scientific manner. The first step, for any company that desires to increase its efficiency, is to determine where and how inefficiencies exist. This necessitates true cost figures that can be analyzed and compared. In calculating such costs, however, interest on the investment and depreciation must be considered, these in turn being based on a knowledge of the detailed property investment or value. It is thus evident that a system which will maintain and show at all times the detailed property value is of the utmost importance in the study of the efficiency of electric railway operation.

BENEFITS OF A CONTINUOUS INVENTORY

In general, the benefits to be derived from the institution of such a system as indicated above, *i.e.*, a continuous inventory of railway physical property, may be classed under two general headings:

1. The ready availability of the figure for the value of any part of the property, and the actual time saved in looking it up, when such information is required for insurance, rate cases, issuance of securities, check on renewals, reports to utility and tax commissions, etc. In this way the inventory is in itself efficient.

2. The substitution of facts for guesswork in the figuring of all operating costs, because of the availability of detailed property values. In this way the inventory is essential to increased efficiency in operation.

PRESENT PROPERTY RECORDS ARE INEFFICIENT

The property records, as they are now kept by most companies, are not efficient in furnishing information for the various purposes outlined under the first heading. In connection with all early acquired or constructed property many companies have very meager records, or records not classified in any detail by accounts. In such cases it has been necessary to make an appraisal in order to determine the value of property units, but after this the values of the various units have not been maintained up to date. An inventory has been lacking, and it has been necessary to hunt through records of expenditures to determine what, if any, changes have occurred in the property since the date of the appraisal.

The property records of later and present-day work are, of course, in more nearly complete form, and the actual cost will usually be found distributed by account numbers under a work order or authorization-for-expenditure number. Such records have their shortcomings, however, for it is sometimes found that when the

cost of a certain section of the property is desired, this section represents expenditures under a number of orders or authorizations. On the other hand, it may represent only a part of the property covered by one authorization. In such cases the amounts shown have to be added or separated, as the case may be, before the desired figure can be ascertained.

Yet, even if the existing records as maintained by the accounting department were complete and covered the property section desired, there would still be an essential difference between such records and a perpetual inventory. In the former case the property would be recorded by the dollars and cents expended to produce it and would be classified in certain general groups. In an inventory, however, the property would be recorded and classified by the units that are usually dealt with in practically all problems pertaining to railway operation. For example, to find the cost of a power-station building, it is necessary under the present methods of accounting first to determine how many authorizations for expenditures were issued which included items entering into the makeup of this building, and then to pick out and add such items. In a continuous inventory, this building would be maintained as a unit, its total value being corrected as additions and betterments and retirements were made. The old questions—"How much does this expenditure cover?" and "Are you sure that all expenditures have been included?"—are not necessary when one is looking up property in an inventory, as values are recorded by the units of property usually called for.

A continuous inventory system, such as that outlined in the 1916 report of the engineering-accounting committee of the American Electric Railway Association, would, if adopted in full, obviate all of the foregoing defects of the present method of handling property records and would show at any time the various kinds of property in detailed sections, as well as the value, up to date. By full adoption of the inventory system is meant the inventorying of the entire property, the appraising of those parts for which there are no cost records and the segregating of all values into the desired sections and units. If a company does not desire to undertake the expense of an appraisal at once, the continuous-inventory system may still be adopted, for the time being, for the property whose costs can be taken from the records and for all new and renewed property as the authorizations are completed. All unrecorded property can then be gradually appraised, either as it is affected by additions and betterments or at a certain rate of so much a year.

With such records available as are provided by a

continuous inventory, it is a simple matter to furnish the information regarding physical property that is called for in many of the reports to utility and tax commissions. The New York State Tax Commission especially calls for this information in such detail that some form of inventory is becoming necessary. The desirability of such records in connection with applying for rate increases, furnishing information for security issues, determining the amount of insurance to be carried and the adjustment for fire and other losses, making sales or purchases of property, etc., is obvious when their availability, adaptability and accuracy are realized.

AID IN CALCULATING OPERATING COSTS

Although a continuous inventory is efficient in itself in furnishing information for use along the foregoing lines, its greatest importance lies in its use in connection with the calculation of operating costs, as mentioned before under the second heading. It is, of course, essential in any railway property to know not only the total net income, but also the net income from the various revenue-producing divisions and departments so that any losses and inefficiencies may be ascertained and properly handled.

Take, for example, the operation of park property. This class of property is primarily operated as a traffic inducement, but is it not desirable to know definitely how much money is being made or lost in this operation, so that studies may be started to make this property in itself a better producer of net revenue as well as a traffic producer? Unless the railway official knows the value of the power station in park service, how can he ascertain the true cost of power used, which must include interest and depreciation on the property? Unless he knows the value of the park property, how can he find out its true operating costs, covering interest and depreciation? Without such true costs, how does he know that the park property is not losing more money than is made by the increased traffic?

Should not interdepartmental charges for power, shop repairs, etc., include interest and depreciation charges in order that the relative efficiencies of different departments may be known? Is any company sure that some of its shop work cannot be done cheaper by an outside concern, unless it includes in its costs the same charges that are included in work done outside?

Moreover, an electric railway doing an express business should know definitely how much this department of the business nets, and whether or not it might be better to devote the facilities and power used for express service entirely to the conduct of passenger business. To know this it is necessary that the entire value of property used exclusively and in part for the express business be ascertained, and that all proper interdepartmental charges be set against this business.

Furthermore, in calculating the cost of rush-hour service, it is essential that the property necessary for this service, over and above that necessary for regular service, be known definitely in order that accurate costs may be secured. From many present-day records this splitting up of property values is a difficult task and will probably, at least in part, be an estimate.

SHOWING DEPRECIATED VALUES

The continuous-inventory system outlined by the 1916 engineering-accounting committee provides for the showing of depreciated values on all property. To do this it is necessary that the rates on all different classes of property—and they vary considerably—be set up and available for ready application. There has been some objection to the practice of carrying depreciated values

in the inventory, but there are many reasons that make it desirable.

No insurance company, for instance, will cover more than the present value of property, but to know that all property is properly covered by insurance it is necessary for the railway to have first-hand information regarding such value.

Moreover, in checking tax assessments and appearing before municipal and town authorities for adjustment of assessments, companies will find that depreciated values are essential to substantiate any contentions. The New York State Tax Commission requires that such values for all physical property be shown in detail in reports to it.

With the age, depreciation and present value given for all property units as listed in the inventory, valuable information is also at hand for determining the proper sums to be set aside to cover depreciation and for disclosing where replacements are urgent or likely to be necessary in the near future. With such information it becomes possible to forecast accurately what the maintenance costs should be for succeeding years. By calculating the weighted age of property units, it is possible to interpret the maintenance accounts with greater accuracy. Detailed units costs on both construction and maintenance work can be calculated and compared, thereby giving more information for checking efficiency.

SEPARATE DEPARTMENT IS NEEDED

The work of maintaining an inventory is more an engineering than an accounting matter. There are no involved accounting problems in maintaining an inventory ledger, but engineering knowledge or familiarity with the physical property is essential to maintain the unit values on the ledger. As the work is joint to a certain degree, however, better results would in all probability be achieved by not allying it with either the engineering or the accounting department. Since the co-operation of all departments is absolutely necessary for the proper handling of the work, it seems most desirable to establish a separate inventory department and to put the other departments all on a par in their relations to it. The man in charge of the inventory work should have a certain practical knowledge of engineering and accounting and at the same time be more or less familiar with the physical characteristics of railway property.

Efficiency is not gaged by the amount of money expended but by the results achieved from such expenditure. I believe that the institution of a continuous-inventory system on any property would result in beneficial achievements along the lines pointed out to such an extent that it would be pronounced a long step in increased efficiency.

If the transfers printed by the United Railways of St. Louis, St. Louis, Mo., and given to the public were placed end to end in one year, according to the *United Railways Bulletin*, they would reach around the world and would then lap over from St. Louis to New York. These transfers, a fraction more than 6 in. in length, would stretch a distance of approximately 25,000 miles. The company prints and gives to the traveling public an average of about 22,000,000 transfers each month in the year. The winter average is around 20,000,000 monthly, while in the summer the number runs up to 25,000,000 for some months, August being the largest. About fourteen carloads, or 700,000 lb. of paper, are used annually in printing the transfers, in the company's own finely equipped shop, under the direction of J. Guy Robertson, superintendent.

MID-YEAR MEETING
BOSTON
FEBRUARY 16, 1917

ASSOCIATION NEWS

MID-YEAR MEETING
BOSTON
FEBRUARY 16, 1917

In Preparation for Inauguration of Joint Company Section of Four National Societies Toledo Company
Outlines Organization as Charted Below—New Publication for Public Service An-
nounced at Newark Meeting—Other Sections Active Also

Manila Section Elects Officers

At the twenty-third monthly meeting of joint company section No. 5 held on Dec. 5, in Manila, the results of the annual election were as follows: President, F. P. Santiago, assistant claim agent; vice-president, J. W. Earle, assistant to auditor; secretary, M. E. Chavez, chief clerk commercial department; treasurer, W. A. Seten, sales agent; director for four-year term, C. Keese, superintendent of transportation.

In addition to the election three applicants from the transportation department were elected to membership and the president announced that at the January meeting medals would be awarded for the best three papers presented during the year 1916. The transportation department orchestra furnished music during the evening and a game of volley ball was played between an all-Filipino team from the electric department and an all-American team from all departments. The American team won by a narrow margin.

Toledo Section Organizing

Henry Friede, secretary of the joint company section which is being formed on the property of the Toledo Railways & Light Company, Toledo, Ohio, reports that the organization will be perfected at a mass meeting to be held next Tuesday in the Newsboys' Auditorium in

that city. The section will be devoted jointly to the interests of the American Electric Railway Association, the National Electric Light Association, the American Gas Institute and the National District Heating Association. The tentative organization plan which has been worked out is shown in the accompanying diagram.

The program for the opening meeting comprises addresses by G. B. Muldaur, field secretary N. E. L. A., and Martin Schreiber, engineer maintenance of way Public Service Railway, Newark, N. J., chairman of the American Association committee on company sections and individual membership. A new musical organization, composed exclusively of company employees and appropriately named "The Rail-Light Band" will make its first public appearance.

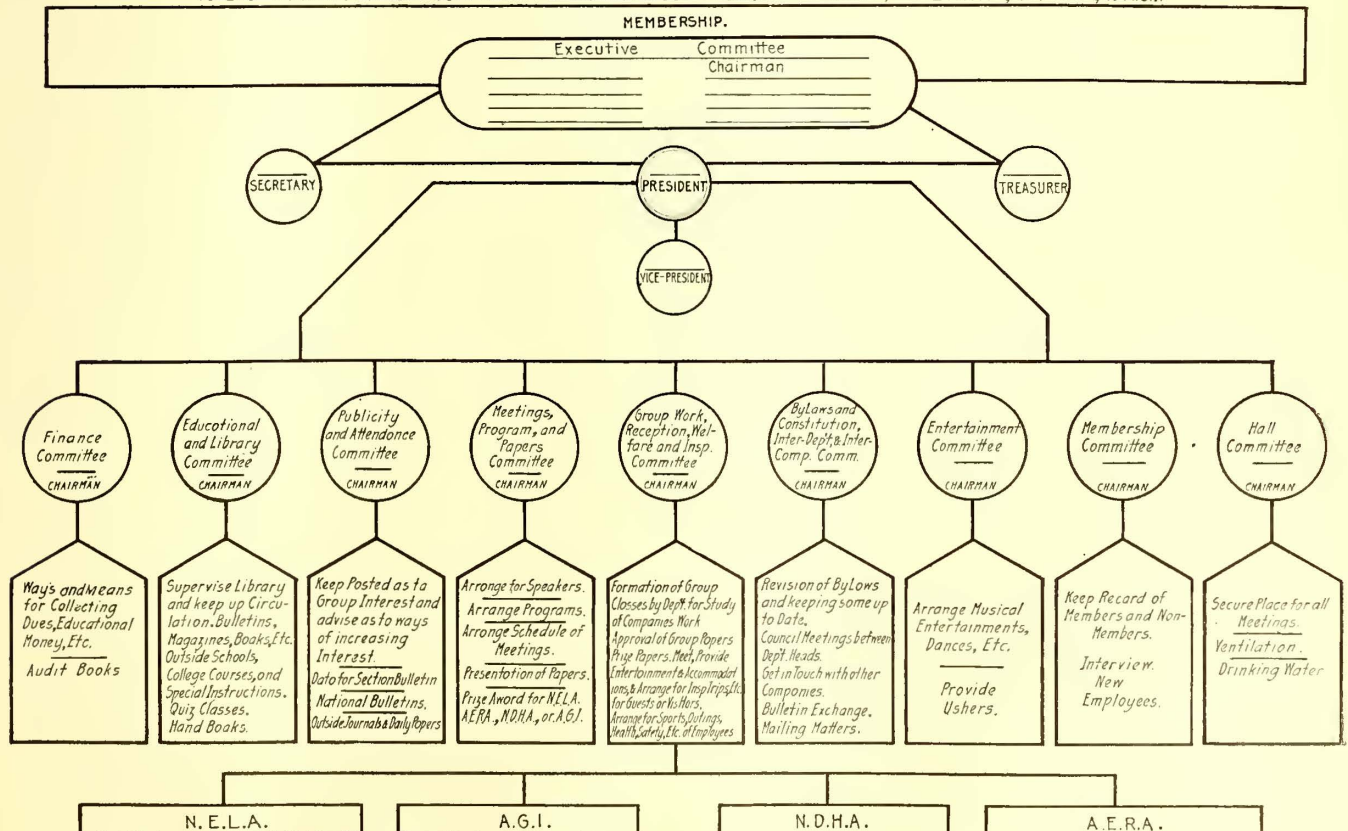
The spirit in which the new work is being undertaken is indicated by the following quotations from Mr. Friede's report:

"In this undertaking we shall succeed because we are pinning our fate to a very good slogan which has been in use by a small mid-western city for some time, namely 'The dern fool didn't know it couldn't be done, so he went ahead and did it.' There are several very good reasons why we are trying to consolidate the work, the most important being that we have a property which provides railway, gas, heating and electric service to a large and ever-growing community. We believe that any educational movement, such as the one under-

TENTATIVE

ADMINISTRATIVE CHART

TOLEDO RAILWAYS & LIGHT COMPANY.— CONSOLIDATED SECTION — N. E. L. A., A. E. R. A., N. D. H. A., & A. G. I.



taken, should cover as far as possible the entire property and we shall not stop until success in great measure has crowned our efforts.

"Beyond all doubt one of the greatest benefits possible for the future is that which will come through a proper understanding of the company's general affairs by its employees. We firmly believe that the improved departmental relationship and the better individual feeling we have always hoped to obtain will come largely through a progressive and enthusiastic educational movement. We are all very enthusiastic about the proposed plan and believe that it will lead us into brighter and better paths for the future."

Washington Ry. & Elec. Co. Section

MEETING COMPANY SECTION NO. 4---A. E. R. A.
MONDAY, JANUARY 8th
 231 FOURTEENTH STREET NORTHWEST
 8:00 O'CLOCK P. M.

AN INTENSIVE STUDY OF
SAFETY FIRST!
 By OFFICER WILLIAM S. SHELBY
METROPOLITAN POLICE FORCE
Officer Shelby has specialized for years on this subject, and is an attractive and forceful speaker

FOLLOWED BY FIVE-MINUTE DISCUSSIONS BY

G. A. LYON, <small>Editor of Safety First Movement Of the Washington Star</small>	MAJ. ROBT. U. PATTERSON <small>American Red Cross Society</small>
MAJ. RAYMOND PULLMAN <small>Metropolitan Police Force</small>	WM. F. PEABODY <small>President, Washington Safety First Association</small>

DR. JOHN VAN SCHAICK
President, Board of Education
OR HIS DEPUTY

SPECIAL FILMS SHOWING
TRAFFIC CONDITIONS IN NEW YORK CITY
 WILL BE SHOWN

REFRESHMENTS

J. T. MOFFETT, President
R. A. VETTER, Secretary

The reproduction of a large poster used in advertising the January meeting of Company Section No. 4 gives the story of the meeting in a nutshell.

Public Service Section

At the meeting of Company Section No. 2, held in Newark, N. J., on Jan. 18, the principal speaker was Percy Ingalls, secretary Public Service Railway. He gave "A Few Impressions of England in War Time." J. L. O'Toole, publicity agent, made the announcement that the first issue of *The Trolley Wheel*, the employees' magazine of the company, was on the press and would be out within a few days. Its purpose is to furnish a medium of communication among the men and to constitute a popular history of the development of the property. Secretary F. J. Davis reported the receipt of eight applications for membership, and Chairman A. T. Warner stated that this brings the membership to 453.

Mr. Ingalls' talk was based upon a trip which H. C. Donecker and he had made to England last summer. His description of the Zeppelin raids, the training camps, the precautions for safeguarding the country, the substitution of women workers for men, etc., gave his hearers a vivid picture of conditions in a country at war. The visitors saw much of Sir Albert Stanley, a former official of the company, and one of the most in-

teresting parts of Mr. Ingalls' remarks was that in which he paid a tribute to this railway man who now plays such an important part in England's share of the war.

F. W. Doolittle Speaks in Milwaukee

At the meeting of company section No. 1 held on Jan. 11 in Milwaukee, F. W. Doolittle, formerly head of the bureau of fare research of the American Association, read a paper on "Some Phases of Our Fare Case." He gave a digest of the several fare cases in which the company had been involved and also analyzed the elements of the present case. He took up among other topics the eight-hour question and the increases in the costs of commodities contributing to the present high cost of living.

Mr. Doolittle was followed by A. D. Schwenke of the accounting department who explained the work done by that department and showed how this work is facilitated by the use of the latest labor-saving devices. He used lantern slides to explain the workings of the several devices and statistics to demonstrate the savings which have been secured. A lively discussion followed the presentation of this paper, covering the topics brought up by both speakers.

Other features of the program were several piano duets by W. C. Bolt and W. W. Cook, active members of the section, and the distribution of the regular "Review of the Technical Press." Sixty-five members attended the meeting.

Cost of Bus Operation Soars

Increased costs for motor bus operation due to the European war average considerably more than 100 per cent, according to a report sent out by the Fifth Avenue Coach Company, operating principally on Fifth Avenue, New York, on a 10-cent fare. The company says:

"When one considers that in some cases the increase in price amounts to more than 300 per cent and many times to more than 200 per cent it is not to be wondered that a quietus has been placed on jitney buses and that public transportation lines throughout the country are feeling the high cost of living.

"Some of the most noticeable increases in the cost of raw materials are in the electrolyte used in the lighting batteries, which has risen 388 per cent; aluminum, which has risen 248 per cent, and sheet brass, 188 per cent. Gasoline, which is consumed by the buses by the carload, has doubled in price. Strangely enough, green paint, which is the official dress of the big double-deck buses so familiar to New Yorkers, has had the smallest proportional advance of all the materials necessary to bus operation—only 9 per cent."

Buenos Aires and Tigre Connected by Electric Lines

Tigre, a popular pleasure resort 27 miles from Buenos Aires, was recently linked more closely with this city by the electrification of a suburban railroad. The road belongs to the Central Argentine system. The main power plant, located near Tigre, generates current at 20,000 volts, which is distributed through underground cables to substations which supply the trains by means of a third-rail. The coaches are connected in units of two, consisting of a motor car and a trailer. Two units make up the standard train, although more may be used. The steam railways have been running from thirty to fifty trains daily between these two cities according to the *Bulletin* of the Pan-American Union.

COMMUNICATIONS

Tributes to the Memory of Henry Gordon Stott

INTERBOROUGH RAPID TRANSIT COMPANY
NEW YORK CITY, Jan. 16, 1917.

To the Editors:

It has pained me extremely to learn of the death of Mr. Stott. In his death the company has lost an invaluable officer, in whose judgment and integrity it had the greatest confidence. His pre-eminent ability was universally recognized. His personal character was such as to endear him to all who knew him.

THEODORE P. SHONTS.

NEW YORK CITY, Jan. 18, 1917.

To the Editors:

The death of Henry Gordon Stott is a great personal loss to hosts of friends and acquaintances who had been drawn to him and who esteemed him most highly. He had all that was necessary to inspire admiration, command respect, and win friendship in the wide circles of professional, business and social life in which he mingled. A sterling character, a well-trained and balanced mind, evincing marked strength, originality and individuality, animated by the spirit of progress and of growth, controlled by a judicial temperament, sweetened by great kindness of heart and amiability of disposition, sustained by the desire to give help, do a favor, or cause pleasure to all with whom he came in contact—these were some, though not by any means all, of the prominent traits and characteristics of the man whose loss is mourned.

Beyond this zone, composed of those with whom Mr. Stott came in personal contact, there is a still greater zone, reaching out to great distances in the widest circles of professional work, in which the death of Mr. Stott will also be felt and regretted. The same qualities of mind which had endeared him to his friends and commanded their admiration, availed him in the important part which he played in the evolution and development of the art of generating electric power on a large scale in central stations. His career as an engineer showed that he possessed quite remarkable powers of adaptability and assimilation. It is most interesting to note that while his early technical training was specially directed to and his experience was obtained in the particular field of electrical engineering in which electrical energy is generated and handled in most minute quantities and by the most delicate methods, namely, the field of ocean-telegraphy, he found his way, by successive stages, into the field where electrical energy is generated and handled on the largest possible scale. In this larger field he witnessed a rapid growth from methods of electric power generation of relative crudity and woeful disregard of economy, to methods of the most scientific character, designed, operated and controlled with the most minute care and the highest scientific precision. It is precisely here that his early education and especially his high respect for methods of accurate measurement proved most useful elements of his professional success. He had so well learned to understand and to appreciate the importance of economy when dealing with the receiving and distributing end of electric power circuits in which the greatest care was taken to save fractions of a per cent of energy by eliminating or reducing losses, that he appreciated and realized, perhaps better than any other power station engineer, the benefits which might be derived from the applica-

tion of similar methods of careful, painstaking precision at the very point where by far the greatest loss occurs, namely, in the boiler room.

The electric railway industry will owe him a debt of gratitude for having emphasized so often and so strongly as he did the importance of boiler room economy. The important contributions of Mr. Stott to the development and improvement of distribution systems, especially in connection with the use of high-tension currents in cables, are overshadowed by his important contributions to the problem of cheapening electric power. The importance of low cost of power generation and distribution in the electric railway industry brought the work of Mr. Stott into well-deserved prominence, which was all the greater because the electric traction system of whose power supply he had charge was the largest in the world. It may be said that he was, perhaps, the greatest contributor of his time to the important science of central station economics. This was realized by many of his colleagues while Mr. Stott lived. Some of us did not hesitate to give him credit for his valuable efforts in this field. I am very glad to realize, at this time, that Mr. Stott's work received at least a certain amount of appreciation during his life. I find great satisfaction in being able to quote, from the Transactions of the American Institute of Electrical Engineers, the following extracts from remarks made by myself, with reference to some of Mr. Stott's epoch-making papers:

"I think it is safe to say that if it were not for the fact that electrical engineering as an art has made so much progress there would be as much blundering and empirical work in the use of coal and in the generation of power generally as there was in the good old days of the so-called age of steam, fifty years ago, which preceded the electrical age, or before electricity or electrical engineering came on the scene. It was the electrical engineer who first learned to measure power systematically and correctly. It was he who first made general use of instruments of precision inside a power station, and, after he had made a great success with his methods of precision-measurement in his own department, in the dynamo room, he found it desirable to go into the boiler room and repeat the same success there, in doing away with the old, crude, rule-of-thumb methods. Mr. Stott himself was one of the first men who preached that doctrine after having practised it himself with very gratifying results; and the men who are following his example are precisely the ones who are in the front rank as experts in power station management and economy."

* * * * *

"I consider that the Institute is to be congratulated again in having a paper of this kind from Mr. Stott. It is especially to be congratulated upon the fact that all of Mr. Stott's papers on central station economies have been read before the Institute. You do not appreciate that now so much as you will a few years from now, when you look back and see the evolution of central station economics and come to realize that Mr. Stott is the man who really put the matter on a sound basis. Some of his papers will then be recognized as classics, and we will appreciate their value. A few years hence engineers will look upon Mr. Stott's papers with the same high respect that is shown the classic writings of Rankine."

I dare say that if Rankine himself were alive to-day he would be the first to indorse this tribute of praise to a great American Scotchman, just as he would be overwhelmed by the marvellous improvement in boiler room efficiency which has been attained since his day.

Every central station engineer who had heard of

Mr. Stott, and of his magnificent work in the development of central station economy, will feel as do his friends and admirers, that the world has sustained a great loss, and that it is a great pity that he could not have been spared to continue the series of brilliant investigations and the development of the new ideas in central station design and operation to which he had devoted so much thought and study in recent years.

C. O. MAILLOUX.

UNIVERSITY OF ILLINOIS COLLEGE OF ENGINEERING
URBANA, ILL., Jan. 17, 1917.

To the Editors:

Henry G. Stott was best known to mechanical engineers for his work in power plant design and operation. His perfect familiarity with the details of his problem as an operating engineer and his ability to see with a prophet's vision the tendencies of present-day practice gave potency to his statements concerning the power plant. For example, it was his belief that we have not yet supplied the fire room with all of the facilities or with the degree of attention that it should have. Not long ago, in discussing power plant economies, he predicted that the time would come when owners of power plants would be willing to pay more to the man who operates the boiler room than to the man who operates the engine room or the turbine room because of the greater opportunity of the man in the boiler room to effect economies in operating.

While his immediate interest was in the operating of plants, he was never content to follow, without questioning, the easy road of established practice. His opinions were formulated judgments, not intuitive decrees.

I first came to know Mr. Stott intimately many years ago when we were fellow members of an advisory board of the United States Geological Survey on fuels and structural materials. At about the same time we became associated in the work of the council of the American Society of Mechanical Engineers, which society he has served as manager and as vice-president, and also as chairman of a number of its committees.

Whatever the relation, it was always his custom to do his part with thoroughness. While exhibiting no personal desire to have his conclusions adopted, his statement of them invariably attracted attention and they generally prevailed. The fact that he could be depended upon to carry to a successful issue anything that was assigned to him, doubtless has on many occasions placed upon him more than his fair share of the common burden. His scientific methods were emphasized by the whole course of his life. He was among the first to advocate detailed specifications which should govern in the purchase of power plant fuel, and he was one of the first, if not the first, to purchase coal on a heat-unit basis for plants operating under his direction.

As chairman of the committee of the American Society of Mechanical Engineers on standard pipe flanges he devoted himself to the task of harmonizing divergent views of long standing, and so successfully did he accomplish this that the committee's studies under his direction were quickly brought to a logical conclusion. When in connection with this work his committee was publicly criticized and his own action assailed, and when the time given to public discussion had been entirely absorbed by his critics and practically none had been left for him in which to give response, he made no complaint. His interest was in the successful issue of the work and this he clearly saw was forthcoming. His confidence was in the knowledge of just action and in the ultimate judgment of his friends.

W. F. M. Goss,
Dean of the College of Engineering.

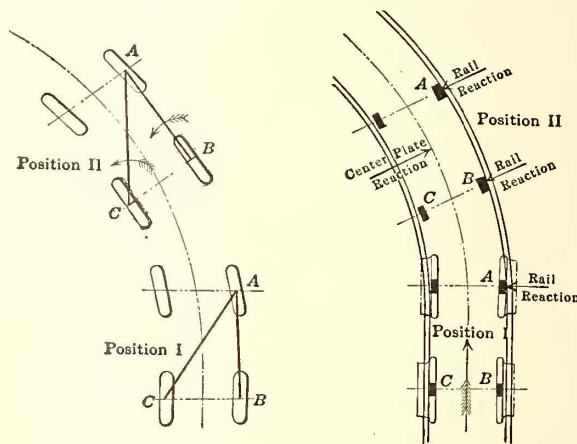
Mechanical Design of Electric Locomotives

NEW YORK CITY, Jan. 12, 1917.

To the Editors:

In connection with the discussion on the subject of mechanical design of electric locomotives appearing in recent issues of the *ELECTRIC RAILWAY JOURNAL*, I should like to call attention to two points that ought to be made clearer. One is that it is unnecessary to consider that a two-axle locomotive truck swings about either the inner rear wheel or the outer rear wheel when the locomotive is passing around a curve. The truck, under these circumstances, has, with reference to the locomotive frame or body, rotary motion about the truck center pin. The motion with reference to the track or ground is a compound motion of translation and rotation.

As an example demonstrating this condition may be taken the simple case of a four-wheeled automobile traveling upon a curved course on a highway. It has two motions: Translation, as from position I to position II shown in the accompanying illustration; and in addi-



FIGS. 1 AND 2—DIAGRAMS SHOWING ACTION OF AUTOMOBILE MAKING TURN AND ENGINE TRUCK ROUNDING CURVE

tion, it has a motion of rotation, just as a locomotive truck swings on its center pin. Does point A swing about point B or about point C? Draw the vectors (radii) BA, CA; notice their relative directions in the two positions of the vehicle. It will be seen that, on this curve to the left, both vectors have swung to the left, or counter-clockwise, viewed in plan. Obviously point A swings to the left about B, or C, or in fact, about any other point back of it.

The second point that I wish to bring out is that, unless a great deal of resistance to swivelling is introduced at the truck center, it is inevitable that both outside truck wheels of a two-axle locomotive truck must hug the outside rail. This fact is brought out in the second illustration. In position I the locomotive truck is shown entering a curve. Here the rail pressure at A tends to rotate the truck about its center pin. At position II, where the truck is entirely on the curve, the truck has rotated about its center pin with reference to the body. The result is that B also is brought into contact with the outer rail, which is here curved. At both A and B the rail exerts a pressure to the left, which is opposed at the truck center plate by the inertia or centrifugal force of the locomotive body acting toward the right. An automobile skids bodily sideways on a smooth greasy or icy roadway when its driver tries to make it curve, and this is what the locomotive truck is trying to do under the influence of the thrust at its center plate.

The rail at both *A* and *B* is resisting the tendency of the truck to skid toward the right, and in combination with the forward propelling force, also exerted at the center plate, is compelling the truck to proceed around the curved path.

HENRY JAMES KENNEDY, M.E.

Electric Railway, Power and Industrial
Plant Engineer.

Cutting Costs in Storage Yards

NEW YORK STATE RAILWAYS

ROCHESTER, N. Y., Jan. 10, 1917.

To the Editors:

R. C. Cram, in his article on "Cutting Costs in Storage Yards" in your Dec. 23 issue, has touched upon a very important item in the operation of any electric railway and the article and photographs are worthy of considerable study.

In general there are certain features of a storage yard which it would seem could be classified, and each of which would contribute toward the cutting of costs in the operation of the road.

The first of these would be the design of the yards. This design would cover the connections with steam roads and water facilities, as well as the general track layout and plan for the location of materials, buildings, etc. When property has been purchased for this purpose, a plan should be prepared which will represent the ultimate layout and then such portions as are immediately necessary could be constructed and additions made to conform to the general plan as conditions require. The general design should also take into consideration the type of equipment which is to be used.

This brings us to the second item in cutting costs, which is referred particularly to in Mr. Cram's article, that of equipment. It is a generally admitted fact that human horsepower at any reasonable rate of pay is the most expensive kind of power purchased. Mr. Cram's article refers more particularly to the use of derricks, cranes, etc., than to any other type of equipment, although there are other things which could be worked to advantage. For instance, it might be advisable under certain conditions to use a trestle track with bins for the storage and handling of such materials as crushed stone, gravel, sand, coal, etc. Another scheme for the handling of such material, which has been in use on this property, is a temporary track, the stone or coal being unloaded in the track and on either side, the track then being jacked up on top of this material. As succeeding cars are unloaded the track becomes in effect a trestle track so that by using the bottom dump cars it is possible to unload them from a track of this sort with comparatively little labor, most of the stone going out and rolling down the embankment. This scheme has resulted in dividing by two the cost of unloading crushed stone and coal. There are also other types of equipment which can be used such, for example, as roller conveyors. The use of these is especially advantageous where material has to be piled at some distance from the track.

The third item of saving in a storage yard touched on in Mr. Cram's article is the storage of material which can be purchased at favorable times, although there is considerable danger in this on account of the liability of over-stocking. Another saving which is obtained from maintaining the supply of material is the elimination of possible delays to construction work due to the lack of material.

The fourth item and one which is very important is the organization for the handling of materials in the yard. The centralization of material receipts and disbursements obtained by means of the yard makes pos-

sible the maintenance of a permanent organization for this type of work.

There are also a great number of small ways in which a storage yard can be made useful. For instance, we have on this property a pile of materials, especially old special work, which we call our "scrap stock." Switches, mates, frogs, etc., which are removed from the track on account of changes in layouts and which are not entirely worn out are put upon this pile. Lists and records are kept in the office so that in case, at any future time, an opportunity arises where it is possible to use this material it can, by means of the office records, be located for use again. A saving of this sort would not be possible unless storage yards having sufficient capacity for this purpose were provided.

In general Mr. Cram's article touches upon one phase only of a very fruitful source of saving; that is, the saving which can be effected, especially in way departments, by the use of labor saving devices.

D. P. FALCONER,

Engineer Maintenance of Way.

Advertising in Company Publications

THE KANSAS CITY RAILWAYS COMPANY.

KANSAS CITY, Mo., Jan. 16, 1917.

To the Editors:

Referring to your request that I submit my ideas concerning the question of advertising in company publications, I hand you the following:

The publication which this company established, known as *The Railwayman*, was primarily for the benefit of our employees and was intended to be a medium through which the employees could interchange ideas and thereby create a closer feeling of relationship between the employees themselves as well as between the employee and the company. The company wished to furnish this publication free to the employees and at its own expense, and I feel that any attempt to advertise in the publication would not only detract from its present standing among the employees but would also have a tendency to place the same upon a monetary basis, the exact position which we are seeking to avoid. As soon as this publication was first issued there were a number of inquiries made from prospective advertisers seeking to secure space, but we have refused absolutely to consider the same. There is no doubt but that the company could, by accepting such advertising, pay the cost of maintaining our publication, which runs into a considerable amount of money.

I cannot but feel that the insertion of advertising in such a publication would destroy its personality and also lessen the interest of the employee in the same.

PHILIP J. KEALY, President.

"Special Work"

BROOKLYN RAPID TRANSIT SYSTEM

BROOKLYN, N. Y., Jan. 17, 1917.

To the Editors:

The term "special work" is used freely by way engineers and others, and yet if even a specialist is asked to define what he means by the term he will probably be at loss to do so. It is particularly important for purpose of classification of accounts to know just what is meant by special work so that the parts of a track system may be suitably divided. As a contribution to this subject, and in the hope of bringing out further suggestions, I offer the following as a possible definition:

"Special work is that part of the track structure which is required for changing the direction of rolling

stock or for carrying it over an intersecting track structure lying within the same plane. Plain curves without guard rails are excepted from this definition."

Under the first part of the above definition would be included plain and reversed curves, turnouts and cross-overs, branch-offs and connecting curves. Under the latter part would be included crossings of every description, straight and curved, right angles and acute.

M. BERNARD,

Assistant Engineer Way and Structure Department.

The Industrial Survey in Routing Studies

Information Regarding the Natural Lines of Travel of Industrial Employees to and from Work
Furnishes a Logical Basis for Routing

BION J. ARNOLD has forwarded to the Rochester, N. Y., Chamber of Commerce a supplement to the report on local traffic conditions which was abstracted in the issue of the *ELECTRIC RAILWAY JOURNAL* for Dec. 16, 1916, page 1238. The supplement deals particularly with the results of the industrial survey made in connection with the preparation of that report, and with an analysis, by industrial and residence districts, of the results of that survey. As the industrial survey is a new factor in routing studies, a brief analysis of the supplement to the Rochester report is given below.

In the survey data were collected showing the residences and places of employment of nearly 23,000 persons, and these data were represented upon maps, of which a sample was presented in the abstract referred to. The purposes of the study were to determine the distribution of residence of persons working in the several factory districts with relation to the car lines operating near their homes, and the identification of the locality of employment of persons residing in the territory tributary to the several lines.

The territory tributary to a car line was assumed to be a strip $\frac{1}{4}$ mile wide on each side of the tracks. The territory considered did not extend into the business district, where all lines converge, but included only residence territory tributary to one or a comparatively few lines. It was found practicable to isolate for study a number of well-defined districts, each of which was considered separately in respect to the transportation facilities.

By this plan it was possible to determine the "community of interest" between sections of the city and thus to indicate the natural directions for car lines to accommodate industrial workers. This community of interest was examined from two standpoints: that of persons employed in the several industrial districts, and that of those living in the several residence districts. The general procedure can best be seen from actual quotations from the report, which are therefore appended.

SAMPLE OF INDUSTRIAL DISTRICT ANALYSIS

"St. Paul Street District.

"From this division there were 2647 destinations reported, distributed as follows:

Northwest	437	Northeast	1786
Southwest	188	Southeast	198
		Suburban	38

"All of the territory is tributary to the St. Paul Street line. As is evident from the above figures, nearly 70 per cent of the persons employed in this district reside in the northeast section of the city, a great many of them living within walking distance of their place of employment. There are, however, a large number living a considerable distance east of St. Paul Street, who

probably would be patrons of the car lines, particularly during bad weather, if any direct means of travel between their residence and place of employment was available. But at present in order to reach any of the other northeast lines it is necessary to make a considerable detour going south on St. Paul as far as Central Avenue and there transferring back to a north-bound car of another route, which in many cases takes as much time as walking by a more direct route. In a similar manner, practically all of the residents of the northwest section working in this district have no adequate transportation facilities. A crosstown line on Clifford Avenue and Emerson Street would not only be a great convenience to these people, but would probably be a source of increased revenue to the railway company.

"There is no particular community of interest with any other part of the city, South Avenue probably serving as many people as any other line outside of the northeast section."

SAMPLE OF INDUSTRIAL DISTRICT ANALYSIS

"Monroe Avenue.

"In the territory selected along this line, 1430 destinations were reported distributed as follows:

Northwest	379	Northeast	325
Southwest	126	Southeast	600

"Aside from persons working in the industrial establishments near Monroe Avenue, there appear to be relatively few industrial employees in that section considering the very heavy traffic carried on the line. A large proportion of the destinations reported were from office buildings and stores along Main Street. Aside from Main Street, State Street, from Lyell to Court, and Clinton Avenue, from Court to Andrew, show the greatest common interest, there being 330 destinations reported from the former and 400 from the latter. In the case of Clinton Avenue, probably a considerable proportion of the destinations reported represent people who walk to and from their work, especially during good weather.

"It is probable, however, that a very large part of the traffic on this line is not to and from industrial plants, which conclusion is further borne out by the fact that the peak load traffic is smaller compared with the non-rush hour traffic than on any other line on the system. For this reason the industrial survey results should not be given too much weight in considering the proper routing for the Monroe Avenue line."

New Safety Association

Twenty-two national societies have united in the forming of the Joseph A. Holmes Safety Association to commemorate and continue the notable safety work of the late director of the United States Bureau of Mines. The function of the association is to further the safety movement by awarding certain medals and honorariums to persons active in developing devices to reduce accidents in the mineral industries, and medals to persons performing notable service in life saving in these industries.

"It Is Safe!"

The Columbus Railroad Company, Columbus, Ga., has placed small frames of picture molding in each of its cars in which "safety signs" are run in series. During December and January the style of these signs has been changed from the old form of "Danger" signs to a "Safe" sign. For instance, instead of "It is dangerous to board a moving car," the sign reads: "It is safe to board a still car," Or instead of "Wait until the car stops," "It is safe to get off a standing car."

New and Up-to-Date Articles on EQUIPMENT AND ITS MAINTENANCE

First of a Series of Charts Gives Unusually Complete Cost Data on Overhead Construction—Spanish Railway Engineer Describes Devices for Locating Trolley Wire and Hangers—Other Articles Cover a Special Pavement-Cutting Machine, Small Gasoline Motor-Driven Interurban Car, Etc.

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

Cutting Long Strips of Pavement

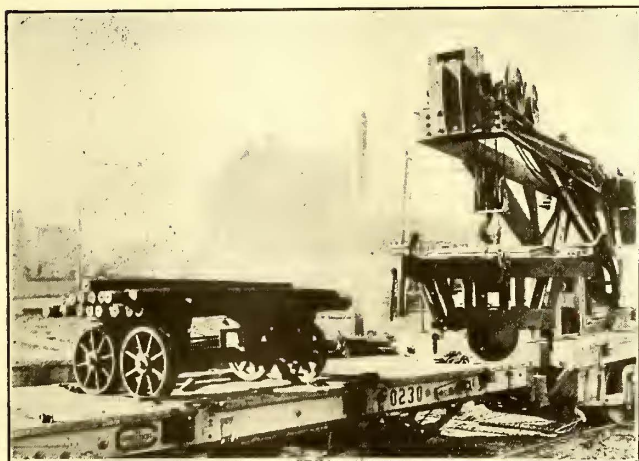
An Inexpensive Machine Made for a Special Job Operates at Low Labor Cost

BY M. E. STARK

Superintendent of Tracks, Connecticut Company, Bridgeport, Conn.

In making repairs on a section of the company's tracks on Fairfield Avenue, Bridgeport, Conn., it was necessary to remove a strip of warrenite pavement, 16,000 ft. long and 2 ft. wide, extending along the outside rails of the double track. To cut away this strip and leave the edge in an unbroken straight line looked like a big proposition, but it was decided that a machine could be built for about \$125 which would do the work required. The machine as built is described below.

It consists of a cutting wheel about 20 in. in diameter, formed similar to the wheel of a glass cutter. This is supported on a heavy iron frame which, when in use, is attached to the side of a single-truck trail car by a hinge mechanism to allow for the inequality of the surface of the pavement. This machine can be attached to a car in less than ten minutes and can be detached in about the same time.



MACHINE USED FOR CUTTING PAVING IN BRIDGEPORT, CONN.

In order to get the necessary weight over the cutting wheel to force it through the pavement, a track is laid across the top of the car, upon which a small truck capable of carrying about 2 tons weight of old car axles is placed. When the cutter is in place ready for work this truck is run out on the top of the frame of the cutter, which also has a track for this truck. The car is then pulled and pushed up and down the street a few trips, and the trick of cutting the warrenite is done. Its removal is a very simple matter. A motorman with the crane car and three or four laborers will take this outfit to the scene of action after the last car is off for the night, and will set it up and cut a strip 3000 or

4000 ft. long before the first car starts out in the morning. A gang of twenty-five men working ten hours with picks and chisels could not do half as much, nor do it half as well.

Locating Trolley Wires and Hangers

The Author Describes His "Trolley Square" and Gives Suggestions on the Above Subject

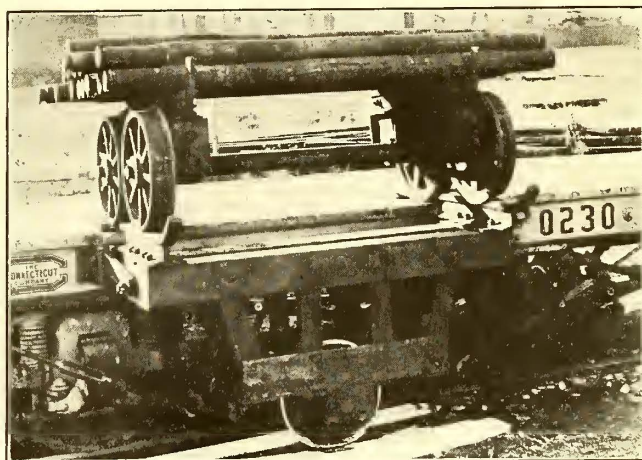
BY R. FINGADO

Seira (Huesca), Spain

As wire and trolley wheel renewals are important items for consideration by electric railway companies, and as the wear and tear on both depend largely on the relative positions of wire and track, it is important that trolley wire be suspended correctly, and its proper alignment maintained. Correct wire location produces minimum tendency for trolley wheels to leave the wire, thereby obviating much trouble and expense.

THE "TROLLEY SQUARE"

The writer has recently devised what he calls a "trolley square," the use of which enables a lineman



to locate the trolley wire correctly for all conditions. As shown in Fig. 1, it consists of a frame similar to a track gage, mounting two mirrors, one stationary, the other movable along a guide. Each is inclined exactly 45 deg. and is provided with a conspicuous horizontal center line. Under the movable mirror guide are two scales, one reading the distance from the center in inches, the other being graduated to read the radius of track curvature in feet.

The fundamental principle of the trolley square is shown in Fig. 2. On account of the angular positions of the two mirrors the observer virtually looks upward in a direction exactly perpendicular to the plane of the

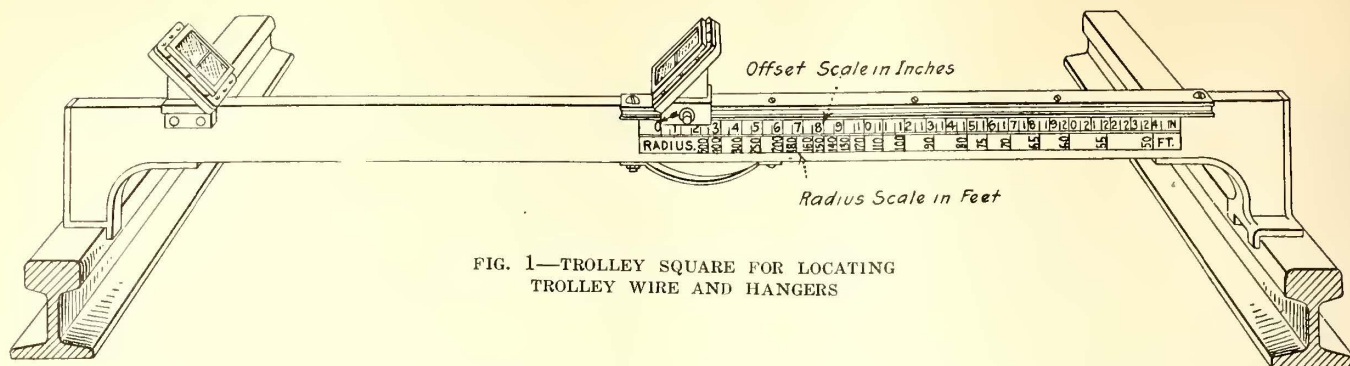


FIG. 1—TROLLEY SQUARE FOR LOCATING TROLLEY WIRE AND HANGERS

rails, at a point determined by the position of the movable mirror. Obviously, then, when the image of any object, such as the trolley wire or a hanger, coincides with the lines on the mirrors the object is in this direction from the line on the movable mirror. The appropriateness of the term "trolley square" is evident from Fig. 2.

With the movable mirror in the correct position, the lineman, by looking into the stationary mirror so the center lines coincide, should see the trolley wire reflected in the same line if it is properly placed. A man on a ladder or tower wagon needs no assistance for aligning the wire, as he can sight from above over the mirror lines and bring the trolley wire to coincide with

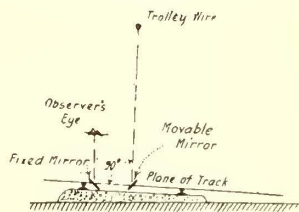


FIG. 2—DIAGRAM SHOWING PRINCIPLE OF TROLLEY-SQUARE

them. The tool weighs only about 15 lb. and is easily carried for inspection purposes by the leather strap provided. The writer has been granted letters patent on this device.

CORRECT LOCATION OF TROLLEY WIRE

Trolleys suspended with the aid of a plumb-bob will very often be found vertically over the center of the track, which is incorrect on curves and on tangents where the rails are not horizontal, as for example on streets having a curved surface. On tangents the trolley wire should be located centrally and in a line perpendicular to the plane of the track, except with pantographs or bow trolleys where the correct zig-zagging of the wire is very important. When using the trolley square on tangents the movable mirror is set over the center of the track, i.e., at zero on the inch scale,

but if staggering is desired it is moved along the guide the required distance and the wire is offset the same amount.

When rounding curves the trolley pole should be tangent to the curve described by the trolley wire. The correct position of this curve is not directly over the center line of the track, but depends upon the location of the trolley base on the car, and also upon the amount of elevation of the outer rail. When using the trolley square on curves or spiral track the movable mirror is set at the proper point on the radius scale.

The relation of the two scales to each other depends

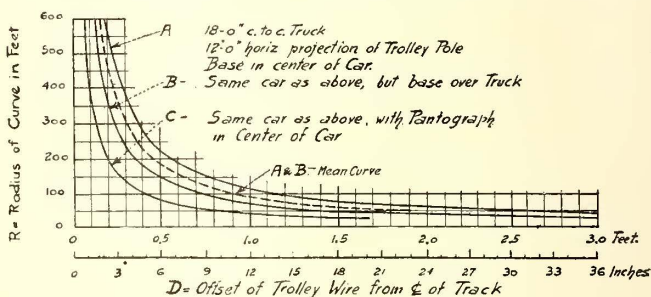


FIG. 3—SAMPLE CURVES GIVING DISTANCES TO OFFSET TROLLEY WIRE

on the type of car being operated. The distances by which the trolley wire should be offset are first found for various radii of track curvature and are then plotted, giving a curve similar to A, B or C in Fig. 3. In case two types of cars in about equal numbers are operated over the same track a mean curve as shown should be drawn for both. The distance D is that by which the wire should be offset by means of the inch-offset scale of the trolley square. With a proper curve in hand, corresponding values of R, the track radius, are read for several values of D and are then marked on the radius scale.

To determine values from which these reference curves are plotted, the trolley wire and trolley pole are projected upon the plane of the track, neglecting the

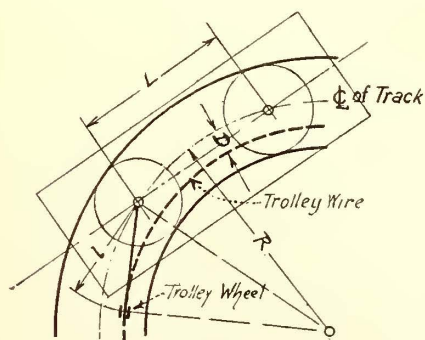


Fig. 4

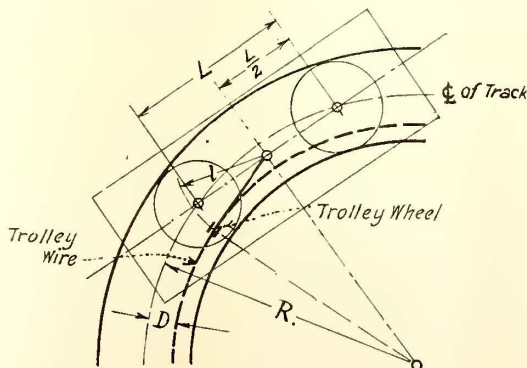


Fig. 5

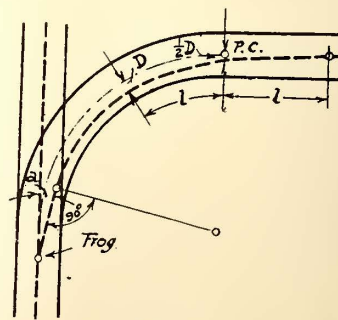


Fig. 6

DIAGRAMS SHOWING CORRECT POSITION OF TROLLEY WIRE—FIG. 4, WITH TROLLEY BASE OVER TRUCK CENTER; FIG. 5, WITH TROLLEY BASE BETWEEN TRUCK CENTERS; FIG. 6, DIAGRAM FOR USE IN LOCATING TROLLEY FROGS

offthrow due to the axle distance of the trucks. Fig. 4 shows the position of the wire for the simple case when the trolley base is over a truck center.¹ The distance L from center to center of trucks has no influence on the displacement of the trolley wire. Fig. 5 shows the position of the wire when the trolley base is midway between truck centers.² This calculation is also simple since L and l , the horizontal projected length of the trolley pole, are constant for a given type of car. With

by chords of equal length measured on the two rails. Then

$$R = \frac{50}{x} + \frac{x}{2}$$

If x is very small as compared with R , the second term in the above formula may be omitted. If it is expressed in inches, R is approximately $600/x$.

The trolley wire can be made to follow closely its theoretically correct curve by close spacing of the hangers, which is especially necessary on curves of

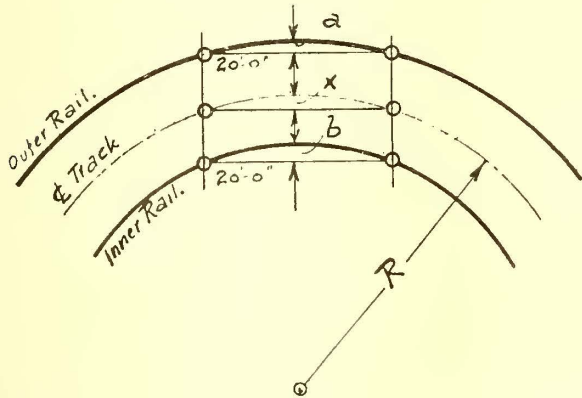


FIG. 7—DIAGRAM SHOWING HANDY METHOD FOR DETERMINING RADIUS OF TRACK

a pantograph l would be zero, and values of D for this case would be different.³ If the pantograph is placed over a truck the trolley wire should follow the center line of the track. Fig. 6 shows how the wire should be hung at the entrance to a curve. The frog should be so placed that the line given by its angle a is tangent to the curve described by the wire, which is offset by the values found as explained above.

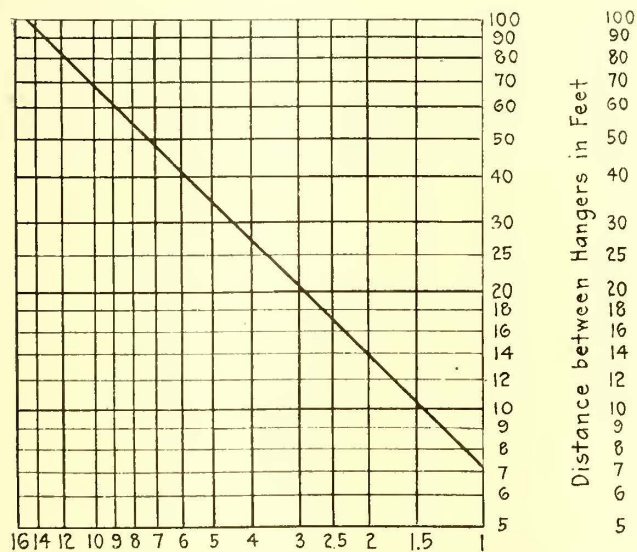
To determine R , the track radius at any point, a simple method can be used as shown in Fig. 7. The distance x between the center line of the track and the middle point of a 20-ft. chord is first found by taking the mean of similar distances as a and b determined

$$\begin{aligned} {}^1D &= R - \sqrt{R^2 - l^2} \\ {}^2D &= R - \sqrt{R^2 - (\frac{1}{4}L^2 + l^2)} \\ {}^3D &= R - \sqrt{R^2 - \frac{1}{4}L^2} \end{aligned}$$

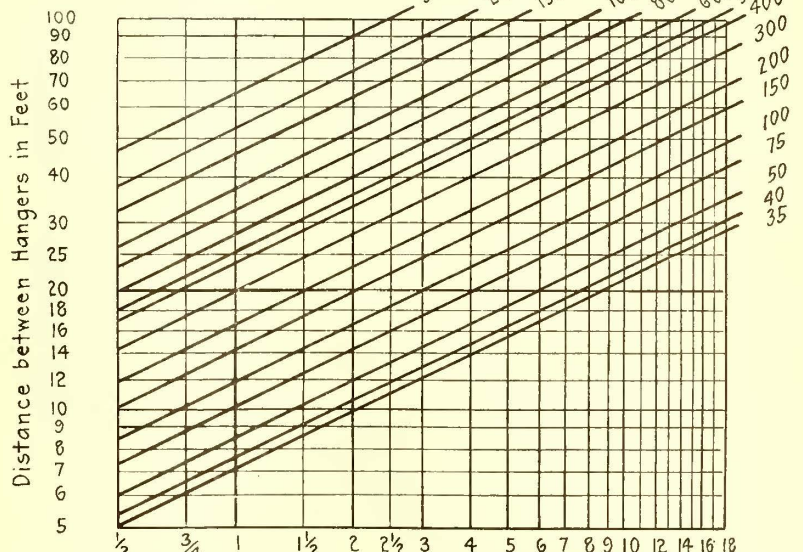
short radius. Referring to Fig. 8, the distance d must be the same on both sides of the theoretical curve of the wire and should not exceed a predetermined maximum. Its value⁴ depends on H , the hanger spacing, and upon S , the radius of the correct curve for the wire at the point where the hanger is being placed, assuming an arc of a circle between hangers.

The length h from the hanger to the point P , where the trolley crosses its theoretically correct position, can be calculated⁵ but it is found to have an approximate relation to the distance between hangers, viz., $H = 6.9 \times h$. This relation is plotted for various

$$\begin{aligned} {}^4d &= \frac{H^2}{16S} \\ {}^5h &= \sqrt{4dS} = \sqrt{2dS} = d \end{aligned}$$



Distance in Feet from Hanger to Point where Trolley Crosses its Theoretically Correct Position



Offset of Hanger, in Inches, from Correct Position of Trolley Wire

FIG. 9—CHART FOR USE IN LOCATING HANGERS

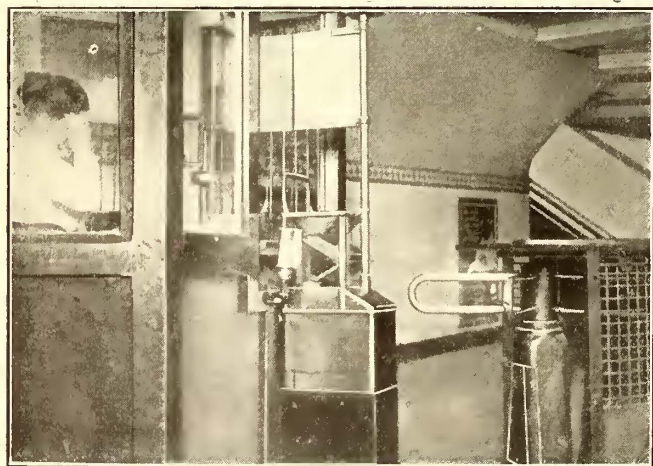
values of H on the left-hand portion of the chart shown in Fig. 9. The remainder of the chart gives values of d for different degrees of track curvature. This can be used for locating hangers in conjunction with the trolley square. The position of the trolley is first found with the latter and the distances d to offset the hangers may be read from the chart. The accuracy of the suspension may be checked by comparing the distance h with that given on the chart, the point P being determined with the trolley square.

Combining Fare Box and Turnstile Service at Boston

Plan Used on Boston Elevated Railway to Reduce Fare Collection Costs by Use of Mechanical Devices

Important economies are being secured by the Boston Elevated Railway in three trial installations of International motor-driven station registers used in conjunction with turnstiles at those subway and elevated stations where the volume of traffic is not large enough to warrant the employment of a coin inspector in addition to a change maker. About one-fourth of the stations on the Boston Elevated Railway are in this class. The other stations are already equipped with motor-driven station registers of the same manufacture, as described in the issue of the *ELECTRIC RAILWAY JOURNAL* for Jan. 8, 1916, page 77.

The accompanying halftone illustrates a recent installation by the company in which the functions of fare box and turnstile are combined in such a way as to eliminate the usual gateman. In the view shown, which was taken in the Boylston Street station of the



FARE BOX USED WITH TURNSTILE AND CHANGE MAKER

Washington Street tunnel, a five-arm turnstile manufactured by the H. R. Langslow Company, Rochester, N. Y., occupies the usual position opposite the change booth. In front of the latter the coin register is located, with a 10-watt reflector lamp mounted at the side so that the attendant in the booth can watch the coin cylinder rotation in connection with the unlocking of the turnstile. When the latter is locked a space of about 2 in. is left between the fare box and the end of the arm, but when the turnstile is released the space between the top shield and the fare box is about 18 in. wide.

The entire supervision of the fare box is transferred in this installation to the change maker, who also collects transfers. The passimeter records every passenger entering the station past the booth; the fare box

totals the cash passengers, and the difference is the number of transfers collected. In various other installations where no turnstile is in use, passengers tendering transfers are admitted after handing them to the gateman, and no mechanical check upon the transfer is available. Two gatemen are eliminated by the combined use of the fare box and turnstile at each entrance, one man being eliminated per shift.

The coin cylinder in the fare box can be stopped by a button in the change booth if the change maker wishes to scrutinize any coin closely, and a switch is also provided for stopping and starting the motor. The automatically-locked coin box is in a cabinet at the bottom of the box. According to the volume of traffic at a station each change maker is supplied with from \$50 to \$100 in change each morning, the remainder being collected at night.

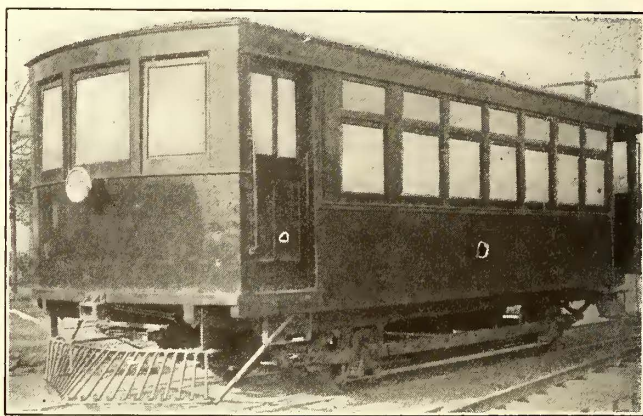
Car Built in Small Shop Is Driven by Automobile Motor

BY J. A. HILL

Superintendent of Equipment and Maintenance Fairburn & Atlanta Railway & Electric Company

An automobile engine furnishes power for the railway car shown in the illustration on this page. The car was built in the small machine shop of the Fairburn & Atlanta Railway & Electric Company, according to the design of the writer.

The motor, which was taken from an old Mitchell automobile, has six cylinders, $4\frac{1}{4}$ in. by 6 in. Automobile transmission gears are used, giving three forward speeds and one reverse. The car turns on Y's at each end of the line. It is mounted on a Brill 21-E truck, which was sawed in two and lengthened by inserting a section of angle iron to make the wheelbase 12 ft. long. The body is 8 ft. wide and 26 ft. long, including one 4-



INTERURBAN CAR DRIVEN BY OLD AUTOMOBILE ENGINE

ft. platform and a 7-ft. engine room. The total seating capacity is twenty-eight.

The car runs from Fairburn to College Park, a distance of 10.6 miles, making the trip in forty minutes, including the time required for ten stops. For eight round trips, about 168 miles, 18 gal. of gasoline and $2\frac{1}{2}$ gal. of lubricating oil are required.

In a recent issue of the Newark, N. J., *Sunday Call* there was given an extensive and well-illustrated article on the Plank Road Shops of the Public Service Railway. The article described in detail the several departments of the shops, giving statistics as to floor area, men employed, etc. One of the illustrations was an outline bird's-eye view of the entire shop property and adjoining tracks.

Cost of Erecting Overhead Work—I

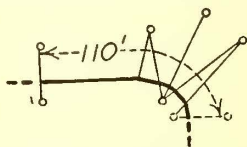
(From the records of a large Eastern company)

The following is the first group of a series of diagrams with cost figures to show actual costs of erecting the various types of overhead construction described under conditions of light, ordinary and congested traffic. Each group, as published, will be printed on only one side of a leaf so that readers may cut up the pages for their data books.

The data in each case include a simple diagram, a brief description thereof and the three sets of labor and trucking costs. It may be pointed out that the average lineman was paid \$3 a day and his foreman (gangs varying from five men to six men) \$4 per day. The company uses both auto trucks and horse-drawn vehicles.

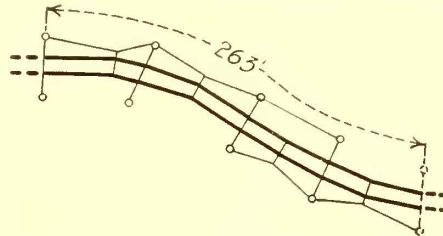
LABOR REQUIRED FOR CONSTRUCTING VARIOUS TYPES OF OVERHEAD TROLLEY SPECIAL WORK UNDER VARIOUS TRAFFIC CONDITIONS

Single track, plain curve, angle 90 deg.



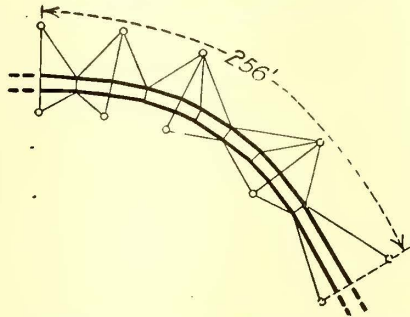
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
1	\$7.98	\$3.30	\$12.76	\$5.28	\$15.95	\$6.60

Double track, reverse curve



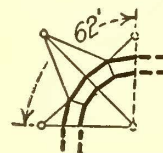
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
2*	\$14.52	\$10.56	\$18.15	\$13.20	\$21.78	\$15.84

Double track, plain curve, angle 60 deg.



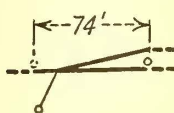
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
3*	\$18.15	\$13.20	\$21.78	\$15.84	\$25.41	\$18.48

Double track, plain curve, angle 90 deg.



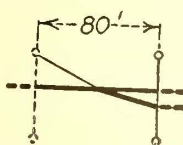
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
4	\$9.57	\$3.96	\$12.76	\$5.28	\$15.95	\$6.60

Left-hand turnout



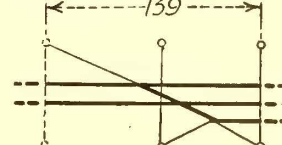
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
5	\$9.57	\$3.96	\$12.76	\$5.28	\$15.95	\$6.60

Right-hand turnout



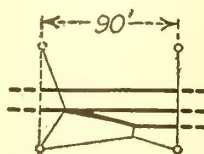
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
6	\$7.98	\$3.30	\$11.17	\$4.62	\$14.36	\$5.94

Right-hand turnout crossing, single track to siding



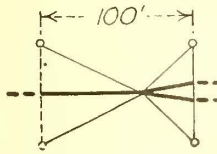
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
7*	\$18.15	\$13.20	\$21.78	\$15.84	\$25.41	\$18.48

Right-hand turnout to siding



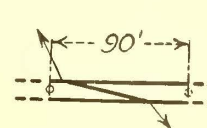
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
8	\$15.95	\$6.60	\$19.14	\$7.92	\$22.33	\$9.24

Diamond turnout.



No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
9	\$7.98	\$3.30	\$11.17	\$4.62	\$14.36	\$5.94

Right-hand crossover



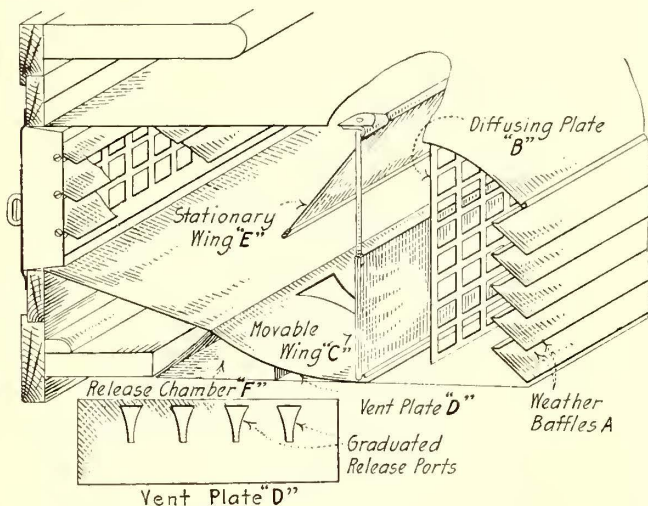
No.	LIGHT		ORDINARY		CONGESTED	
	Labor	Trucking	Labor	Trucking	Labor	Trucking
10	\$9.57	\$3.96	\$12.76	\$5.28	\$15.95	\$6.60

*Trucking includes cost of extra reel truck. The figures not starred do not include cost of superintendence and engineering.

A Natural Ventilating System Adjustable for Speed Variation

A new intake ventilator is the feature of the system of ventilation being advocated by the Railway Utility Company of Chicago. The complete system comprises a means of natural ventilation whereby the air is taken in through this new patented automatic intake in the car roof at the front end and is exhausted through Utility exhaust-type ventilators along the sides. The readers of this paper are familiar with the design and construction of the Utility exhaust-type ventilators, as they have been described and in use for about four years.

The intake ventilator is a new development in the natural ventilation field, its principal feature being a



INTAKE VENTILATOR WITH MOVABLE WING WHICH COMPENSATES FOR SPEED VARIATION

movable wing which is designed to compensate automatically for the variations in car speed and thus to permit a uniform flow of fresh air into the front end of the car. One of these devices is located at each end of the monitor deck, or in a corresponding position on an arch-roofed car, the one at the front end acting as an intake and the one at the rear end as an exhaust ventilator.

Referring to the accompanying drawing, it is seen that the air enters between a number of baffle plates, A, which are designed to exclude rain or snow. Just behind the baffle plates is a vertical diffusing plate, B, which tends to equalize the air pressure beyond it. Passing through this, the air strikes and passes over the movable wing C, then under the stationary wing E and through the grille into the car. As the car moves forward the inrush of air causes a pressure on the front of the movable wing and forces it backward, reducing the size of the opening between it and the permanent partition E. The position of the movable wing is thus largely dependent on the speed of the car. As it is forced backward it reduces the opening into the car to compensate for the increased pressure, and is said to admit a practically uniform quantity of air under all conditions.

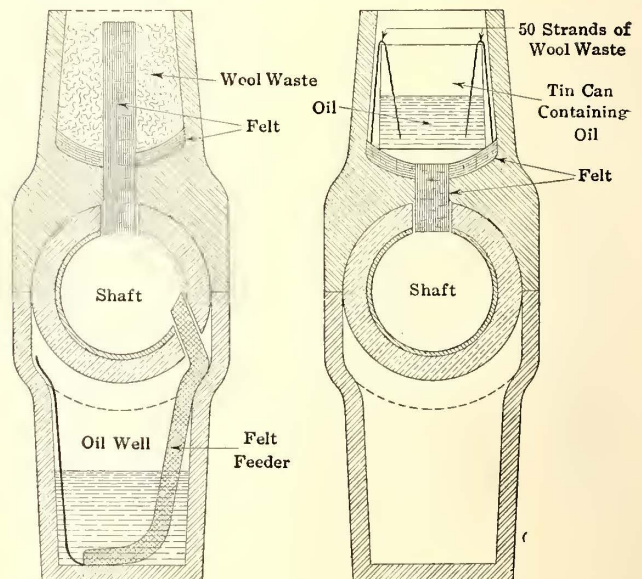
Below this movable wing is a plate D in which are cut four vent openings. These ports in the vent plate are graduated so that the opening is increased as the movable wing is forced farther back. This releases a part of the pressure to the chamber F' and thence to the atmosphere, tending to hold the movable wing more steady, and to prevent it from constantly moving back and forth. At a speed of about 15 m.p.h., the ventilator

ceases to operate, the leakage in the car then giving sufficient ventilation. The intake is designed to admit about 15,000 cu. ft. of air per hour, while the leakage factor of approximately 25,000 cu. ft. of air per hour makes a total of 40,000 cu. ft. per hour.

In view of the fact that the Department of Health of the city of Chicago has approved this ventilating system as conforming to the requirement of the ordinance that the carbon dioxide content in a car be kept below twelve parts to 10,000 parts of air, the Chicago Surface Lines has placed orders for installing this system of ventilation on all its cars except those now equipped with mechanical systems of ventilation. About 1920 cars will be equipped each with two intake ventilators, eight exhaust-type ventilators and the thermostatic heat control. The orders include a total of 15,396 Utility Honeycomb exhaust-type ventilators, 3840 intake ventilators, 1144 round vestibule-type ventilators, and 2302 Utility thermostatic regulators for controlling the heating current.

Lubrication of Old-Type Motors Improved

The lubrication of the old-type motors of the San Antonio (Tex.) Traction Company has been improved, and the money spent for oil has been greatly reduced by a novel system developed by Henry Fink, master mechanic of the railway. The accompanying illustration shows the alterations made in the method of feeding the oil to the bearing. In the new scheme the oil is held in a tin container which fits into the stuffing box over the bearing. Strands of woolen waste feed the oil



SECTIONS SHOWING OLD AND IMPROVED METHODS OF LUBRICATING OLD-TYPE MOTOR BEARINGS

over the brim of the container and down to the felt pad, which in turn conducts the oil to the bearing. The oil-well under the bearing is not used.

After a considerable amount of experimenting it was determined that about fifty strands of woolen waste would provide the proper constant supply of oil to the bearing. This number was used, and the scheme has been in successful operation for a year. With the old system the bearings were filled with oil every night, and the lubrication cost per 1000 car-miles was about 25 cents for double-truck cars. With the improved method of lubrication the cost per 1000 car-miles has been reduced to 16 cents.

News of Electric Railways

Traffic and Transportation

Financial and Corporate

Personal Mention

Construction News

Cleveland Problem Acute

Congestion in Public Square Grows—Papers Protest Against Service Dominated by Idea of Preserving Three-Cent Fares

The transportation problem in Cleveland, Ohio, has become acute. It is perhaps impossible for the Cleveland Railway to operate many more cars, with the Public Square as a terminal for all lines. Moreover, the addition of cars during the rush hours would add greatly to congestion and increase appreciably the expense of operation, something which all city officials wish to escape, because it would mean an increase in the rate of fare. Apparently the city authorities feel that the elimination of congestion in the business district can be brought about only by the use of underground tracks that will emerge to the surface well out of the busy zone, and several officials have expressed themselves as favorable to this plan. Mayor Harry L. Davis, however, is opposed to placing the ownership of underground lines in the hands of a private corporation, unless the Cleveland Railway will undertake their construction on the basis of the Tayler franchise. He feels that the city should build the subways and lease them to the railway.

The renewal of the franchise of the Cleveland Rapid Transit Railway is in the hands of the City Council. This company, in order to retain its franchise, was to have spent at least \$500,000 in preliminary construction work by February, 1917. This has not been done, and there is opposition among the city officials and members of the Council to making a renewal of the present rapid transit grant to the company.

In discussing accidents and delays to service, the *Cleveland Leader* on Jan. 15 said:

"The traditional 3-cent policy of running only enough cars barely to carry the traffic has been stretched to a point where a rush-hour ride in a Cleveland street car has become an ordeal of discomfort, indecency, suffocation, infection, exhaustion, and danger to life and limb. Whether all this results from failure on the part of the company, the street railway commissioner, the city administration, or the City Council, or whether it is the best that can be had for 3 cents in these times, the people have a right to know. Because they have full power to apply the remedies, they will very soon insist on being told."

In order to secure relief from the long hauls, Mayor Davis is inclined to agree with Fielder Sanders, street railway commissioner, who suggested recently that a proposition be made to the Nickel Plate Railroad to build electric railway tracks on its right-of-way for service to East Cleveland and Lakewood, either by operating the cars itself or by leasing the tracks to the Cleveland Railway. O. P. Van Sweringen, chairman of the board of directors of the Nickel Plate Railway, said a proposal would find the company in a receptive mood.

Councilman J. E. Smith has suggested that the 3-cent fare be limited to an area of 5 miles from the Public Square. This may be brought up in connection with the renewal of the franchise in East Cleveland. The 5-mile line would come close to the western boundary of Cleveland. Mr. Smith contends that the zone system is bound to come, and that it is the only thing that will save the 3-cent fare to any considerable proportion of the population.

The street railway committee of the City Council will report adversely on Councilman Kadlecik's ordinance prohibiting the interurban cars from using the tracks of the Cleveland Railway as an entrance to the city. More than fifty business men appeared at the hearing on the ordinance and entered a protest.

Emergency Petition Denied

Plea of Milwaukee Companies for Eight-Hour Day and Higher Wages, However, Will Be Considered Later on Its Merits

On Jan. 16 the Wisconsin Railroad Commission dismissed the application of the Milwaukee Electric Railway & Light Company and the Milwaukee Light, Heat & Traction Company for increased rates under the emergency clause of the public utilities act. As noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 13, the emergency petition had in view the securing of sufficient additional revenue to permit the establishment of an eight-hour day and the payment of increased wages to offset the higher cost of living. In denying the petition, the commission held that no such emergency existed under the public utility law as would warrant its granting the petition at this time. It was said, however, that the questions involved would be considered on their merits when hearings were held on the original petition of the companies for increased fares, this having been filed on Nov. 6, 1915. The new valuation of the companies' property, it was stated, would probably be completed by the commission in about two months, and the original petition would then be taken up. In commenting upon the action of the commission, J. D. Mortimer, president The Milwaukee Electric Railway & Light Company, stated:

"It is clear that in any subject of this magnitude, involving many complicated facts as to cost of service, time is necessary to inquire into and weigh the evidence submitted. It must be remembered in this connection that the Wisconsin Railroad Commission as now constituted is entirely different from the commission which in previous years made a very thorough study of the traction situation, and it is necessarily unfamiliar with the facts as they have been presented in earlier years. This change in personnel of the commission and its staff necessitates a much more elaborate presentation of evidence than would have been necessary if the case could have been presented as a continuation of the previous fare cases, with commissioners thoroughly familiar with every aspect of the case.

"The matter is further complicated by a revaluation of the companies' entire property, now nearing completion, the results of which the commission has expressed its desire to have in its hands prior to giving a final decision on the company's original petition, dated Nov. 6, 1915, for increased fares. While we are disappointed that no relief was granted upon the emergency as disclosed to the commission, we expect to accomplish the same result from the hearings on the merits of the original petition, to be held some time in the near future, and carry out the plans for change in hours of work and the making of allowances in compensation comparable with increases in the living cost."

New York Commission Review

The Public Service Commission for the First District of New York submitted to the Legislature on Jan. 10 its report for the year. The report blames the war and other "unforeseen difficulties" for the failure of the contractors to finish the new dual system rapid transit lines by Jan. 1, 1917, as provided in the contracts. A review of the progress under these contracts was published in the *ELECTRIC RAILWAY JOURNAL* for Jan. 6, page 47. Other features of the report are a review of the traffic increases in Greater New York and a summary of accidents. Concerning the street railway strike of 1916, the report says the commission has drafted a number of amendments to the public service law, which, if passed, will enable the commission to prevent a recurrence of such a situation.

Commission Discusses Railway Problems

Massachusetts Body Recommends Paving Tax Change—Will Carefully Scrutinize Further Consolidations—Says Improved Service Is Needed

In its fourth annual report to the Legislature, the Massachusetts Public Service Commission discusses the general economic problems of electric railways within its jurisdiction and renews its recommendation for legislation relieving the companies of the present commutation tax by placing all paving work squarely in the hands of municipalities, and by requiring the companies to meet only the reasonable cost of any such work done within their track locations. Referring to the recently decided Bay State Street Railway rate case, the board reviews the difficulties entailed in reaching a decision dealing with a system of this kind, which is a combination of city and rural lines operating in ninety-one municipalities and suffering from a paucity of interurban patronage. The fact that a 6-cent fare is now charged on certain portions of the system and a 5-cent fare on other portions, has caused some complications which may require adjustment at the end of the experimental period of one year. The board is of the opinion that the investigation of the company's operating methods by B. J. Arnold has had, and will continue to have, a beneficial effect on street railway operation throughout the State.

The commission believes that the terms of any further consolidations of street railways must be scrutinized with great care. In the past, the tendency has been to overestimate the virtue inherent in such consolidations and to permit them freely, provided the total outstanding capitalization remained unchanged. The result has been that prosperous companies have frequently taken over companies with low earning power on the basis of an exchange of stock share for share, when these latter properties might have been consolidated on a more favorable basis corresponding more nearly to their market value. In this way the resources of the prosperous companies have at times been spread so thin that their financial strength has been impaired. The board also holds that any further extension of the control of voluntary associations over Massachusetts public utilities should be prevented by appropriate legislation.

The commission states that there is ground for doubt, from the experience so far gained in the cases where it has been adopted, whether the introduction of the 6-cent fare unit is likely to be of great benefit to the average street railway. It is of the utmost importance that every effort should be made to invite additional traffic through faster, better or generally more attractive service and to decrease expenses through improved operating methods. In this connection, type of rolling stock is of particular importance. The economy from large semi-convertible cars or trailers, easy to load and unload, is marked, and it is now possible (under Chapter 671, Acts of 1914) to capitalize temporarily replacements involved in substituting such cars for older types, spreading the charge to operating expense over a series of years. The report states that the economy through proper attention to paint, cleanliness and general maintenance of cars is also marked. Because of the importance of this subject, the commission desires, if it can secure a slight increase in appropriation, to centralize and further develop the inspection of street railway rolling stock throughout the State, making this the special duty of one man. If this plan is carried into effect, the inspector will be expected not only to direct his attention to the cleanliness and upkeep of the cars, but also to keep himself informed as to the progress of car designing and maintenance throughout the country.

Some extension of the right of eminent domain is considered desirable for street railways. The commission believes that it is possible that if a broad power were granted by the general law, companies like the Bay State Street Railway would be able gradually to convert certain existing lines of low earning power into high-speed routes, similar to the one in very successful operation between New Bedford and Fall River.

The report states that the general condition of the street railway properties in Massachusetts continues to be unsatisfactory. The financial condition of the roads, the scarcity and high cost of labor and of material and the delays in delivery of the latter have resulted in few improvements. Recognizing the great need of the companies for capital, the commission admits that rate increases in some cases may be the lesser evil, but believes that the present regulative policy will in the long run lead to the most satisfactory results.

Electrification of West-Side Lines

Form of Agreement Between City and New York Central for West Side Improvement Made Public

A "form of agreement" reached between representatives of the city of New York and the New York Central Railroad was made public on Jan. 16. It was asserted that it disclosed that the road was willing to make what it considered important concessions for the right to carry out its west side improvement, and especially its plans in Riverside Park. The agreement, which contemplates an expenditure by the road of between \$60,000,000 and \$100,000,000, provides that its rails in the park be completely hidden by roof of subsoil and fill carried over the right-of-way to the waterfront. This arrangement, the road contends, will not only increase the attractiveness of the park, but actually add twenty acres to it. The draft also proposes that the city convey to the railroad properties and easement rights totaling \$11,094,381 and receive in return lands owned by the road valued at \$4,984,482. The difference of \$6,109,899 is to be contributed by the city as its share in bringing about a development which will, it is contended, add greatly to its commercial greatness and railroad facilities.

It is provided that the railroad completely electrify its entire line in four years. All construction work south of Seventy-second Street must be completed within six years. Below the yards at Sixtieth Street it is the intention of the company to operate its trains on elevated structure to Canal Street, and to turn over its rights-of-way on Hudson Street, Eleventh Avenue, etc., below that to the city, in return for property and concessions to be received by the road from the city.

As explained by Controller Prendergast of New York City, none of these provisions can go into effect until the "form of agreement" has been submitted to the Board of Estimate and Apportionment of the city and discussed at additional public-hearings.

Anti-Strike Plan Offered

Senator Cummins Presents Bill as a Substitute for the Newlands Measure

Senator Cummins of Iowa presented to the Senate interstate commerce committee on Jan. 17 a bill designed as a remedy for the conditions that might arise in case of a long-drawn-out transportation strike, and as a substitute for the plan proposed in Senator Newlands's bill giving the President power to take over railroads temporarily in time of emergency, by the use of the military power. Under the Cummins proposal, if a road were tied up by a serious strike or similar cause, the Department of Justice would apply for the appointment of a receiver, who would then operate the road. After three months if the road was still unable to take care of itself, the Government would take over the property permanently.

The committee also discussed on Jan. 17 a bill proposed by Senator Newlands to prevent the physical obstruction of trains in strikes, and another measure suggested by Senator Cummins providing for the investigation of railroad disputes, by a committee consisting of the Vice-President and four Governors of States appointed by the President. The latter was offered as a substitute for the "Canadian disputes act," voted down on Jan. 16, which was designed to prohibit strikes and lockouts during the course of a Government investigation. No vote was taken on any of the suggestions made on Jan. 17.

Plea for Rhode Island Company

Federal Trustee Says Company Cannot Be Run Successfully Unless Relieved of Burdens

Rathbone Gardner, chairman of the trustees appointed by the United States Court to manage the Rhode Island Company, in addressing a public gathering in Providence, R. I., on Jan. 15, declared that the company could not be successfully run by trustees or anyone else, unless it be relieved of some of its burdens or allowed to increase fares. He favored the increased fare proposal. He said in part:

"The present 5-cent fare is evidently inadequate. If it was the proper thing ten years ago, everyone realizes that it is inadequate now. Everything used by a railroad has increased in cost. Wages have gone up and may go still higher. The street railway industry is the only one I know of which, with increased cost of operation, cannot increase the price of its product."

Mr. Gardner said that the company is paying to lessors of its various component lines approximately \$1,153,794 as rentals each year. An expert valuation of the company is now being made. Mr. Gardner told of the various franchises and other taxes the road has to pay. In this connection he said:

"Neither the present nor any other administration can continue to run the road in Providence successfully unless relieved of some of its burdens or allowed to increase the present 5-cent fare. At present the company has no means of raising money, as an issue of stock upon a road not paying dividends would not be apt to prove an attractive investment to purchasers. Neither has the company any property upon which a substantial sum of money could be raised. Just what is to be done I do not know. We of the board of trustees have been doing the best we know how, but we are most seriously handicapped."

The company has announced that it is making a systematic study of its car schedules, with a view of making a general shift to better the service. Figures kept by the city's public service engineer show that during the rush hours fifteen minutes are consumed by some cars in making one loop of less than 2000 ft. about the center of the city.

Trial of Strike Damage Case

Verdict of \$2,800 Awarded to Railway for Damages to Its Property

All efforts have been unavailing which were made by counsel representing the county of Erie to have Justice Louis W. Marcus in Supreme Court at Buffalo, N. Y., dismiss the action brought against it by the International Railway in an effort to recover \$108,410 damages for property alleged to have been destroyed during the street car strike riots in the spring of 1913. Under the decision of Justice Marcus, the county of Erie can be made defendant in the damage action because of its alleged failure to provide adequate protection to the company's property and the International Railway's additional complaint that the county can be held responsible for the company's earnings during the period when service was curtailed.

Scores of witnesses were examined during the first three days of the trial, which was started on Jan. 8. The company has closed its case and Thomas A. Sullivan, former county attorney, who appears for the defense, started the examination of witnesses for the county during the early part of the week of Jan. 15. A great mass of evidence was introduced by James O. Moore, of Norton, Penney, Spring & Moore, of counsel for the International Railways, all of which tended to show that rioting prevailed in the city during the strike period. Newspapermen who gave evidence for the company told of rioters who hurled bricks and stones off the eighteen-story Marine Bank building onto passing street cars. Others told how members of the two regiments of the New York National Guard sympathized with the strikers and rioters and did damage to the company's cars while engaged in patrolling the streets and apparently protecting the company's property. Michael Regan, who was chief of police during the strike, testified that the mobs were so riotous that he was unable to handle them, even with hundreds of special police and deputy sheriffs.

Employees of the International Railway testified as to the condition of cars when they left the various carhouses and of their damaged condition when the cars returned. Windows had been broken, vestibules smashed, car bodies damaged and wires cut in all parts of the city. Loyal employees who operated cars during the few days of the strike told how they were intimidated and threatened by strikers and rioters.

Rebuttal testimony was introduced by members of the Buffalo police department who told of specific damage done by strike breakers who were brought to Buffalo by the International Railway.

On Jan. 18 the company was awarded a verdict of \$2,800 against Erie County for property damage during the strike.

Report on Omaha Franchise

Attorney for Railway Replies to Demand of City That Portion of System Be Abandoned

John Lee Webster, counsel for the Omaha & Council Bluffs Street Railway, Omaha, Neb., has reported to G. W. Wattles, president of the company, with respect to the claim of the city to the reversion of the property of the Omaha Horse Railway. Mr. Webster suggests several points to sustain the position of the company as adverse to the demand now made upon it, that it vacate certain streets which form the heart of its system. Mr. Webster recites the history of the franchises and the terms under which they were granted, and the fact of the consolidation of the Omaha Horse Railway and the Omaha Cable Tramway into the Omaha Street Railway under the law of 1889. He reviews the organization of the Omaha & Council Bluffs Street Railway, and its succession to the franchises and property of the Omaha Street Railway, and further cites the fact that the city not only acquiesced in the removal and extinguishment of the Omaha Horse Railway's property, but actually ordered that some of it be removed, which order was carried out at a considerable cost to the present company. In his conclusion, Mr. Webster says:

"If the city should undertake to interfere with the property or franchises of the company at the present time, when it is conceded that the company is the legal holder of the franchise granted to the Omaha Cable Tramway, which does not expire until May 22, 1928, this company should insist on the full limit of its rights under the street railway act of 1889, to wit: 'to hold said properties and franchises in perpetuity.'"

Los Angeles Subway Reagitated

Subway agitation has been renewed in Los Angeles, Cal. On Jan. 5 plans were submitted to Mayor Woodman of that city for building a subway to connect the Hill Street station of the Pacific Electric Railway with the Vineyard station, together with a proposal that the railway build a cutoff line from Vineyard station to Highland Avenue, and thence through the Cahuenga Pass to the San Fernando Valley. In discussing the matter, the Mayor said:

"One of the imperative needs of Los Angeles is relief from the congestion of traffic on its main streets. Some years ago steps were taken toward a diversion of the traffic of outside towns by a subway from Hill and Fourth Streets to Vineyard, and distributing from that point.

"For ten years there has been talk of the development of a rapid transit subway, but down to date little has been done actually to realize the project. Millions of dollars already have been expended in acquiring rights-of-way for this subway, and it would certainly seem to be expedient to awaken the project into activity at the earliest possible moment.

"I understand that legal hindrances to the construction of the proposed subway will soon be removed and necessary rights-of-way acquired. The traffic problems of the city have reached an acute stage, so that it seems unquestionably the time to press the development of this subway rapid transit service. It was thought justifiable ten years ago. If it was justifiable then it certainly is many times more so now."

A Plausible Impostor

A warning has been issued by Anton H. Classen, president, Oklahoma Railway, Oklahoma City, Okla., in regard to a man calling himself Chester Williams. This man visited the office of the Oklahoma Railway a short time ago and represented himself as an ex-convict who had reformed and desired to secure work. He had a letter that he claimed had been written by Thomas Mott Osborne, former warden of Sing Sing prison, New York. A certain part of the man's story made Mr. Classen suspicious, and he took the matter up with the Prison Association of New York. The testimony from that organization indicates that the same man, working under the name of George Colgate, had been soliciting funds in St. Paul and Minneapolis. He is said to be "one of the smoothest crooks in the business." Mr. Classen sends this word about him so that other companies may be warned.

Service Suspended in Cleburne.—The Cleburne (Tex.) Street Railway has again discontinued service, and this has led to the inauguration of a jitney line in the city. In February, 1916, service was resumed on the line after having been suspended for more than a year.

Bonus for Pacific Electric Railway Employees.—J. McMillan, general manager of the Pacific Electric Railway, Los Angeles, Cal., announced on Jan. 2 that the company would give all employees who had been in service two years and were receiving less than \$2,000 a year a bonus of 10 per cent of their salaries. Half the amount will be paid in January and the remainder in July.

Newspaper Reviews Railway Work.—The *Daily Journal* of Springfield, Ill., published a column article recently giving detailed information of the interurban railways centering in that city and praising the work of the Springfield Consolidated Railway. The work of the Illinois Traction System was noted carefully. Several roads which are projected from that city also received attention.

Completing the St. Paul Electrification.—Finishing touches are being put on the last 25-mile stretch of electrified territory of the Chicago, Milwaukee & St. Paul Railroad. It is expected that the entire mountain division will be electrically operated by Feb. 1. Early in December the line from Harlowton to East Portal, 406 miles, was in operation for passenger and freight service.

Another "Conscience" Contribution.—"God forgive me" was the footnote of an unsigned letter, accompanied by \$50, which the Public Service Railway, Newark, N. J., received recently. Above the footnote was written, "Conscience Money—N. & S. O. Ry." The letter was mailed in Newark. It is supposed to be from a conscience-stricken conductor on the Newark and South Orange line.

Danbury Hatters' Judgment.—In a new phase of the old "Danbury hatters'" case the Supreme Court on Jan. 8 decided that Dietrich E. Loewe, Danbury, Conn., hat manufacturer, and not the United Hatters' Union, is entitled to \$20,000 in interest accrued on union hatters' savings bank deposits attached toward satisfying Loewe's \$353,000 judgment secured under the Sherman law for union boycotting in 1903.

Railway Men Arraigned for Failure to Heat Cars.—The seven officials of the Brooklyn (N. Y.) Rapid Transit Company who were summoned to court for failing to maintain a minimum temperature of 40 deg. Fahr. in the cars on their lines appeared before Magistrate Walsh in the Adams Street Police Court on Jan. 16. Through their attorney they waived examination and were held in \$100 bail each for Special Sessions.

Refuse Officially to Call Off Strike.—Sixty members of Division 709 of the Amalgamated Association on Jan. 10 unanimously voted "to continue" the strike called on July 16 on the lines of the Harrisburg (Pa.) Railways. More than seventy-five members of the union are back at work under the new working agreement made by the company with its men, and the places of the other men were long since filled with new men.

Interurban Road Increases Wages.—The Rockford & Interurban Railway, Rockford, Ill., increased wages 1 and 2

cents an hour, effective on Jan. 1. The wage increase affects 200 men. The younger men will receive the 2-cent increase, as the older men received the larger advance last year. The present wage scale is from 21 to 28 cents an hour. The increase involves an additional expense to the company of about \$10,000 a year.

Check of Minneapolis Valuations Suggested.—The economy and efficiency committee of the new City Council of Minneapolis, Minn., on Jan. 4 discussed the suggestion of Mayor Van Lear that an expert be retained to check the valuations submitted by the Twin City Rapid Transit Company and by City Engineer Cappelen in connection with the application of the Minneapolis Street Railway for a renewal of its franchise in Minneapolis.

Pittsburgh Subway Legislation Proposed.—C. K. Robinson, assistant city solicitor of Pittsburgh, Pa., is preparing for introduction into the Legislature of Pennsylvania a general measure providing for rapid transit subway construction in Pittsburgh. It is said that the basic idea of Mr. Robinson's plan is to provide for a city-built downtown subway loop or make legal the provision of funds for the construction of such a line by a private corporation.

Franchises Made Uniform in Expiration.—On Dec. 29 the street railway committee of the City Council of Cincinnati, Ohio, decided to approve an extension of ten years in the franchise of the Interurban Railway & Terminal Company. It provides for certain changes in route to conform to improvements made at the Delta Avenue crossing, but makes no reference to the rates of fare. The franchises of the company will now all expire at the same time.

Municipal Employees Seek Increase.—The trainmen in the employ of the San Francisco (Cal.) Municipal Railway have renewed their request to the Board of Works for an increase in wages of 5 cents an hour. While the last annual statement of the lines showed a profit, T. A. Cashin, superintendent, issued a note of warning against overextension. The cost of the increase now requested is placed at \$72,000 for the year, and T. A. Reardon, president of the Board of Works, has intimated that the board will support Mr. Cashin in the stand that he has taken and that no unnecessary outlays will be made.

Adamson Law Argument Concluded.—Argument in the Adamson law case was concluded before the Supreme Court of the United States on Jan. 10 and that body now has before it for decision the question of whether the Adamson statute is constitutional. In their closing arguments the railroad attorneys, Walker D. Hines and John G. Johnson, maintained that there was a lack of authority by Congress to enact "railroad wage legislation." They insisted that the new law was incapable of operation with judicial interpretation. They contended, furthermore, that the act took away property without due process of law and that it interfered with liberty of contract.

Affairs of United Railways, St. Louis, Reviewed.—The St. Louis *Post-Dispatch* in its issue of Jan. 16 published a review of the affairs of the United Railways, including a summary of the history of the company's organization, both financial and legislative, presented in the light of the appeal by the company to the city for release from the so-called mill tax. Richard McCulloch, president and general manager of the company, was quoted as giving among other reasons for the problems that confront the company now the severe general panic of 1907, continuous and unprecedented increases in the prices of labor and materials, the increase in the use of the transfer and the higher standards of service required by the Public Service Commission.

Commissioner Wood to be Tried in February.—Assistant District Attorney James O'Malley of New York City applied on Jan. 4 to Judge Mulqueen, in General Sessions, to have the case of ex-Public Service Commissioner Robert Colgate Wood, under indictment on a charge of having solicited a bribe, put on the regular calendar for an early trial. Judge Mulqueen assigned the trial to the February term of Part VI, where Judge Nott will be sitting. Judge Nott last month denied a motion made by District Attorney Swann to dismiss the indictment against Mr. Wood, on the ground of insufficient evidence. In his decision, Judge Nott

said that as Mr. Wood was a public official, he should be tried on the indictment, and either be vindicated or convicted.

Franchise Referendum in Dallas.—The City Commission of Dallas, Tex., on motion of Mayor Lindsley, has passed a resolution submitting the railway and lighting franchises granted by the city of Dallas to J. F. Strickland and C. H. Hobson to a referendum election. This action was taken by the Mayor when it was disclosed that the petitions being circulated asking a referendum election on the franchises were void through being improperly drawn. These franchises have been approved by the City Commission substantially as first drawn. They are to be passed in connection with the plan under which control of the present local railway and light properties will pass from Eastern to Dallas interests under terms reviewed previously in the *ELECTRIC RAILWAY JOURNAL*.

Man Shortage in Bridgeport.—Charles H. Chapman, local manager of the Connecticut Company in Bridgeport, Conn., was quoted in the *Bridgeport Standard* of Jan. 8 as follows: "All big organizations have found it extremely difficult to secure the kind of men they want to work for them. Especially has this been true within the last year or so, when the demand for workers has far exceeded that of any other year. Just as an instance of this, the Connecticut Company for the year just ended hired 1111 men. Of these, there are exactly 218 now in our employ. We can't always secure the kind of men that we want. In fact, I may go so far as to state that at times dismissals reached as high as four a day. We were compelled temporarily to retain men we otherwise would have discharged through fear that we wouldn't have enough on hand to man the cars the next morning."

Toledo Paper Gets an Appeal.—On Jan. 10 Judge Denison of the United States Circuit Court allowed the Toledo Publishing Company, publisher of the *Toledo News-Bee*, an appeal from the decision of the United States Court of Appeals to the United States Supreme Court. The Circuit Court recently affirmed the sentence of the United States District Court at Toledo in which a fine was assessed upon the paper and N. D. Cochran, its editor, in contempt proceedings which grew out of articles, editorials and cartoons published in the paper, following the action of the District Court in a street railway decision. The case was appealed on error, and in its assignment of errors the publishing company claims the Circuit Court of Appeals erred in affirming the judgment of the District Court; that it should not have held the lower court had jurisdiction, and that it should have reversed the judgment on the ground that there was no evidence that the publications complained of had been read by United States District Judge J. M. Killits of the District Court at Toledo. The case grew out of the negotiations between the city and the Toledo Railways & Light Company for a renewal of the franchise of the company.

Railway Business Association Meets.—The annual dinner of the Railway Business Association was held at the Waldorf, New York, N. Y., on the evening of Jan. 16. George A. Post, president of the association, said that he hoped the Newlands joint Congressional committee, recently constituted to canvass the whole railway situation, would approach its task with breadth of mind and a desire to solve the problem for the benefit of the public. Alfred P. Thom, general counsel of the Railway Executives' Advisory Committee, expressed his belief "that every member of the joint committee on interstate commerce is convinced of the need for a real remedy." Frederic A. Delano, a member of the Federal Reserve Board, recited some fallacies which he thought were at the bottom of the public misunderstanding concerning the railway problem. At the annual meeting of the association the members re-elected as president Mr. Post, and as vice-presidents W. H. Cottingham, Cleveland; W. B. Leach, Boston; E. B. Leigh, Chicago; Henry Elliot, East St. Louis; J. S. Coffin, New York; Irving T. Hartz, Chicago, and J. C. Bradley, Buffalo. M. S. Clayton, of New York, was re-elected treasurer. In his annual address before the business meeting Mr. Post made a plea for support of the Chamber of Commerce of the United States.

Financial and Corporate

Annual Report

Bay State Street Railway

The comparative income statement of the Bay State Street Railway, Boston, Mass., for the years ended June 30, 1915 and 1916, follows:

	1916		1915	
	Amount	Per Cent	Amount	Per Cent
Operating revenue	\$9,996,484	100.0	\$9,538,406	100.0
Operating expenses	7,764,880	77.7	6,897,752	72.3
Net operating revenue	\$2,231,604	22.3	\$2,640,654	27.7
Taxes	609,062	6.0	653,380	6.9
Operating income	\$1,622,542	16.3	\$1,987,274	20.8
Non-operating income	62,811	0.6	66,459	0.7
Gross income	\$1,685,353	16.9	\$2,053,733	21.5
Deductions from gross income:				
Rent of leased roads	\$189,253	1.9	\$182,228	1.9
Interest on funded debt	1,037,109	10.4	1,039,077	10.8
Interest on unfunded debt	86,769	0.8	104,279	1.1
Miscellaneous	27,249	0.3	25,599	0.3
Total deductions	\$1,340,380	13.4	\$1,351,183	14.1
Net income	\$344,973	3.5	\$702,550	7.4
Dividends:				
First preferred stock	\$164,916	1.7	\$164,916	1.7
Common stock	102,586	1.0	512,930	5.4
Total dividends	\$267,502	2.7	\$677,846	7.1
Surplus for year	\$77,471	0.8	\$24,704	0.3

The foregoing statement is based on that appearing in the latest report of the Massachusetts Electric Companies, the controlling organization. The business of the Bay State Street Railway was favorably affected during the last fiscal year by the great manufacturing activity in parts of the territory served by its lines. As a result, its operating revenue increased \$458,077 or 4.8 per cent. The operating expenses, however, increased in greater proportion, by \$867,128 or 12.5 per cent, resulting in a diminution of \$409,051 or 15.4 per cent in net operating revenue. The operating expenses included \$120,000 for depreciation of equipment, the same charge as in 1915, and \$379,759 for reconstruction non-betterment, an increase of \$196,909. Prior to 1915 no charge was made for depreciation of equipment, and reconstruction non-betterment was charged off to profit and loss.

Taxes and income deductions showed slight decreases for the last year, so that the falling off in net income totaled \$357,576, or more than half. The divisible remainder was not sufficient to enable the declaration of dividends in such an amount as would permit any dividend on the preferred shares of the Massachusetts Electric Companies. After paying the interest on its coupon notes, the controlling organization had, on Sept. 30, 1916, a deficit of \$4,737, a decrease of \$404,215 from the net income before dividends of the year previous. Since the end of the fiscal year, however, and up to Dec. 6, the date of the annual report, the gross and net income of the Bay State Street Railway has shown increases. This result has been obtained in spite of the jitney competition, which still exists, although without any increase above the estimated figures of a year ago.

During the year the following amounts were spent on new property and reconstruction: Track construction, \$57,978; track reconstruction and State and municipal requirements, \$374,929; cars and electrical equipment, \$84,070; electric lines and feeders, \$154,599; power stations, \$43,426; land and buildings, \$15,189; and sundry equipment, \$4,264; total, \$734,457.

Most of the latest annual report is devoted to a detailed consideration of various points in connection with the decision of the Massachusetts Public Service Commission in the Bay State Street Railway fare case. After taking issue with the commission in various matters, the report concludes:

"The trustees believe that the result will prove the company to have been fairly entitled to all the increases in fares which it originally requested, but it will take time to show who is right about that. We think the greater part of the criticisms contained in the opinion of the commission are unfounded, and that the ignoring of all the necessary elements of credit is a dangerous error, but no reasonable person can quarrel with the caution which desires to see doubtful matters rendered certain by actual trial before taking further action. The position adopted by the commission that the Bay State Street Railway may apply again for leave to increase fares if the changes they have permitted do not produce a proper net income, apparently indicates that the necessary relief has merely been postponed to ascertain the result of the changes allowed. The concessions granted by the commission may prove sufficient; if so, the desired result has been obtained; if not, it will be necessary to show the commission that they are insufficient.

"In the course of their opinion the commissioners stated that the present situation of the Bay State Street Railway is not one which need cause discouragement. For somewhat different reasons than those set forth in the opinion, the trustees agree with that conclusion. If the non-paying lines are made to pay, the property ought to do well enough. There can be no question that the earning possibilities of the company are better since the commission's decision than they were before. The officers of the company are making an honest and strenuous effort to do all the things advised by the commission for which the necessary means can be found, and to procure therefrom every possible dollar of increased revenue. We see no reason why the Bay State Street Railway should not resume its former condition of prosperity if it receives fair treatment from the public and the regulating authority, and we believe that it will in the end receive that treatment."

New York Lines in 1916

Railway Operating Revenues Increased 5 Per Cent During Last Fiscal Year—Net Income Gained 72 Per Cent

According to the latest annual report of the Public Service Commission for the Second District of New York, the falling off of railway operating revenues during the fiscal year ended June 30, 1915, for the electric railways under its jurisdiction did not persist during the last fiscal year. On the contrary, the railway operating revenues for the year ended June 30, 1916, represented at \$32,668,000 (in round numbers) an increase of 5 per cent over those of the preceding fiscal year, while the net income showed a gain of 72.2 per cent. This was in decided contrast to the showing made in the previous year, when the railway operating revenues for the first time since the formation of the commission in 1907 showed a decrease, which in comparison with 1914 was 2.9 per cent, with the net income dropping 46.3 per cent.

To give the showing more in detail, it may be said that the railway operating expenses totaled \$21,318,000, an increase of 5.4 per cent for the year, so that the net revenue from railway operation at \$11,350,000 showed an increase of 4.1 per cent. The operating ratio rose from 64.99 to 65.26. Railway tax accruals increased very slightly by 0.1 per cent to a total of \$1,993,000, and the railway operating income therefore rose 5 per cent to \$9,357,000. The railway operating income was nearly as high as that in the highest preceding year of the series, 1914. The net revenue from other operations increased 5.5 per cent, but the non-operating income fell off 4.5 per cent, so that the gross income at \$10,725,000 showed a gain of 4.5 per cent. Interest charges, which amounted to \$7,636,000, showed a substantial decrease of 4.4 per cent, this being partly offset by an increase of 10.6 per cent in the \$1,433,000 of other deductions, including rentals, amortization of suspense items, etc.

The net income at \$1,607,000, while showing a gain of 72.2 per cent for the last fiscal year, represented a decrease of 44.0 per cent from that secured in 1907. In the ten years for which the commission has electric railway re-

ports, in only three instances, 1910, 1911 and 1912, has the net income been greater than that in 1907. The decrease in 1916 was next to the largest during the period, the preceding decreases in 1913, 1914 and 1915 being respectively 28.4 per cent, 39.5 per cent and 67.5 per cent.

In the last fiscal year, the dividends at \$2,985,000 represented an increase of 7.2 per cent, their excess over the net income figure showing that to some extent they were paid out of accumulated surplus. The total fares and transfers amounted to 643,472,000, a gain of 5.8 per cent, and the total revenue car miles to 104,396,000, an increase of 1.0 per cent. The traffic total was greater than in any preceding year, and the number of revenue car miles was greater than for any year except 1914.

The miles of road operated within New York State during the last fiscal year were 2027. It should be remembered, however, that this mileage figure is not comparable with the income and traffic statistics. While for the electric railways under the commission's supervision the traffic on lines outside the State is very much less important than in the case of steam railroads, it is still considerable. A decrease of 10 miles from the 1915 mileage figures was caused by the abandonment of the road of the Lima-Honeoye Light & Railroad Company and the St. Lawrence International Electric Railroad & Land Company.

In connection with a point emphasized in last year's report of the division of capitalization, i.e., the desirability of utilities analyzing their plant account in order to learn their investment in the different classes of property and also in different localities, it is now reported that work of this character is being actively carried on by corporations owning and operating 1090 miles of track, one-third of the electric railway track mileage in the State. The fixed capital being analyzed, verified and distributed by these corporations amounted on June 30, 1916, to about \$82,000,000. In previous years electric railways operating 613.33 miles of track, which represented a reported fixed capital of approximately \$51,000,000, completed such work and have since continued to maintain a correct record of their investment in various classes of facilities and in the communities served. According to the commission, the verified returns of corporations which have completed such an allocation of plant costs, show a general and steady increase in the selling prices of their securities. The improvement in the market for practically all classes of securities is partly responsible for this, but it is believed by the commission that its inquiries into the balance sheet accounts, which have resulted in a verification of assets and liabilities, have had a beneficial effect upon the salability of the securities of the utilities concerned.

Boston Report Decided Upon

Legislative Committee Decided Not to Grant Boston Elevated Plea for 6-Cent Fare

The special commission created by the Massachusetts Legislature of 1916 to investigate the financial condition of the Boston Elevated Railway decided on Jan. 11 in executive session not to approve the proposed increase of fare from 5 to 6 cents when it reports to the Legislature. Lieutenant-Governor Coolidge, chairman of the commission, is reported to have said:

"The Elevated has been very anxious to have the 6-cent fare authorized. Our great problem has been to get the Elevated out of its troubles without such an increase."

He further stated that the commission has determined to recommend taking the Cambridge subway off the company's hands, together with the remission of certain franchise and compensation taxes amounting in the aggregate to about \$600,000.

The commission will recommend to the Legislature that the Public Service Commission undertake a thorough investigation and examination of the financial condition of the company as well as a comprehensive study for the development and improvement of the transportation service and facilities within the metropolitan district. To Prof. George F. Swain was delegated the work of drafting the report for the committee to submit to the Legislature.

Atlanta Petitions Opposed

Leader of Recent Agitation Against Georgia Railway & Power Company Seeks to Upset Company's Financial Program

At the insistence of the committee raised at a mass meeting of sympathizers with the agitation to compel the Georgia Railway & Power Company to permit the organization of its conductors and motormen by the Amalgamated Association, the Georgia Railroad Commission on Jan. 11 postponed to Jan. 16 its scheduled hearing of the two petitions filed by the power company and of the one petition filed by the Georgia Railway & Electric Company.

One of the power company's petitions is for authority to issue non-interest bearing scrip in the sum of \$420,000 for payment at the rate of \$30,000 semi-annually of that amount accrued during the past four years, less \$60,000 to be paid in cash, on its \$2,000,000 issue of 6 per cent first preferred cumulative stock. The other petition by the power company seeks authority to issue \$459,000 of first and refunding mortgage bonds. The electric company's petition is for authority to issue \$283,000 of refunding and improvement bonds.

Marion Jackson, editor of *The Way*, a weekly Atlanta publication, and one of the leaders in the agitation against the power company, insisted upon the postponement. He declared that he and his associates intended to protest each of the issues, and that their attorney, Thomas B. Felder, was unavoidably absent from the city. He asked for postponement to Jan. 23. He submitted a lengthy document attacking the power company and its affiliated companies on the grounds of low wages, unsatisfactory working conditions, exorbitant charges, undue earnings and several similar grounds. The reading of the petition was interrupted and stopped by C. M. Candler, chairman of the commission, who stated that it was totally irrelevant to the issue of the hearing. Mr. Jackson stated that this document was based upon a report by F. W. Ballard & Company, Cleveland, Ohio, following an investigation by that company of the power company's affairs at the instance of himself and his associates. Among other things, the report suggested that the city of Atlanta construct and operate a municipal electric plant.

Readers of the *ELECTRIC RAILWAY JOURNAL* will recall that in the course of the trial of William Pollard, strike agitator, in the criminal court of Atlanta upon the charge of inciting to riot, sworn evidence was adduced that the offer had been made to the power company to call off the Ballard investigation if the power company would recognize the Amalgamated Association. This offer was characterized by President P. S. Arkwright, on the witness stand, as an attempt to blackmail the company.

Securities of Nova Scotia Company Offered

A syndicate of bankers in which Lee, Higginson & Company; Potter, Choate & Prentice and Stone & Webster are participants, are making two offerings of the securities of the Nova Scotia Tramways & Power Company, Ltd., Halifax, N. S. The offerings consist of (1) Nova Scotia Tramways & Power Company, Ltd., first mortgage 5 per cent gold bonds due Dec. 1, 1946, at 95½ and interest to yield about 5.30 per cent, and (2) Nova Scotia Tramways & Power Company, Ltd., preferred and common stock in blocks of ten shares of 6 per cent cumulative preferred stock and three shares of common stock each of a par value of \$100 for \$1,000.

The Nova Scotia Tramways & Power Company, Ltd., was incorporated under a special act of the Legislature of Nova Scotia in 1914 and is the successor to the Halifax Electric Tramway, Ltd. It does the entire electric light, power and gas business and also the entire electric railway business in Halifax and serves a population of about 65,000. In addition, it is empowered to acquire water powers, land, etc., on the Gaspereaux River, 55 miles from Halifax, capable of a hyroelectric development of approximately 12,008 hp. The company has authorized \$10,000,000 of first-

mortgage 5 per cent gold bonds due in 1946, \$2,500,000 of 6 per cent cumulative preferred stock and \$3,500,000 of common stock. Of these amounts \$2,250,000 of bonds, together with \$1,500,000 of preferred stock and \$2,500,000 of common stock, have been issued. It is explained that the purpose of the present issues of stocks and bonds of the company is to provide for the acquisition of the properties of the Halifax Electric Tramway, Ltd., and the water power rights on the Gaspereaux River and to provide adequate working capital.

Hearing on Frontier Railway

Pennsylvania and D., L. & W. Railroads Seek to Purchase Stock of Frontier Electric Railway

The Pennsylvania Railroad and the Delaware, Lackawanna & Western Railroad presented an application before the Public Service Commission for the Second District of New York at Albany on Jan. 15 for permission to purchase the capital stock and the right-of-way of the Frontier Electric Railway between Buffalo and Niagara Falls, paralleling and contiguous to the high-speed line which the International Railway now has under construction. The applicants, however, did not disclose enough of their plans and proposed developments of the road to satisfy the commission and the case was adjourned subject to call.

All of the railroad interests at Buffalo and the Niagara frontier were represented at the hearing. Assurance was given that the road would be run only as an electric line, but the proponents of the scheme did not deny that it might be used for freight as well as for passenger business.

The stock of the Frontier Electric Railway, it developed, is owned by Marshall J. Dodge of the New York banking firm of Bertron, Griscom & Company. He also holds title to the right-of-way. He owned the right-of-way of the old Buffalo, Thousand Islands & Portland line and has already sold to the International Railway space for its double track line. E. G. Connette, president of the International Railway, was present at the hearing and registered no opposition to the plans.

L. L. Babcock, representing the Delaware, Lackawanna & Western Railroad, told the commission that it was important that the plans for the development of the Frontier Electric Railway be hurried along as its powers lapse within the next few years. The company was organized in 1906, under the authority of the old railroad commission.

Brooklyn (N. Y.) City Railroad.—Frank Lyman, president of the Brooklyn City Railroad, which is operated under lease by the Brooklyn Rapid Transit Company, on Jan. 15 addressed the following communication to the stockholders of the Brooklyn City Railroad: "You have been previously advised that your directors expected to resume the payment of the full dividend of 10 per cent per annum on Oct. 15, 1917. Since the completion of the payment of the current obligations of the company on account of the settlement of the suit on Oct. 23, 1913, the books show we now have \$168,000 in current cash and invested in real estate mortgages and securities. Your directors feel there should be a substantial increase in said amount of \$168,000 by adding thereto \$60,000 on April 1, 1917, from the quarterly rent of \$300,000 to be received on said date from the lessee, so as to bring the amount up to and over \$228,000 before resuming the payment of said 10 per cent dividends. Therefore, your directors now expect to resume the payment of the full dividend of 10 per cent per annum on July 15, 1917, instead of Oct. 15, 1917, as previously announced. The directors on Jan. 2, 1917, declared a quarterly dividend of 2 per cent upon the capital stock of the company, amounting to \$240,000, payable on Jan. 15 to stock of record on Jan. 3."

Cleveland, Painesville & Eastern Railroad, Willoughby, Ohio.—The Cleveland Trust Company, trustee of the first mortgage 5 per cent bonds of the Cleveland, Painesville & Ashtabula Railroad, has notified holders of the bonds that no funds were deposited to pay the coupons maturing on Jan. 1. There are \$1,000,000 of the bonds outstanding, and a protective committee has been organized in the interest of the holders. In 1906 the Cleveland, Painesville & Eastern Railroad acquired control of the Cleveland, Paines-

ville & Ashtabula Railroad. The bonds on which the interest remains unpaid are dated July 1, 1902, and are due July 1, 1922. They are not guaranteed, and the section of the road which they cover is understood to have failed for some time fully to cover its charges. E. V. Hale and J. A. House, bankers of Cleveland, have been named as the protective committee, and bonds are to be deposited with the Cleveland Trust Company.

Columbus, Delaware & Marion Railway, Cincinnati, Ohio.—The Cleveland Trust Company, Cleveland, Ohio, as trustee of the first mortgage bonds of the Columbus, Delaware & Marion Railway, has filed an answer and cross petition in the receivership proceedings of that company asking foreclosure of the first mortgage. The trustee avers that the company defaulted in the payment of interest of \$25,000, due on Nov. 1, 1916, on \$1,000,000 of first mortgage bonds. The receiver of the company had paid practically all interest charges up to last November, but the demand for improvements in 1916 caused the expenditure of all surplus earnings, and no money was available to pay the interest maturing in November.

Commonwealth Power Company of Nebraska, Lincoln, Neb.—Liggett, Hichborn & Company, New York, N. Y., are offering for subscription at 100 and interest \$750,000 of first mortgage 6 per cent gold bonds of the Commonwealth Power Company dated March 1, 1914, and due March 1, 1944, callable at any time at 105. The bankers say: "The Lincoln Traction Company of Lincoln, Neb., by agreement, reference to which is indorsed upon each bond, obligates itself to pay from the amounts due the power company, the interest charges and the sinking fund of the Commonwealth Power Company of Nebraska. By this agreement the interest charges of the Commonwealth Power Company become a part of the operating expenses of the Lincoln Traction Company, and are a prior charge to all interest charges on its bonds."

General Gas & Electric Company, New York, N. Y.—The holding of the General Gas & Electric Company in the securities of its subsidiaries on Jan. 13, 1917, was as follows: 14.8 per cent of the total bonds outstanding, 70.6 per cent of the total preferred stocks outstanding, and 95.2 per cent of the total common stocks outstanding.

Hagerstown & Frederick Railway, Frederick, Md.—Nelson, Cook & Company, Baltimore, Md., are offering for subscription at 100 and interest to yield 6 per cent first and refunding 6 per cent thirty-year sinking fund gold bonds of the Hagerstown & Frederick Railway dated April 1, 1914. The authorized issue is \$10,000,000 and there are outstanding at present \$1,224,000. The bonds are in coupon form in the denomination of \$1,000, \$500 and \$100. They are redeemable at 105 per cent of par with interest, at any interest period. The letter from Emory L. Coblenz, president of the railway, to the Fidelity Trust Company, Baltimore, trustee of the issue, explains that the bonds are secured by a first mortgage on practically the entire street railway system in Frederick, on almost the entire line from Frederick to Thurmont, on the company's new modern power plant, and high-tension transmission lines and substations throughout the system; and upon the entire street railway trackage in Hagerstown, as well as the branch line from Hagerstown to Williamsport, and the line from Hagerstown running eastward to Funkstown. The bonds are in addition a direct mortgage on the remaining properties of the company subject to \$850,000 prior lien bonds. By a covenant in the deed of trust securing the first and refunding bonds, the mortgages securing prior lien bonds of constituent companies have been closed.

Ohio Valley Electric Railway, Huntington, W. Va.—The Fidelity Trust Company, Baltimore, Md., heads a syndicate which has bought an issue of \$800,000 of Ohio Valley Electric Railway first mortgage 5 per cent bonds. With this issue the outstanding bonds of the railway amount to \$1,679,000. The bonds are a direct first mortgage upon all railway property now owned or hereafter acquired.

Philadelphia (Pa.) Rapid Transit Company.—A semi-annual dividend of 2½ per cent, or \$1.25 per share, has been declared out of the surplus earnings of the current fiscal year beginning July 1, 1916, upon the capital stock of the Philadelphia Rapid Transit Company, payable on Jan. 31, 1917, to shareholders of record at the close of business on

Jan. 22, 1917. Last October \$1 was paid on the stock, being the first disbursement since the company was formed in 1902.

West End Street Railway, Boston, Mass.—The Massachusetts Public Service Commission has authorized the issue by the West End Street Railway of thirty-year bonds to the amount of \$2,700,000 bearing interest at not more than 6 per cent for the retirement of a like amount of bonds due on Feb. 1, 1917. The West End Street Railway is operated under lease by the Boston Elevated Railway.

Dividends Declared

Columbus Railway, Power & Light Company, Columbus, Ohio, quarterly, 1¼ per cent, preferred B; quarterly, 1¼ per cent, common.

East St. Louis & Suburban Company, East St. Louis, Ill., quarterly, three-quarters of 1 per cent, preferred.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., quarterly, 1½ per cent, preferred.

Electric Railway Monthly Earnings

AURORA, ELGIN & CHICAGO RAILROAD, WHEATON, ILL.

Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Nov., '16	\$168,131	*\$120,526	\$47,605	\$35,741	\$11,864
1 " " '15	156,441	*106,097	50,344	35,616	18,728
5 " " '16	932,957	*616,072	316,885	179,546	137,339
5 " " '15	869,759	*568,757	301,002	182,741	118,261

CHATTANOOGA RAILWAY & LIGHT COMPANY, CHATTANOOGA, TENN.

1m., Nov., '16	\$103,536	*\$73,866	\$29,670	\$29,735	†\$65
1 " " '15	98,812	*61,537	37,275	29,623	7,652
12 " " '16	1,230,205	*798,411	431,794	355,949	75,845
12 " " '15	1,071,013	*730,036	340,977	357,315	†16,338

CONNECTICUT COMPANY, NEW HAVEN, CONN.

1m., Nov., '16	\$759,716	*\$636,392	\$123,324	\$96,488	†\$49,557
1 " " '15	679,900	*487,961	191,939	100,575	†114,719
5 " " '16	4,262,684	*3,214,988	1,047,696	487,891	†703,142
5 " " '15	3,747,870	*2,496,831	1,251,039	493,014	†874,177

EAST ST. LOUIS & SUBURBAN COMPANY, EAST ST. LOUIS, ILL.

1m., Nov., '16	\$278,467	*\$168,019	\$110,446	\$63,410	†\$47,038
1 " " '15	219,595	*127,551	92,044	62,679	29,365
12 " " '16	2,970,954	*1,777,194	1,192,860	754,265	438,595
12 " " '15	2,442,300	*1,441,179	1,001,121	765,081	236,040

GRAND RAPIDS (MICH.) RAILWAY

1m., Nov., '16	\$102,921	*\$67,706	\$35,215	\$17,322	†\$17,893
1 " " '15	99,020	*66,024	32,996	14,223	18,773
12 " " '16	1,290,412	*840,470	449,942	181,654	268,288
12 " " '15	1,190,353	*823,215	367,138	164,874	202,264

LAKE SHORE ELECTRIC RAILWAY, CLEVELAND, OHIO

1m., Nov., '16	\$125,610	*\$86,790	\$38,820	\$36,263	\$2,557
1 " " '15	112,682	*74,626	38,056	35,992	2,064
11 " " '16	1,468,736	*924,797	543,939	400,089	143,850
11 " " '15	1,263,331	*821,245	442,086	397,107	44,979

LEHIGH VALLEY TRANSIT COMPANY, ALLENTOWN, PA.

1m., Nov., '16	\$207,397	*\$139,243	\$68,154	\$52,353	†\$35,795
1 " " '15	190,556	*114,943	75,613	53,363	†34,408
12 " " '16	2,471,871	*1,518,110	953,761	630,493	†468,476
12 " " '15	2,056,875	*1,204,387	852,488	665,246	†323,387

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.

1m., Nov., '16	\$199,981	*\$120,520	\$79,461	\$42,314	\$37,147
1 " " '15	185,260	*111,567	67,693	42,902	24,791
12 " " '16	2,370,491	*1,445,906	924,585	509,791	414,794
12 " " '15	2,136,817	*1,313,008	823,809	498,720	325,089

NEW YORK (N. Y.) RAILWAYS

1m., Nov., '16	\$837,383	\$614,547	\$222,836	\$361,681	†\$76,272
1 " " '15	1,134,595	672,139	462,456	370,532	†140,729
5 " " '16	4,447,489	2,972,433	1,475,056	1,824,760	†\$80,416
5 " " '15	5,795,652	3,420,963	2,374,689	1,853,975	†748,004

NEW YORK & STAMFORD RAILWAY, PORT CHESTER, N. Y.

1m., Nov., '16	\$22,650	*\$22,367	\$283	\$7,987	†\$7,659
1 " " '15	25,092	*24,301	791	7,998	†17,157
5 " " '16	164,268	*127,606	36,662	39,393	†13,004
5 " " '15	186,660	*135,332	51,328	40,003	†11,638

NEW YORK, WESTCHESTER & BOSTON RAILWAY, NEW YORK, N. Y.

1m., Nov., '16	\$52,414	*\$47,276	\$5,138	\$35,972	†\$16,266
1 " " '15	44,264	*41,804	2,460	\$5,421	†11,628
5 " " '16	259,309	*231,588	27,721	\$31,767	†747
5 " " '15	214,340	*208,158	6,182	\$30,460	†16,040

PHILADELPHIA (PA.) RAPID TRANSIT COMPANY

1m., Dec., '16	\$2,487,287	\$1,396,094	\$1,091,193	\$813,921	\$277,272
1 " " '15	2,213,472	1,237,668	975,804	815,497	160,307
6 " " '16	13,857,145	7,703,819	6,153,326	4,887,234	1,266,092
6 " " '15	12,416,972	6,959,936	5,457,036	4,895,793	561,243

*Includes taxes. †Deficit. ‡Includes non-operating income. §Excludes interest on bonds, charged income and paid by the New York, New Haven & Hartford Railroad, under the guarantee; also interest on notes held by the New York, New Haven & Hartford Railroad not credited to income of that company.

Traffic and Transportation

B. R. T. Efficiency Campaign

Surface Transportation and Mechanical Departments Start Series of Weekly Efficiency Bulletins as Educational Mediums

Plans in connection with the recently inaugurated joint efficiency campaign of the men and management of the Brooklyn Rapid Transit system, an announcement of which appeared in the *ELECTRIC RAILWAY JOURNAL* of Jan. 13, have matured rapidly enough to allow departmental educational work under the efficiency program to be instituted in the surface transportation and mechanical departments.

According to the *B. R. T. Monthly*, departmental notices announced the establishment in the surface transportation and mechanical departments respectively of a series of weekly efficiency bulletins, each of which the participants in the campaign would be expected to read one every day until the next bulletin appeared. The notices also invited suggestions and particularly solicited the co-operation of safety committees. Enrollment blanks were distributed in the various surface depots during the week of Dec. 4 to 9 and about 4800 out of a total of 5200 surface transportation department employees voluntarily signed them and turned them in as evidence of their desire to participate in the joint efficiency campaign.

In both the surface transportation department and the mechanical department the efficiency bulletin service was started with a bulletin entitled "Your Heart in Your Work and Your Mind on the Job." In the mechanical department this bulletin was followed by a bulletin on "Rules," dealing with the necessity of self-discipline, pointing out the uselessness to himself and everybody else of the man who refuses to impose upon himself any rules and the fact that such a man generally comes into conflict with the "Rules" or laws of the community and by suffering prosecution and punishment is made to feel their existence more forcibly than anyone else.

Investigation of Blue Hill Fares

Seven-Cent Fare Unit with Old Three-Zone System Discussed as Possible Solution for Any Equitable Adjustment

Financial results of the existing fare units and zone system on the Blue Hill Street Railway were discussed before the Massachusetts Public Service Commission at Boston on Jan. 3, upon petition of the selectmen of Canton asking for the restoration of the former three main-line zones with three 6-cent fares. A. Stuart Pratt, vice-president of the Stone & Webster Management Association and of the railway, represented the company.

Mr. Pratt said that speaking broadly, the results of the last year and a half under the four-zone main-line system have not proved financially satisfactory for the company. The total gain on the entire Blue Hill road, resulting from the fare and zone changes ordered, was \$1,862 in the year ending Oct. 31, 1916. The total revenue passengers carried, including those riding on all classes of revenue tickets, increased from 1,471,393 to 1,731,522 during the year, in comparison with those riding in the previous year, when four fare zones were in effect on the entire system, five zones being in operation under the commission's order, taking main and branch lines into account, since July, 1915.

On behalf of the company it was contended that this increase is inadequate, especially in view of the recent large increase in expenses which has unavoidably resulted from rising cost of labor and materials. Mr. Pratt said that while it has been impossible to analyze the earnings of the system sufficiently to determine the principal cause of the addition to revenue, the increased prosperity of the communities served has unquestionably been a substantial

factor. At this time the company is not prepared to recommend any further fare increase, but J. A. Murphy of the Canton board of selectmen suggested that a compromise solution worked out in the board favors the establishment of a 7-cent fare unit under the old three-zone system, with workingmen's tickets at the rate of ten for 60 cents. Mr. Pratt stated that while he desired not to give a final opinion as to the merits of the proposal for a 7-cent fare unit at the time of the hearing, he was inclined to favor its trial, but for a shorter period than one year. There is no way of ascertaining, Mr. Pratt said, what the maximum practicable fare unit is on such a road, without the test of experience. The use of one-man cars is being considered, but no conclusion has as yet been reached. Mr. Pratt said that he anticipated a double-truck design for one one-man car service would be developed in the street-railway field in due course.

Courtesy a Medium for Safety Training

Application of This Principle Is Being Urged by the New York & Queens County Railway as a Direct Method for Preventing Accidents

Courtesy is the keynote of a series of educational classes for employees recently started by the New York & Queens County Railway, Long Island City, N. Y., and held in its Woodside carhouse. According to a statement made by Martin F. Lynch, assistant attorney of the company, to a representative of the *ELECTRIC RAILWAY JOURNAL*, the inauguration of this movement, although partly inspired by similar educational talks held in the depots of the New York Railways under the direction of James L. Quackenbush, general attorney of that company, became imperative in order to reduce the unusual number of accidents suffered by the company last fall, owing to certain local conditions. When this company was involved in a labor strike during last September, October and part of November, it became necessary to employ an unduly large number of new platform men, thus handicapping the work of administering proper instruction.

The handling of cars by untrained crews, together with the overcrowding caused by an inordinate growth of suburban travel in premature anticipation of the yet uncompleted rapid transit facilities in Queens County, contributed to an alarming number of accidents. Mr. Lynch stated that the legal department of his company met with accident cases wherein it was impossible to obtain a favorable verdict from the jury, because, as some of the jurymen afterwards admitted, they had based their judgment on previous ill-treatment which they themselves had suffered at the hands of discourteous motormen and conductors.

The new educational lectures are divided into two classes: accident prevention, given by Mr. Lynch, and proper car operation, covered by S. H. Serena, superintendent of transportation. The talks, now given three times a day when feasible, will be continued until all the employees on the system have been included, and will probably be supplemented later by moving pictures. During the February meetings it is expected to have J. W. Gerke, superintendent of maintenance, discuss the handling of car equipment from the safety standpoint. The meetings are held in a most informal manner and the men have been encouraged to participate freely in the discussions, ask questions and report any complaints they may have heard from passengers. Mr. Lynch has devoted particular attention toward encouraging polite insistence by conductors that their passengers be not permitted to stand on the platforms, a frequent source of accidents, but pass into the interior of the car. There are many patrons on this line, who, although they have been accustomed to obey the rule against platform riding on the pay-as-you-enter cars in Manhattan with which they are familiar, have shown obstinacy in this matter when riding on the non-prepayment cars of the New York & Queens County Railway.

The new lectures are claimed to have had highly successful results, the rate of accidents during the last three weeks having decreased about 50 per cent, with a marked reduction also in the number of collisions.

Autoists Warned of Danger

Secretary of State of New York Sounds Note of Warning in Letter Accompanying 1917 Registrations

In an effort to bring about a decrease in the number of grade crossing accidents 400,000 folders impressing the need of a more strict observance of "Stop, Look and Listen" are being mailed New York State automobilists by Secretary of State Hugo. In this the State automobile bureau is co-operating with one of the main trunk lines, the latter bearing the expense. A folder is now being sent with each 1917 certificate of registration.

The folder calls attention to the fact that more than 1000 persons are killed in grade crossing accidents each year in the United States and that a tenth of the number are from New York State alone. Twice the number are seriously injured. There has been a 100 per cent increase in grade crossing accidents in the last five years.

Secretary Hugo urges motorists to use care when approaching a grade crossing. The folder also carries the suggestion that motorists take no chances, but always stop or slow down and then both look and listen. So far as is known the present effort is the first of its kind between railroad and State automobile bureaus.

As has been noted previously in the *ELECTRIC RAILWAY JOURNAL*, the electric railways of New York are also busy at work in co-operating with automobile clubs and Secretary Hugo's office in the hopes of bringing about like results. Sunday casualties at grade crossings have become altogether too numerous. A meeting along safety-first lines will be held in the near future. Among the recommendations to be made at that time will be the following:

That warning whistles on trolley cars be of a type not producing sound which can be confused with those of an automobile horn.

That automobile horns be standardized as to volume of tone.

That steps be taken to secure legislation requiring vehicles, including horse drawn as well as automobiles, to carry lights by night that will be visible from front, rear and both sides.

That obstructions on highways outside of cities and villages precluding a proper length of vision at crossing be removed at public expense.

That obstructions on railroad companies' private rights-of-way precluding a proper length of vision at crossings be removed by the railroads at their own expense.

That obstructions on private property outside of cities and incorporated villages precluding a proper length of vision at crossings be removed by the town, county or State, legislation being enacted to that end. If such obstructions are not removed that the Public Service Commission have power upon its own initiative to order such.

That all public highway crossings of electric railways outside of cities and incorporated villages including those protected by gates or flagmen be equipped with stationary crossing signs illuminated after dark.

That stationary district signals be installed on the highways bearing the words: "Railroad Crossing, 500 ft.," the State, county or town bearing the expense.

That warning whistles on electric road begin not less than 800 ft. from a crossing and continue until the crossing is reached.

War Fund for British Columbia Employees

When the European war broke out in August, 1914, and the necessity of the Canadian Patriotic Fund was foreseen, and subscriptions were being solicited throughout the Dominion of Canada, the British Columbia Electric Railway, Ltd., Vancouver, B. C., through George Kidd, general manager, volunteered until further notice to take care of the dependents of its employees who enlisted for war service. Monthly payments to dependents were made direct by the company until the end of October, 1916, when owing to many married men who enlisted during 1916, the monthly payment

aggregated a sum in excess of what the company considered it could afford to contribute. Therefore, a new arrangement was made, whereby the company, instead of making the payments direct to dependents of employees, agreed to make a monthly contribution of \$2,000 direct to the Canadian Patriotic Fund, and the managing committee of the Vancouver Branch of the fund, took over the payments to the families of employees on the basis of the regulations governing the distribution of the fund.

With regard to the company's employees and their contributions to the fund the employees formed a committee at the beginning of the war and solicited subscriptions to the Canadian Patriotic Fund. Many of the employees agreed to contribute 1 per cent of their wages each month, the contribution to be deducted from the payrolls and paid over to the honorary treasurer of the fund. This amounted to approximately \$480 a month. The straight 1 per cent has been adhered to until recently when Sir Herbert Ames, the honorary secretary of the Canadian Patriotic Fund, visited British Columbia for the purpose of arranging additional voluntary subscriptions, and immediately following his visit a general canvass of the cities and districts was undertaken and a large percentage of the company's employees has already increased the monthly subscriptions, and it is expected that when the canvass is completed the total monthly contribution by the employees of the railway and its subsidiary companies will be \$800 or more.

Serious Head-on Collision in Western New York.—In a head-on collision on Jan. 2 on the Jamestown, Westfield & Northwestern Railroad, Jamestown, N. Y., the motormen of the cars were killed, three passengers were seriously injured and about a score of other passengers were injured slightly.

Cleveland Council Considers Street Railway Matters.—Two resolutions were introduced in the Cleveland City Council on Jan. 15, one asking the Cleveland Rapid Transit Railway Company to show cause why its franchise should not be revoked, and the other for the immediate revocation of its franchise. Both were referred to the committee on streets.

Mayor Vetoes Measure for Seats for Motormen.—Mayor George Karb of Columbus, Ohio, on Jan. 12 vetoed the Alcott ordinance which made it compulsory for the Columbus Railway, Power & Light Company to install seats on its cars for motormen and conductors. The Mayor is of the opinion that the best means of providing rest for the car crews will be determined by experiments now being made by the company.

Two-Cent Fares Upheld in Illinois.—The supremacy of the Illinois 2-cent rate for passenger travel within the State was affirmed on Jan. 13 by Judge Landis in the United States District Court, when he dismissed, for want of equity, the petition of twenty-eight railroads operating in Illinois for an injunction to restrain the State authorities from prosecuting them for establishing a 2.4-cent rate, indirectly authorized by the Interstate Commerce Commission.

Rooke Registers in Brooklyn.—The Brooklyn (N. Y.) Rapid Transit Company has begun the use of the Rooke register in the collection of fares on the Hamburg Avenue surface line of the Canarsie Division, which also includes the Ralph-Rockaway, New Lots, Church and Ralph Avenue shuttle surface lines. In a statement to the public the company says: "Please have your nickel ready. This will ultimately promote the convenience of both passengers and conductors, because the making of change involves discomfort to both."

Skip-Stop Discontinued.—The operation of the skip-stop on the Bloomfield line of the Public Service Railway, Newark, N. J., has been discontinued. The Board of Public Utility Commissioners of New Jersey refused formally to approve the plan, although it took occasion to say that it believed such a method of operation would benefit the people of the several communities along the line. At the same time, as certain representatives of these communities objected to a continuance of the skip-stop, because of a division of opinion among their people, the commission decided not to act against the expressed wishes of the municipalities.

Ohio Men May Urge Eight-Hour Day and Seats for Motormen and Conductors.—Street railway men in Ohio are preparing to ask the Legislature for the enactment of laws that will give them an eight-hour day and seats for both motormen and conductors. They claim that their duties are fully as exacting as those of railroad engineers and conductors, and that they should receive the same consideration. On the other hand, they allege that the railway managers are urging greater speed all the time, and that cars are becoming more overcrowded every day. This, they say, is increasing their responsibilities to such an extent that, for the safety of themselves and their passengers, the work-day should be limited to eight hours. They expect to work through the Ohio State Federation of Labor for the legislation desired.

Spokane Jitneys Worked Overtime.—According to figures given out by the Spokane Motor Bus Association, jitneys in Spokane, Wash., during the past year carried more than 4,500,000 passengers. According to the figures of the association, there are seventy-two jitney buses operating in Spokane at the present time. While some of the jitney drivers take in as high as \$14 a day, a fair average is \$10 per day per jitney. Some of the jitneys have two drivers; that is, the car is operated on two separate shifts. Some of the drivers run as high as twelve hours a day, but a fair average is ten hours. A large percentage of the jitneys are Fords, and they average close to 20 miles on a gallon of gasoline; other jitney buses have special carburetors, and they make between 18 and 20 miles to the gallon. Each bus in Spokane covers approximately 200 miles a day.

Prizes for Safety Records in Dallas.—Plans for "safety first" and greater courtesy on the street railways of Dallas, Tex., have been announced by Richard Meriwether, superintendent of the Dallas (Tex.) Consolidated Street Railway. Cash prizes amounting to \$500 will be awarded the team making the best accident record. The award will be made at the end of the year 1917. A democratic plan has been worked out whereby the trainmen will elect the captains of the different teams. A new council of efficiency has also been created, to meet on the first Tuesday of each month. It will be composed of seven captains of the teams, the inspectors, superintendent of transportation, claim agent, and general superintendent. The council will discuss the working conditions among trainmen and all matters pertaining to the safe operation of the local street railways.

Hearing on Jan. 31 on Closed Vestibules in New York.—On recommendation of C. W. Wilder, its electrical engineer, the Public Service Commission for the First District of New York has called a hearing for Jan. 31 at which will be considered the matter of minimizing the number of accidents to passengers boarding or alighting from surface cars. Reports made to the commission indicate that the chief means of eliminating or at least minimizing such accidents appears to be the installation of closed vestibules. The question of requiring this safeguard on all cars will be considered. In his memorandum to the commission, Mr. Wilder pointed out that studies of statistics gathered by the commission showed that boarding and alighting accidents "have practically disappeared in connection with cars equipped with closed vestibules and with center entrance cars."

Street Cars Have Right of Way Over Vehicles in Oakland, Cal.—A new traffic ordinance adopted by Oakland (Cal.) City Council on Dec. 15, 1916, contains some important provisions for facilitating the movement of traffic and insuring safety. According to the new ordinance, street cars have the right of way over all vehicles at all intersecting streets not controlled by police traffic officers. In approaching street cars which have stopped or are about to stop to permit passengers to alight or board, vehicles moving in the same direction as such cars must stop 10 ft. to the rear, unless they can pass the cars leaving 6 ft. between the vehicles and the steps of the cars, in which case they may proceed at a speed not greater than 10 m.p.h. Vehicles shall not approach or cross any intersecting street upon which there are street car tracks at a greater rate of speed than 10 m.p.h.

Conference Asked on Missouri-Illinois Fares.—The public utilities committee of the Board of Aldermen of St. Louis, Mo., was asked on Jan. 10 by the Illinois Traction Company to hold a public conference with officials of Venice, Granite City and Madison, Ill., at which the passenger fare question could be threshed out. The chairman of the committee said the committee was "very busy with other matters," and expressed doubt whether a hearing would be scheduled in the near future. The company was authorized some time ago by the Interstate Commerce Commission to increase the single fare between St. Louis and the so-called tri-cities across the river in Illinois from 5 cents to 10 cents and to establish certain commutation rates at an average fare between 5 cents and 10 cents. Threats of reprisals were made by the municipalities affected and in the case of St. Louis there is a bill pending before the public utilities committee of the Aldermen seeking to repeal the company's franchise there.

Buffalo Traffic Increase Taxes Railway Facilities.—Rush-hour traffic over the Buffalo, N. Y., city lines of the International Railway is breaking all previous records. More than 250 additional trainmen are being employed and within the next few weeks forty-one new and rebuilt cars will be placed in operation. Owing to the shortage of cars during the early morning and evening rush hours, the company has been forced to use large interurban cars on some of its lines. N. H. Brown, general superintendent of transportation, says that the company is making every effort to improve its service. Additional cars have been placed on all lines; more trainmen are being employed than ever before and on the East and West Utica lines, where passengers are forced to transfer, through service is maintained during the evening rush hours; express service is maintained from the large industries in the north end of the city to all parts of the east side, and the company is meeting the shortage of electric power by generating at its reserve plants power from steam.

Buses Owned by Traction Company Operate at Loss.—The Pacific Gas & Electric Company, which operates the electric railway system in Sacramento, Cal., has in service two gasoline-driven buses which were put on in response to a demand for service in certain outlying districts not reached by the company's tracks. The buses run over different routes in the eastern annexed portions of the city, one route being about a mile long and the other about 2 miles. Both buses are Ford automobiles, fitted with special bodies, and have a seating capacity of twelve each, including driver. Although the buses have been operating several months and the routes are well established, the company states that the revenue they bring in does not cover the operating cost. Several applications for similar bus service in other suburban districts have been refused by the company after a traffic count showed what traffic could be counted upon. It is the plan, however, to continue the bus service now operating for the convenience of the patrons served.

Company Move in Interest of Public Health.—The Beaver Valley Traction Company, New Brighton, Pa., through Superintendent W. H. Boyce, has given official notice in an advertisement in the *Beaver Times* that the most rigid rules for the protection of the health of passengers on Beaver valley cars will be observed. Owing to the prevalence of pneumonia, persons are asked to use more than usual care when sneezing or coughing while riding in the cars. The order also states that the rules against spitting in the cars will be rigidly enforced without the customary warning. In commenting on this action of the company the *Times* said: "In enforcing these regulations the company has in mind only the welfare of the traveling public and it desires to make traveling as safe as possible by taking every precaution against the spread of diseases. This is only another important step in the safety first campaign which the railway has been conducting through various lines of activity for several years. To promote the safety of the public, especially that portion of it which uses the street cars daily, or occasionally, the company has spent thousands of dollars. They will continue this good work through publicity work and other effective agencies in the future."

Personal Mention

Arthur C. Hume has been elected president of the Babylon (N. Y.) Railroad.

M. Cummings has been appointed roadmaster of the Oklahoma (Okla.) Railway.

T. F. Kaap has been appointed purchasing agent of the Evanston (Ill.) Railway.

A. Gardiner has been elected secretary of the Saskatoon (Sask.) Municipal Railway.

John MacDonald has been appointed track foreman of the City Railway, Dayton, Ohio.

Walter N. Munroe has been appointed manager of the Paris (Tex.) Transit Company.

E. S. Koller has been elected president of the Denver & Interurban Railroad, Denver, Col.

F. D. Aiken has been elected president of the City & Suburban Railway, Brunswick, Ga.

Harry Murphy has been appointed roadmaster of the Columbus, Magnetic Springs & Northern Railway, Richwood, Ohio.

John Treanor has been elected vice-president of the Glendale & Montrose Railway, Glendale, Cal., with office in Los Angeles.

J. A. Spaulding has been appointed auditor of the Lake Charles Railway, Light & Water Works Company, Lake Charles, La.

John F. Esch has been appointed purchasing agent of the Cripple Creek & Colorado Springs Railroad, Colorado Springs, Col.

H. C. Pinnock has been appointed claim agent of the Cripple Creek & Colorado Springs Railroad, Colorado Springs, Col.

J. J. Cogan has been appointed general manager of the Cripple Creek & Colorado Springs Railroad, Colorado Springs, Col.

Dwight M. Lewis has been appointed a member of the Iowa Board of Railroad Commissioners, succeeding Clifford Thorne, resigned.

E. L. Byington has been appointed chief inspector of the United Railroads of San Francisco, San Francisco, Cal., succeeding W. J. Wright.

M. McCants has been appointed assistant to William Von Phul, general manager of the United Railroads of San Francisco, San Francisco, Cal.

J. A. Guiher, a member of the Iowa Board of Railroad Commissioners, has been appointed chairman of the board, succeeding Clifford Thorne, resigned.

M. L. Ross has been appointed superintendent of the Vincennes (Ind.) Traction Company to succeed Louis J. Fohr, resigned to enter the insurance field.

George D. Murphy, master mechanic of the Columbus, Magnetic Springs & Northern Railway, has been appointed general manager to succeed Charles J. Fifer.

Edmund I. Bowen, formerly superintendent of the Rochester electric division of the Erie Railroad, has been transferred as superintendent to the Marion division of this railroad.

A. G. Hoyt has been elected president of the American Public Service Company, New York, N. Y., which controls the Marshall (Tex.) Traction Company and other utilities in Texas.

Matthew C. Brush, president of the Boston (Mass.) Elevated Railway, was elected to the board of directors of the Second National Bank in Boston at its annual meeting on Jan. 10.

H. W. Wischmeyer, superintendent of electrical equipment of the Louisville (Ky.) Railway, will hereafter also have charge of the steam equipment for the company, succeeding Frederick L. Ray, resigned.

J. A. Vandergrift, of J. A. Vandergrift & Company, engineers and contractors, New York, has been elected president of the Slate Belt Electric Street Railway, Pen Argyl, Pa., succeeding C. H. Latta, resigned.

H. D. Swain has been appointed superintendent of the Peekskill Lighting & Railroad Company, Peekskill, N. Y. He is also secretary and treasurer of the Putnam & Westchester Traction Company, Peekskill, N. Y.

A. L. Mathews has been elected a vice-president of the J. G. White Management Corporation, New York, N. Y., to take charge of a new department which has been organized for the management of sugar properties.

Henry C. Paul, treasurer of the Fort Wayne & Northern Indiana Traction Company and president of the Old National Bank of Fort Wayne, Ind., has resigned the former office to give his entire time to his duties with the bank.

J. W. Osborne, formerly master mechanic of the Chicago & Milwaukee Electric Railroad, Highwood, Ill., has resigned that position to become master mechanic of the Terre Haute, Indianapolis & Eastern Railway, at Lebanon, Ind.

Frederick L. Ray, superintendent of steam equipment of the Louisville (Ky.) Railway, has resigned his office and gone to Indianapolis, Ind., where he has become superintendent of power plants for the Merchants' Heat, Light & Power Company.

F. S. Nicholson, for the past eight years vice-president and general manager of the Sayre (Pa.) Electric Company, will succeed Byron T. Burt as vice-president and general manager of the Rutland Railway, Light & Power Company, Rutland, Vt. He will remain a vice-president of the Sayre property.

F. J. Haas, who has been secretary of the Public Utilities Company, Evansville, Ind., has been elected vice-president and general manager of the company to succeed A. C. Blinn, whose election as vice-president, treasurer and general manager of the Northern Ohio Traction & Light Company was noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 2, 1916.

Charles J. Fifer, general manager of the Columbus, Magnetic Springs & Northern Railway, Richwood, Ohio, has been appointed general manager of the Cleveland, Alliance & Mahoning Valley Railroad, with offices at Ravenna, Ohio. Mr. Fifer still retains the secretaryship of the former company. He was formerly general manager of the Philadelphia, Coatesville & Lancaster Passenger Railway, Parkersburg, Pa.

Winthrop More Daniels on Jan. 10 had his nomination confirmed by the United States Senate as a member of the Interstate Commerce Commission. Mr. Daniels, who has served two years as a member of the commission, was re-appointed early in December by President Wilson for a full seven-year term. Mr. Daniels has served as chairman of the Board of Public Utility Commissioners of New Jersey. He was formerly professor of political economy at Princeton University, a chair which he held from 1892 to 1911.

Dwight Burroughs, who came to the United Railways & Electric Company, Baltimore, Md., last May as publicity manager, is editor of the new employees' magazine, *The United Railways Forum*, the first issue of which has just been published, and which was described in the News Department of the *ELECTRIC RAILWAY JOURNAL* for Jan. 13. Mr. Burroughs has been principally a newspaper man, although he has done some magazine and book writing and has at different times acted as publicity manager for various causes. For a number of years and up to the time of his recent position he was city editor of the *Baltimore News*.

Byron T. Burt, for the past two years vice-president and general manager of the Rutland Railway, Light & Power Company, and allied interests in and near Rutland, Vt., has resigned to take a responsible position with another organization. Mr. Burt was formerly manager of the Chattanooga (Tenn.) Electric Company until its consolidation with the Chattanooga Railway & Light Company. When the Chattanooga & Tennessee River Power Company was organized to construct the hydroelectric plant at Hale's Bar, on the Tennessee River, he was made general manager of the

company. He later resigned that position to become vice-president of the Rutland Railway, Light & Power Company.

M. F. Flatley, formerly master mechanic at the Lebanon shops of the Terre Haute, Indianapolis & Eastern Traction Company, in charge of equipment on the Northwestern, Martinsville, Crawfordsville and Lebanon divisions, resigned on Jan. 1 to become master mechanic of the Dayton & Troy Electric Railway. Mr. Flatley became master mechanic of the Terre Haute, Indianapolis & Eastern Traction Company's property in June, 1915, and was previously employed for six years as master mechanic on the Rochester, Syracuse & Eastern Railway. He was also employed by the Brooklyn Rapid Transit System as foreman of the elevated division for four and one-half years, and served three years as foreman of car equipment on the elevated division of the Interborough Rapid Transit System. He began his experience in electric railway work with the Westinghouse Electric & Manufacturing Company, where he spent three years. Mr. Flatley is the inventor of a number of car appliances.

James M. Barrett has resigned as president of the Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind. He has been associated with the road since it was an insignificant horse-car line, the law firm of which he is a member having continuously looked after the legal affairs of the company. Mr. Barrett resigns the presidency in order to give himself entirely to the business of his law firm. Mr. Barrett was born on a farm in La Salle County, Ill., on Feb. 7, 1852. He entered the University of Michigan in 1871, and was graduated in the academic department in 1875. He studied law at Chicago and Princeton, Ill., and afterward at Fort Wayne, Ind., and was admitted to the bar in 1876. In 1881 Mr. Barrett was elected a director and appointed counsel for the local street railway system in Fort Wayne, and thereafter he continued as director and counsel until the organization of the Fort Wayne & Wabash Valley Traction Company, which acquired the local street railway systems in Fort Wayne and the interurban lines running from Fort Wayne to Peru and Lafayette, and from Fort Wayne to Bluffton, Ind. He was then appointed general counsel for the Wabash Valley company, and continued as such until its property and franchises were acquired by the Fort Wayne & Northern Indiana Traction Company, after which he became vice-president, director, general counsel and president of that company, until his recent resignation. Mr. Barrett served as a member of the Indiana Senate in the sessions of 1887 and 1889, and was a trustee of Purdue University, Lafayette, Ind.

C. F. Handshy, assistant general manager, Illinois Traction System, was elected president of the Illinois Electric Railway Association at its annual meeting in Chicago Jan. 19. Mr. Handshy is one of the successful railway operators who has come up through the ranks to places of responsible activity. He began his career in the steam railway field as a telegraph operator for the Wabash Railroad in 1884. Six years later he became train dispatcher of the same company and in 1902 was promoted to the position of assistant chief dispatcher at Decatur, Ill. Two years later he succeeded to the position of chief dispatcher and then to trainmaster in 1905. On Sept. 15, 1907, the Illinois Traction System secured his services and he entered the electric railway field as general superintendent of transportation of interurban lines for this company. In January, 1910, he was appointed general superintendent of interurban lines, and on June 1, 1913, became assistant general manager. Mr. Handshy's nine and one-half years' experience with the problems of electric railways in Illinois should bring a constructive program to the year's activities in the Illinois Association.



C. F. HANDSHY

Obituary

Henry Gordon Stott, superintendent of motive power of the Interborough Rapid Transit Company and the New York Railways of New York, died at his home in New Rochelle



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H. G. STOTT

on Jan. 15 after an illness of many months. He was a native of the Orkney Islands, Scotland, where he was born in 1866. On leaving the Watson Collegiate School, Edinburgh, he entered the College of Arts and Sciences at Glasgow, and began a course in mechanical engineering and electricity, graduating in 1885. In the year previous he had entered the employ of the electric illuminating company of Glasgow. Shortly after graduating he was made assistant electrician on board the steamship *Minia*, belonging to the Anglo-American Telegraph Company. The next four and one-half years saw him engaged with those duties, during which period he undertook a number of experiments that resulted in the introduction of improved methods of handling cable repairs. He was also identified with the "duplexing" of the United States Cable Company's main cable, 2750 knots, the longest duplex cable in the world.

In 1889 Mr. Stott was made assistant engineer of the Brush Electric Engineering Company at Bournemouth, England. The following year he was offered a position by Hammond & Company as assistant engineer in the construction of an underground cable and power plant at Madrid, Spain. He remained there until 1891, coming to the United States in that year to install an underground cable and conduit system for the Buffalo Light & Power Company, now the Buffalo General Electric Company. Later he became engineer of the company, and during the next ten years was one of the most active figures in the industrial progress of Buffalo. His efforts attracted wide attention, and in 1901 he was appointed superintendent of motive power of the Interborough Rapid Transit Company, New York City, a position which he filled with signal success. At the time he took up these duties the Interborough had not yet been organized, the company having the title of the Manhattan Railway Company. The position to which Mr. Stott was called had just been created, and it devolved upon him to organize the operating force, in connection with which he completed the Seventy-fourth Street power plant of the company, various substations and transmission lines. When the Manhattan system was amalgamated with the Interborough in 1904 Mr. Stott retained his office with the new corporation and immediately took over supervision of the construction of the power plant on Fifty-ninth Street.

Mr. Stott was elected president of the American Institute of Electrical Engineers for the term 1907-1908, vice-president of the American Society of Mechanical Engineers for the term 1912-1914, director of the American Society of Civil Engineers in 1911, and was vice-president and trustee of the United Engineering Society at the time of his death. Up to the last Mr. Stott was a recognized power in the American Institute of Electrical Engineers and was a member of the standards committee, the Public Policy Committee, the Committee on Development of Water Power, the United States National Committee of the International Electrotechnical Commission, the Power Stations Committee, the Committee on Economics of Electric Service, the Edison Medal Committee, and was one of the institute's representatives on the joint committee on the metric system, of which he was an ardent advocate. Among the large number of papers which Mr. Stott wrote on engineering problems are "The Conversion and Distribution of Received Currents," "Power Plant Economics," "Notes on the Cost of Power," "Steam Pipe Covering and Its Relation to Station Economy," "Tests of a 15,000-Kw. Steam Engine Turbine Unit," "Power Plant Design and Operation," etc.

Construction News

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

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

FRANCHISES

Fullerton, Cal.—The Los Angeles Railway has asked the City Council for a fifty-year franchise to construct a line in Fullerton.

Gary, Ind.—Charles D. Davidson, receiver of the Gary & Interurban Railroad, has asked the City Council of Gary for a franchise to construct extensions on Broadway, Fifth Avenue, Eleventh Avenue, Clark Road, Ninth Avenue, Buchanan Street, Virginia Street, Mississippi Street and Taft Street.

Cincinnati, Ohio.—It is reported that an ordinance has been introduced in the City Council granting authority to the Cincinnati, Newport & Covington Railway to construct a line on Third Street between Vine and Walnut Streets. The ordinance further provides for the abandonment of the present track on Second Street and on Walnut and Vine Streets, south of Third Street.

Elyria, Ohio.—The Cleveland, Southwestern & Columbus Railway has announced it would accept the franchise which had before been rejected by the company and had been twice vetoed by Mayor Charles E. Tucker and passed by the Council over his veto. The franchise grants six tickets for 25 cents and provides for extension of service to the factory district of the East End.

Dover, Pa.—The Dover-Rossville Transit Company, recently granted a franchise to operate trackless trolley cars in York County, will ask the Public Service Commission of Pennsylvania next week for permission to exercise its franchise.

Oakhurst, Pa.—The City Council of Oakhurst has repealed the franchise granted to the Johnstown Traction Company for a line through that borough. The company failed to begin work within the required period of two years after the granting of the franchise.

Union, S. C.—A franchise has been granted by the City Council for the construction of an electric railway in Union. Under the franchise the work must be begun by April 1 and some of the lines must be in operation by Jan. 1, 1918. E. F. Kelly, B. F. Kennedy and A. G. Kennedy, Union, are interested. [Jan. 6, '17.]

Salt Lake City, Utah.—The Emigration Canyon Railroad has received a franchise from the Council to construct an extension up Big Cottonwood Canyon and Little Cottonwood Canyon.

TRACK AND ROADWAY

San Diego (Cal.) Electric Railway.—The San Diego Electric Railway will begin immediately the construction of an extension from the east gate of Balboa Park to University Avenue, past the Normal School, to Adams Avenue, approximately 1½ miles. A 114-lb. rail will be used. The line will traverse a private right-of-way and will cross Powder Canyon and two smaller canyons. Steel for bridges across these canyons has been ordered.

Hillsborough-Pinellas Interurban Railway, Tampa, Fla.—The Hillsborough-Pinellas Interurban Railway has placed \$2,000,000 of bonds, and construction of its proposed line to connect Tampa, Tarpon Springs, Clearwater, St. Petersburg and intermediate points, about 60 miles, will probably begin within a month. Martin Carabello, Tampa, secretary. [July 29, '16.]

Savannah (Ga.) Electric Company.—This company plans to construct an extension south on Abercorn Street to a point beyond Fiftieth Street.

Honolulu Rapid Transit & Land Company, Honolulu, Hawaii.—This company reports that it will construct 8600 ft. of new track during 1917, material for which has been ordered.

Chicago, Fox Lake & Northern Electric Railway, Chicago, Ill.—The Chicago, Fox Lake & Northern Electric Railway has purchased a terminal site on North Clark and Howard Streets, and will utilize the roadbed constructed five years ago by a company which abandoned its plans before any track was laid. The Public Utilities Commission of Illinois has approved a bond issue of \$750,000 and enough stock has been sold to assure the immediate construction of the proposed line. L. K. Sherman, Chicago, chief engineer. [Jan. 13, '17.]

Chicago Heights Street Railway, Chicago, Ill.—This company will construct 1 mile of new track during 1917.

Kewanee & Eastern Electric Railway, Kewanee, Ill.—The Public Utilities Commission of Illinois has granted a permit to the Kewanee & Eastern Electric Railway to construct a line from Kewanee to Henry Junction, about 42 miles. C. G. Lampman, Cedar Rapids, is interested. [Sept. 9, '16.]

Union Traction Company, Anderson, Ind.—This company is erecting a new bridge at Summitville, Ind.

Cincinnati, Bluffton & Chicago Railroad, Huntington, Ind.—It is reported that J. M. Wilson, Cincinnati, who has recently purchased the Cincinnati, Bluffton & Chicago Railroad, will construct an extension from Portland to Cincinnati via Union City, Richmond and Hamilton, and from Huntington to South Bend via Columbia City and northern lake resorts.

Rumford Falls & Bethel Street Railroad, Rumford, Maine.—The Public Utilities Commission of Maine has rendered a decision authorizing the Rumford Falls & Bethel Street Railway to issue and sell at par its common stock, in an amount not exceeding \$70,000, and its 6 per cent preferred capital stock, in an amount not exceeding \$50,000, proceeds of such sales to be used in the work of constructing and equipping its proposed line in Mexico and Rumford. [Nov. 4, '16.]

Detroit (Mich.) United Railway.—A report from the Detroit United Railway states that the company plans to construct 29 miles of new city track and 47 miles of interurban line between Highland Park and West Utica and between Oakwood and Dearborn.

Duluth (Minn.) Street Railway.—This company reports that during 1917 it will construct 3.13 miles of city track.

Salem & Penns Grove Traction Company, Salem, N. J.—Through operation on this company's line from Salem to Penns Grove was not begun on Jan. 15, as announced by the company. Work had not progressed as far as had been hoped, and it is not known definitely when the line will be completed. Cars have been operated by the company for several months between Penns Grove and the du Pont powder villages and camps at Carney Point.

International Railway, Buffalo, N. Y.—This company reports that during 1917 it will construct 32 miles of new track between Buffalo and Niagara Falls and 8.8 miles of new track in Buffalo.

Panama Traction Company, Jamestown, N. Y.—Track construction has been begun on this company's proposed line from Ashville to Panama. One bridge has been completed near Ashville and work has been begun on another bridge over Goose Creek, near Blockville. The line will be operated by motor car. B. L. Davis, Lakewood, is interested. [Dec. 30, '16.]

Interborough Rapid Transit Company, New York, N. Y.—The Public Service Commission for the First District of New York recently received bids for the construction of the Livonia Avenue elevated extension of the Eastern Parkway Subway in Brooklyn. In the effort to obtain the lowest prices in steel and steel erection, bids for the work were received in three forms. Under one form bids were received for construction including the supply of steel and under two other forms for construction, and for furnishing steel. The lowest bid for construction including the supply of steel was received from the Oscar Daniels Company, New York, at \$1,775,508. The lowest bidder for construction exclusive of furnishing steel was W. G. Cooper, New York, whose bid was \$257,164. The lowest bid for furnishing steel was that received from the American Bridge Company, New York, whose proffer was \$1,431,755.

Toronto (Ont.) Railway.—An order was recently issued by the Ontario Railway and Municipal Board requiring the Toronto Railway to construct a double-track line on Carlaw, Guelph and Pape Avenues; and to operate a car service thereon in order to relieve the traffic congestion in the east end of the city. The company is ordered to commence work not later than April 1 next and to have it completed by July 1. Plans for the work are to be submitted to the board for approval not later than Feb. 1. The city, however, is given permission to object against the route ordered, and may suggest an alternative route. Should the city recommend an alternative plan, the board reserves the right to either approve or reject it. Should it be rejected, the order issued will stand.

Portland & Oregon City Street Railway, Portland, Ore.—It is reported that a bond issue of \$350,000 will soon be made by the Portland & Oregon City Street Railway to construct an extension of its line from the present terminus 15 miles southeast of Portland to the Viola-Highland country. No plans have as yet been made for beginning the construction work.

Allen Street Railway, Bethlehem, Pa.—The Public Service Commission of Pennsylvania in an opinion handed down Jan. 15 by Chairman Ainey approved the plans for an overhead crossing to be constructed by the Allen Street Railway over tracks of the Lehigh & New England Railroad near Bath. The opinion states that the entire cost of the construction and payment of consequential damages is to be borne by the street railway company, but the railroad company, having offered to pay \$2,000 toward the improvement, is directed to do so.

Hull (Que.) Electric Company.—This company reports that it will construct about 2½ miles of new track in Hull during 1917.

Jackson Railway & Light Company, Jackson, Tenn.—Improvements totaling an expenditure of about \$90,000 were begun during the past year by the Jackson Railway & Light Company, which will be finished during the first half of 1917. The sum of \$65,000 will be spent on laying new steel rails over the city and \$20,000 will be used to enlarge the present power house of the company, on South Royal Street, to handle the increased light and power business. New rails are now being laid on Royal Street from the Nashville, Chattanooga & St. Louis Railroad depot to Allen Avenue, and work will soon be started on the laying of new rails on Highland Avenue from Main Street North. Main Street will be double-tracked to facilitate traffic from Royal Street West to Market.

El Paso (Tex.) Electric Company.—The El Paso Electric Company has increased its capital stock \$1,000,000 to take care of improvements to its system. The installation of the underground wire system in the business district will cost about \$300,000, it is said. Other improvements include the installation of a substation for supplying power to the Government Hill and Fort Bliss lines.

Marlin-Temple Interurban Company, Marlin, Tex.—Surveys have been completed by the Marlin-Temple Interurban Company on its proposed line from Marlin to Temple, and work of grading the line will soon be begun. S. D. Hanna, Temple, chief engineer. [Nov. 11, '16.]

San Angelo, Tex.—J. D. Sugg, formerly president of the San Angelo Power & Street Railway, has been ordered by the City Commission to remove the tracks and equipment of the San Angelo Power & Street Railway from the streets. The line will be replaced by a system to be constructed by the Interstate Electric Corporation of New York.

Salt Lake & Utah Railroad, Salt Lake City, Utah.—It is reported that the Salt Lake & Utah Railroad has under consideration the construction of an extension to Salina Canyon.

Steubenville, Wellsburg & Weirton Railway, Wellsburg, W. Va.—It is reported that the West Penn Power Company, Connellsville, Pa., has purchased the Steubenville, Wellsburg & Weirton Railway, which operates an electric railway between Wellsburg, Follansbee, Steubenville, Holiday's Cove and Weirton. Extensions and improvements will be made.

Madison (Wis.) Railways.—This company will construct ¾ mile of new track during 1917.

SHOPS AND BUILDINGS

Interborough Rapid Transit Company, New York, N. Y.—The Public Service Commission for the First District of New York has awarded to the Seventh Avenue Construction Company, New York, a contract for finishing six of the stations on the underground portion of the Southern Boulevard and Westchester Avenue extension of the Lexington Avenue subway. The stations will be located at Brook Avenue, Cypress Avenue, East 143d Street, East 149th Street, Longwood Avenue and Hunts Point Road, the station last named to be an express stop. All work is to be completed within six months, the contract price being \$239,-616.05.

Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio.—Practically all arrangements have been completed by this company for the construction of a passenger and freight station at the corner of Liberty and Lincoln Way East, Galion.

Toledo Railways & Light Company, Toledo, Ohio.—It is reported that a contract has been awarded by Henry L. Doherty & Company, New York, to A. Bentley & Son, 210 Belmont Avenue, Toledo, for the construction of the new power station at Toledo.

Eastern Pennsylvania Railways, Pottsville, Pa.—The car-house and power house of the Eastern Pennsylvania Railways at Palo Alto, recently damaged by fire, will be rebuilt immediately.

Salt Lake & Ogden Railway, Salt Lake City, Utah.—This company plans to construct new stations at Kaysville and Sunset this year at a cost of about \$10,000. Improvements will also be made in the track facilities at the Salt Lake Union Stock Yards and it is probable that a station will be erected there.

POWER HOUSES AND SUBSTATIONS

Danville Street Railway & Light Company, Danville, Ill.—The Danville Street Railway & Light Company plans to install a 5000-kva. General Electric turbine in its power-house.

Iowa Railway & Light Company, Cedar Rapids, Iowa.—Plans are being prepared by the Iowa Railway & Light Company for the construction of a powerhouse on North Sixth Street East, to cost about \$20,000.

Northern Ohio Traction & Light Company, Akron, Ohio.—It is reported that the Northern Ohio Traction & Light Company plans the construction of a substation at Massillon.

Reading Transit & Light Company, Reading, Pa.—This company has just placed in service a 12,500 kw. turbo-generator in addition to its former equipment. Power business already contracted for will absorb this capacity and an additional generator of 25,000-kw. capacity has been ordered for delivery in 1918 to take care of further business in prospect.

Beaumont (Tex.) Traction Company.—Plans are being considered by the Beaumont Traction Company for the erection of an electric transmission line between Beaumont and Port Arthur, and also for increasing the output of the two power plants.

Southern Traction Company, Dallas, Tex.—Plans have been made by the Southern Traction Company and the Texas Light & Power Company for the construction of a power plant on the Oklahoma side of the Red River north of Denison. The site for the plant has been acquired in Bryan County and the Oklahoma Legislature will grant the easement asked.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis.—A contract has been awarded by the Milwaukee Electric Railway & Light Company for the construction of an addition to its power plant at Racine to the J. F. Greene Engineering Company, Racine.

Sheboygan Railway & Electric Company, Sheboygan, Wis.—The Milwaukee & Fox River Valley Railway, which is leased by the Sheboygan Railway & Electric Company, contemplates the construction of a hydroelectric plant, including dam across the Mullett River.

Manufactures and Markets

Discussions of Industrial Conditions

A Department for the Manufacturer, Salesman and Purchasing Agent

Rolling Stock Purchases

Business Announcements

Trade Literature

An Invitation to Discuss Purchasing Problems

This Department an Open Forum—Discussions of Problems of Mutual Interest to Buyer and Seller Are Invited—One Subject Is Suggested

The purchasing agent of the present must be alive. Things are happening every day to change the well-laid plans of yesterday. To fulfill the requirements of his job well the purchasing agent must keep informed on the trends of the general market so that he may better be able to sense the many ups and (few) downs of his own market. He must be active in locating available sources of supply and in accelerating deliveries. In fact, the purchasing agent of to-day has a bigger job than any of his predecessors ever had.

The columns of this department have presented much evidence of purchasing activity. They have set forth the views of many important men on manufacturing and marketing conditions, and have discussed those topics which are of great mutual interest to the buyer and seller.

In the many interviews with purchasing agents and manufacturers a desire to be helpful to both has been kept in mind. This department is an open forum. Are there not questions which now might well be jointly discussed? If so, the ELECTRIC RAILWAY JOURNAL would appreciate the opportunity of presenting them.

Consider, for example, the topic of "Buying Repair Parts on an Annual Basis," which was presented on page 1184 of this paper for Dec. 2, 1916. Should an electric railway buy its material on an annual basis, with specified prices and deliveries? There are, no doubt, some materials and supplies which lend themselves very well to this method of purchase and the net results benefit both buyer and seller. Such being the case, how are prices to be fitted to possible fluctuations of the industrial labor and material market? Unless some such provision is made, long-term buying becomes speculation, and a public utility should not speculate.

In consideration of these facts, the buying of electric railway materials on an annual basis might well be discussed. The ELECTRIC RAILWAY JOURNAL will be pleased to receive the views of purchasing agents and manufacturers on this and any other topics of interest.

Railways Show Co-operative Spirit

Brakeshoe Manufacturer Reports Roads as Showing Appreciation of Present Industrial Situation

Everybody has his troubles these days, and particularly the manufacturer who supplies service and materials on a long-time contract basis. Hence, when one of them reports the cheerful co-operation of his customers tending to relieve the stress, it is a pleasure to record the facts. Frank Gordon, western sales manager, American Brake Shoe & Foundry Company, says that he and his associates deeply appreciate the way in which the electric railway managers have come to the front and have shown their appreciation of the exceptional conditions at present surrounding the sale of materials and service contracted for long in advance of the present market conditions.

Many roads purchase brakeshoes on a guaranteed basis of cost per 1000 miles. Contracts are made for a term of years. These contracts contemplate much which falls under the name, "service." They are intended to express the true spirit of co-operation. For one thing, the manufacturer supplements the work of the railway company's

engineers by making extended studies of operating conditions, and by regular expert supervision, all of which is intended to reduce the cost of braking and brakeshoes. The road benefits from a reduction of costs as well as the manufacturer.

With the advent of complex manufacturing conditions, the manufacturers found that many long-term contracts were being filled at a loss due to circumstances over which neither the railway nor the manufacturer had any control. At the time contracts were made no provision for meeting present conditions could possibly have been foreseen. The prices of the metals now required for manufacturing purposes—cast-iron, steel plate, crucible steel and scrap iron—are sky-high. Steel plate, for instance, has risen from \$40 to \$100 a ton, and the average rise of all materials has been between 100 per cent and 200 per cent.

Relief from contract prices made earlier seemed a reasonable expectation, and this has come voluntarily from many roads which, appreciating the situation, are now cheerfully co-operating.

Warning Sounded by Wire Manufacturing Company

While Prospects for the 1917 Wire Market Are Bright Buyers of Insulated Wire and Cable Are Warned to Purchase for Actual Needs Only

Speculation is running wild over the prospects for the new year. One thing, however, is certain. The first sign that the nations of Europe are ready to consider peace proposals will be accompanied by a break in the raw-materials market and a slump in the value of stocks on hand. This statement is well borne out by the reaction in the copper market on the news of Teutonic peace proposals. Prices of raw materials are undoubtedly inflated and will therefore tumble, not far, perhaps, for some time, when peace becomes somewhat certain.

In view of these facts the following paragraphs from the current number of *The Wire Message*, published by Habirshaw Electric Cable Company, Inc., and The Electric Cable Company, are significant.

"In the insulated wire and cable industry we find evidence of sound prosperity. Statistics show that in 1914 less than 2 per cent of our total production of insulated conductors left the country, and in the favorable conditions of 1915 between 4 per cent and 5 per cent. Exporters of goods manufactured in this country, who were able previous to the war to successfully compete with European goods, certainly can do so after the war. Reasonable profits have made possible increased facilities and higher efficiency. Most factories are working overtime and orders are booked that cannot be delivered until well into 1917. Reports from all sections of the country indicate no curtailment of demand in the near future. Some decrease in purchasing activity that would bring demand near to maximum production should be welcomed rather than feared. The industry as a whole has never faced a new year with brighter prospects. It has but one thing to fear.

"WARNING

"When great business activity exists and supplies of all kinds are difficult to obtain, there is a strong temptation to over-buy. Speculation of this kind, especially at top prices, may lead to disastrous results, though basic conditions of business may be sound. Our warning is to buy for actual needs only and we cannot make this warning too strong. We reiterate our belief that the wire and cable industry, and business in general, faces a year of great prosperity, but it would be fatuous to believe that abnormal conditions

will continue to prevail. Sooner or later there must be an adjustment to the normal. When this comes those who have bought in excess of their needs will be under strong temptation to pass along their losses by endeavoring to cancel unfilled orders and outstanding contracts. This attitude is wrong, and a much harsher term might rigidly be applied to it. We are not speculating in raw materials, but are buying only to take care of orders and contracts in hand. We assume these were given us in good faith and to supply legitimate needs, and we shall insist upon the acceptance of all goods covered by such contracts and orders, under the exact terms and conditions on which they were accepted. To avoid misunderstanding we stamp all quotations and invoices as follows:

"Owing to the extraordinary conditions which now exist, and the cost of labor and materials, all quotations made and orders accepted with the absolute understanding that material will be taken in full quantities and without change of specifications."

Foreign Trade Conference

At Meeting in Pittsburgh, Foreign Markets, Trade Development, and the Webb Bill Will Be Principal Topics

According to present appearances there will be a large attendance at the national foreign trade conference to be held at Pittsburgh on Jan. 24, 25 and 26 for the discussion of all after-the-war problems. The call for this trade conference has been issued by James A. Farrell, chairman of the National Foreign Trade Council and president of the United States Steel Corporation. The call asks for a study of the problems of America's foreign markets after the war, such as the foreign trade aspect of the American tariff system; co-operation in foreign trade development; the American merchant marine; foreign investment of American capital as an aid to oversea commerce; and problems of the smaller manufacturer and merchant.

An entire session will be devoted to the necessity of legislation, authorizing co-operation among American exporters who are now individually obliged, through the doubt surrounding the application of the anti-trust laws, to cope with government-encouraged combinations of foreign rivals. The legislation is provided by the Webb bill, advocated by the federal trade relations commission.

Air Brake and Signal Companies Merged

The plan for the merger of the Union Switch & Signal Company into the Westinghouse Air Brake Company, noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 16, 1916, page 1279, was formally declared effective on Jan. 12. At a special meeting of the board of directors of the air brake company it was announced that practically all of the stock of the Union Switch & Signal Company had been deposited in asset of the plan.

Later a meeting of the directors of the switch company was held for the purpose of reorganization and giving air brake officers representation on the board of directors.

The officers of the Westinghouse Air Brake Company chosen are as follows: Chairman of the board, W. D. Uptegraff, formerly president of the Union Switch & Signal Company; president, A. L. Humphrey, first vice-president and general manager of the air brake company; vice-president, John F. Miller, president of the air brake company; vice-president and treasurer, T. W. Siemon, formerly vice-president of the signal company; vice-president in charge of sales, G. A. Blackmore, formerly manager of sales of the signal company; acting vice-president and secretary, T. S. Grubbs, formerly secretary of the signal company; controller, C. A. Rowan, controller of the air brake company; auditor, F. V. Shannon, formerly auditor of the signal company; assistant treasurer, M. K. Garrett, who was associated with George Westinghouse's private office in an accounting capacity for twenty-five years.

The directors of the air brake company have called a special meeting of stockholders for March 15 to ratify the merger and also to approve an increase in the capital of the

company from \$20,000,000 to \$30,000,000 to finance the transaction. Out of the increased capital it is proposed to declare a stock dividend of 20 per cent to holders of air brake stock, including the shares exchanged for the stock of Union Switch & Signal Company.

Car Shortage Decreased 50 Per Cent in Last Two Months

The freight car shortage which in November was becoming increasingly serious has decreased almost 50 per cent since that time, according to the figures for Jan. 1, 1917, which the American Railway Association has just made public. On Nov. 1 there was a shortage of 114,908 freight cars; on Dec. 1, as noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 30, 1916, page 1372, it was 107,778, and on Dec. 31 it had fallen to 59,892 cars.

This decrease in the car shortage is attributed more than anything else to the co-operative efforts of the Interstate Commerce Commission, shippers and the railroads. The latter for the past two months have had a special committee of the American Railway Association to deal with the subject. Emergency measures have been adopted to meet the abnormal situation, and progress has been made in getting cars out of the congested districts into the territory where they are most needed.

CURRENT PRICES FOR MATERIALS

Quoted Thursday, Jan. 18

Copper (electrolytic)	New York, 29 cents per pound
Rubber-covered wire (base).....	New York, 38 cents per pound
Tin (straits)	New York, 45 cents per pound
Lead	New York, 7.65 cents per pound
Spelter	New York, 10 cents per pound
Rails, A. S. C. E., O. H.	Mill, \$40 per gross ton
Rails, A. S. C. E., Bess.	Mill, \$38 per gross ton
Wire nails	Pittsburgh, \$3 per 100 pounds
Cement (carload lots) without rebate for sacks.....	
	New York, 1.97 per barrel
Cement (carload lots)	Chicago, \$1.96 per barrel
Cement (carload lots)	Seattle, \$2.20 per barrel
Linseed oil (raw, 5-bbl. lots)	New York, 94 cents per gallon
Linseed oil (boiled, 5-bbl. lots).....	New York, 95 cents per gallon
White lead (100-lb. keg).....	New York, 9½ cents per pound
Turpentine (bbl. lots).....	New York, 56½ cents per gallon

OLD METAL PRICES

Copper (heavy).....	New York, 28.5 cents per pound
Copper (light).....	New York, 24 cents per pound
Red brass	New York, 17 cents per pound
Yellow brass	New York, 17.5 cents per pound
Lead	New York, 6.75 cents per pound
Steel car axles	Chicago, \$40 per net ton
Iron car wheels	Chicago, \$19 per gross ton
Steel rail (scrap).....	Chicago, \$24.50 per gross ton
Steel rail (relaying).....	Chicago, \$30 per gross ton
Machine shop turnings.....	Chicago, \$9.50 per gross ton

ROLLING STOCK

Columbus Railway, Power & Light Company, Columbus, Ohio, expects to purchase ten cars and, in addition, will rebuild eight cars of the summer type during the year.

Smolensk (Russia) Municipal Tramway has purchased the property of the Smolensk Electric Company. It is expected that American manufacturers will supply the necessary material and equipment to develop this property.

Cleveland (Ohio) Railway, on Dec. 26, had its plan of rebuilding fifty trail cars approved by the city council. The company has agreed to build three all-steel cars as a test but the remainder of the fifty will be a combination of steel and wood, similar to those in use at the present time.

Preston Car & Coach Company, Preston (Ontario), Canada, on Jan. 7 lost eight cars in a fire which completely destroyed the company's large erection shop. It is estimated that the total loss will be about \$150,000. D. M. Campbell, managing director of the company, said that work would be resumed at once in the company's other buildings.

TRADE NOTES

Templeton, Kenly & Company, Ltd., Chicago, Ill., have furnished the Havana (Cuba) Central Railroad with two No. 318 simplex pole jacks.

Cambria Steel Company, Johnstown, Pa., is contemplating the erection of two new blast furnaces and a new plant to make car wheels. The total estimated cost is \$7,000,000.

H. Denton White has been elected president of the Laconia Car Company to succeed C. S. Hawley, who resigned

to accept the position of treasurer of the Remington Arms-Union Metallic Cartridge Company.

Charles Houchin Higgins, 165 Broadway, New York, N. Y., engineer and architect, announces the removal of his offices from the Hudson Terminal to the City Investing Building. Joseph R. Greenwood will be associated with Mr. Higgins in the future.

R. N. Chipman, who for a number of years has been manager of the Atlas Preservative Company of America, Inc., is now president of the Chipman Chemical Engineering Company, Inc., which has acquired the business of the former company, as noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 6.

Consolidated Car Heating Company, Albany, N. Y., announces that at a meeting of the board of directors, held at Albany on Monday, Jan. 15, Frederic Pruyn was elected secretary succeeding Edward A. Groesbeck, deceased. W. S. Hammond, vice-president in charge of sales, was elected a director of the company.

Bound Brook (N. J.) Oil-Less Bearing Company announces the appointment of A. K. Smith as production manager. Mr. Smith came to this company three years ago from the American Engine & Electric Company and this appointment has been made in recognition of his faithful and valuable services.

W. F. Cutler, who has just returned from service with the troops at the Mexican border, will resume his work as vice-president of the Southern Wheel Company with offices in the McCormick Building, Chicago, instead of the Railway Exchange Building, St. Louis. In addition to his duties for the Southern Wheel Company, Mr. Cutler has been appointed assistant to the vice-president of the American Brake Shoe & Foundry Company, with headquarters at Chicago.

Moulton Engineering Corporation, Consulting Engineers, New York, N. Y., in association with the Electron Chemical Company, announces the opening of a New York office in the Woolworth building. The office will be under the direction of Horace W. Flashman, who for a number of years has been associated with the Westinghouse Electric & Manufacturing Company. The corporation is prepared to render prompt and efficient service in general, civil, mechanical, chemical and power engineering, and in addition offers the co-operation of a trained corps of experts for the development of special processes and apparatus in connection with any of the industrial arts.

A. W. K. Billings has returned from Barcelona, Spain, where he has been for the past five years as manager of construction, managing director and vice-president of the Ebro Irrigation & Power Company, Ltd., and allied interests, in charge of extensive hydroelectric construction and other work. More than 110,000 hp. has already been developed, one interesting feature being the construction, under very unusual conditions, of the largest dam in Europe. Previous to his work in Spain and elsewhere for the Pearson interests, Mr. Billings spent two years in Pittsburgh and ten years in Cuba, principally on electric railway and power plant construction, and two years in New York as engineering manager of the J. G. White & Company, Inc. He has opened an office as consulting engineer at 115 Broadway, and will devote considerable attention to work in Europe and in Latin America.

Holden & White, Chicago, Ill., general sales agents for the Joliet Railway Supply Company, announce that they have received orders from the following companies for Perry anti-friction side bearings and Hartman self-centering center plates: Des Moines City Railway, Chicago & West Towns Railway, Buffalo & Lake Erie Traction Company, Lehigh Valley Transit Company, Southern Texas Traction Company, McGuire-Cummings Manufacturing Company, Fort Wayne & Northern Indiana Traction Company, Chicago, South Bend & Northern Indiana Railway, Gary & Interurban Railroad, Baldwin Locomotive Works, Cleveland, Painesville & Eastern Railroad, Union Traction Company of Indiana, New York, West Chester & Boston Railway, St. Louis Car Company (for the Michigan Railways), Lowell & Fitchburg Street Railway, Mason City & Clear Lake Railroad, York Railways Company, and Cleveland & Eastern Traction Company.

ADVERTISING LITERATURE

Roth Brothers & Company, Chicago, Ill., has issued an illustrated bulletin describing direct-current motors and generators. The motors are shown in various industrial applications suitable for shop work.

Ohmer Fare Register Company, Dayton, Ohio, is distributing a booklet on "The Ohmer Way" of properly collecting and accounting for fares. The maintenance of these fare registers is described and sample reports from different types of Ohmer fare registers are shown.

Vanadium Alloys Steel Company, Pittsburgh, Pa., is distributing a folder descriptive of "Vasco-Marvel," a semi-high-speed steel. This folder contains considerable information regarding the treatment of this metal, together with the high speed steel standard classifications of extras adopted July 22, 1915.

General Electric Company, Schenectady, N. Y., has issued bulletin No. 46104-A describing a new type of demand meter. It is used in connection with a watt-hour meter, and consists of a demand-registering element and a timing element which record graphically the energy consumption during a definite time interval.

Portland Cement Association, 111 West Washington Street, Chicago, Ill., has issued a bulletin entitled "Concreting in Cold Weather." This describes and illustrates methods suitable for protecting the work under extreme conditions. A simple set of rules suitable for posting on the job is also ready for distribution.

Barrett Company, New York, N. Y., is distributing a booklet on the "Long Life for Wood at Low Cost," which explains where and how to use Carbosota grade 1 liquid creosote oil. Numerous illustrations are given showing decay in wooden structures due to improper or non-treatment, and in addition plans and specifications of a simple and inexpensive wood-treating plant are given. The open-tank treatment and other treatments are illustrated and described.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued leaflet 3953 on its HLD control, which is a combination of lightweight HL and PK, with all parts assembled in a single box for convenience in installation. This control was designed especially for use on the low-floor car of the fully inclosed type without platforms, which is being widely adopted for city and suburban service. This control has been developed with a capacity for handling quadruple equipment of 40 hp. motors, or the largest size ordinarily employed for low-floor cars.

New Publications

Awakening of Business. By Edward N. Hurley. Doubleday, Page & Company, New York, N. Y. 240 pages. Cloth, \$2, net.

This book, presenting the individual views of the former chairman of the Federal Trade Commission, is designed to assist business men in bettering business conditions and working out sound co-operative methods, and to bring about a closer harmony between business and government. In Mr. Hurley's opinion, business men must not be narrow-minded, and government must be a counselor rather than a policeman. As a whole, the book is a timely warning of what is demanded by the new era of business upon which the world seems to be entering.

Mathematics for the Practical Man. By George Howe, M. E. D. Van Nostrand Company, New York, N. Y. 153 pages. Cloth, \$1.25, net.

Written especially for practical self-instruction, this book affords a simple and quick explanation of the elements of algebra, geometry, trigonometry, logarithms, co-ordinate geometry and calculus. It is a most valuable compendium of the general phases of mathematics which are so necessary for the understanding of technical works, and which are so easily forgotten even by the engineer when not constantly used. The book "begins at the beginning," and presents fundamentals in a straightforward yet scientific manner, without useless discursions into theory. As the title indicates, therefore, it satisfies a big want of the practical man.