

Electric Railway Journal

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An Ounce of Prevention Would Be Worth Several Pounds of Cure in This Case

THE severe snowstorms which visited the eastern part of the country last month gave a trying test to the snow-fighting methods and facilities of the electric railways. In the main the railways met the contingency with gratifying success. Only in New York City, and to be exact only in the Borough of Manhattan, have we heard of any serious difficulty in keeping lines open during one of the most peculiar snowstorms with which railway men have ever had to contend. And in Manhattan it was the underground conduit, always susceptible to sleet storms, which caused the trouble.

The interest in snow-fighting methods has naturally been aroused and we have endeavored by correspondence with engineers on several properties to find out what methods or improvements therein have been adopted. From the replies received to our inquiries we believe that there have been practically no changes in method, although considerable improvement in details of apparatus has been noted.

The essential factor in snow fighting, as expressed by our correspondents, is preparedness—preparedness through having a sufficient amount of adequate equipment together with a definite program for handling it upon the road when the storms come.

It has been impressed upon us that the success of our snow-fighting methods is primarily due to the prevention of accumulation of snow, which is accomplished by the snowplows and sweepers. But this sort of prevention is much more costly in the end than would be some form of prevention which could be applied to the lateral accumulation of large mounds of snow alongside the tracks. The removal of such huge snowbanks is a tedious and expensive process, while the damage to equipment and delays to schedules through stalled vehicular traffic upon the track area add costs substantially equal to those involved in the removal of the snow. Surely there is need for the concentration of our thought upon the problem of how best to prevent secondary accumulation in the roadways.

There May Be Heavy Snowstorms Next Winter

IT will be easier now than later to secure tentative appropriations for next summer's work and purchases in the line of snow-fighting equipment. That transportation superintendent is a wise one who utilizes the still vivid impression of last month's experiences to "nail" a reasonable allowance in the current budget for this purpose. To this end the ELECTRIC RAILWAY JOURNAL is publishing this week a number of articles which represent a comprehensive study of the snow-fighting game. One or two more will follow promptly.

It might seem that the appropriate season for con-

sideration of snow-handling equipment and processes would be the fall, just prior to the season when machines and men must be prepared for the fray. Just the reverse, however, is the case, for time slips by apace and it is none too early now to plan and scheme. As soon as the winter's cripples are out of the shop the snow machines might well come in for attention. At any rate the subject can have some thought now, with a view to storing up information which later may be urgently needed.

In many fields, even though it were possible, it would not necessarily be the most efficient practice always to be prepared to cope with any contingency which could arise. The cost of being prepared might more than offset the savings resulting when the actual contingency did, if ever, occur. In the matter of snow handling, however, every railway should be sufficiently well equipped and prepared to cope with the worst storm which might reasonably be expected to occur in its particular locality.

Progress in Design of Curved Heads for Grooved Girder Rails

INTEREST has been renewed of late in the subject of curved-head rails through the assignment of the subject to the committee on way matters, jointly with the committee on equipment. While the thought was expressed, when this subject first came up, that there was a possibility that a suitable curved-head design might eliminate corrugation, the principal claims made for the design were more along lines of the possibilities of securing greater life both of rails and wheels through the lessening of the rates of wear.

It is now well established that corrugation is not prevented by this change in design. It has been observed, however, that where these rails have been in service, the length of time within which corrugation first appears has been extended from the few days or weeks formerly experienced to a period of about two years. Perhaps this observation may be construed as indicative of a greatly lessened rate of wear. In any event, it is of sufficient moment to warrant the adoption of the curved head as a principle of design. Meanwhile, in its report last year the way committee presented several other good reasons in support of the correctness of the curved-head principle.

Having accepted the view that the principle is correct, there remains the question of detailed application to the existing standard grooved girder rails of the association. The problem thus resolves itself into a determination of the proper contour which will be suitable to wide application, since the standard rail is intended for use throughout the country. An examination of existing designs of curved heads discloses the tendency, on widely separated properties, toward the use of a contour which takes the form of a compound curve, having an initial radius of 12 in. starting at or near the back of the head.

an intermediate radius of about $1\frac{1}{2}$ in. and a final radius at the gage-line fillet of $\frac{3}{8}$ in. This is in substantial agreement with British designs which have been in service for some years. There is every reason to believe that the average contours of both worn rails and worn wheels are so nearly alike upon different properties that the committee should be able to settle upon a design which will approximate the average wear so closely that it may be readily accepted, and we are inclined to the view that the form of contour substantially as above outlined should be selected.

It's Bus or Bust for New York!

IN OUR March 20 issue we adverted briefly to the decision taken by the Board of Estimate in New York on Friday, March 12, to invest \$1,140,000 in motor buses and to engage actively in the transportation business with them in New York. Perhaps it is the privilege of youthful industries to see the future as through a glass lightly rather than darkly. Only on this assumption can we account for the rose-tinted canvases of bus promoters, whether they be of the private broker or public official tribe! Here is New York's Commissioner of Plant and Structure, who is to manage the bus department, telling the newspapers that the city actually expects to increase rather than decrease its revenues by running buses at 5 cents up to distances of 8 miles. Beyond that Alpine 8 miles, Commissioner Whalen concedes, lies trouble.

We certainly have no quarrel with the installation of one-man, 27 to 30-seat motor buses as a successor to two-men, 24-seat storage battery cars on the old inter-ferry routes of downtown New York. We do not believe that it would have ever paid to electrify these routes on the costly conduit system demanded by the city. Permission to operate the battery cars with one man would have staved off disaster a bit longer, but after all the conditions for track operation of any kind were not particularly favorable because of the speed limitations of such cars and the congestion of the highways. For these streets, therefore, even a jitney service has proved preferable from the viewpoint of the rider. On the other hand, we see no reason for instituting direct competition with 5-cent large-car and train service, as in Brooklyn.

This is not the place to enter into another mathematical analysis of the city's futile expectation of profit from a 5-cent universal fare as we did Dec. 27, 1919. Let us, however, point out this significant fact: Of the existing jitney-bus routes in Manhattan or Brooklyn Boroughs not one comes anywhere near the 8 miles named by Mr. Whalen. With the exception of the Flatbush Avenue line, all routes now operated are 4 miles or less in length. The Flatbush Avenue line is rather exceptional in that most of the passengers ride only as far as the terminus of the Interborough and New York Municipal subways at Atlantic Avenue (less than 4 miles), and furthermore the last down-town mile of this route serves the local business and shopping district in which a certain amount of short-haul, pick-up traffic can be developed. We may conclude, then, that the economic limit of the present 5-cent motor-bus operation is 4 miles; a deduction confirmed by the fact that no operator has undertaken to give service on Route No. 8, which is about 5 miles long, although the invitation has been out since November, 1919.

A little thought should convince anybody that if subsidized individual operators will not venture beyond 4 miles for 5 cents there is no prospect whatever that an organization, whether private or public, will be able to do even as well and break even. The present operators are at a disadvantage in comparison with an organization in such matters as the purchase of supplies, but in everything else they are at an enormous advantage. If this were not the case such great jitney businesses as those of Bridgeport, Conn., and Newark, N. J., would long ago have evolved to company form. Let us see why this is so:

The individual busman pays 2 or 3 cents more a gallon for gasoline, but his fuel cost per mile is sure to be less than that of a hired man because he has a strong personal reason to use fuel, as well as lubricant, economically. The same degree of personal interest applies to the vital items of tire wear and general upkeep. Furthermore, many busmen are practical repairmen who are capable of doing their own tinkering during spare moments. Where the busman is not a mechanic his membership in a co-operative association assures a reasonable repair bill. So much, then, for fuel and maintenance.

Now take the items of gross revenue. The individual operator picks up many a fare that would be ignored by an employee busman, for the former knows that he is working upon a pretty narrow margin at best. Any one who rides around with these men for a few hours will never question the fact that they are genuine transportation salesmen. Besides picking up more customers than an employee busman, a working owner has the satisfaction of getting every fare tendered. There are no leaks, and the number of passengers who would cheat an individual is far less than the number who think it good sport to "welch" on a corporation—yea, even a municipal corporation. Again, the individual operator cannot be compelled to work during thin hours or on thin routes. An organized bus company necessarily will average a smaller intake per bus-mile because it seeks to give a definite service, rain or shine, and is willing to stick through a period of development on promising routes. In New York the individual busmen have bluntly refused to do development work.

The organization is also at a disadvantage with regard to wages. It cannot get men to work for more than eight to ten hours a day and must pay a minimum guarantee to spare men, whereas the individual operator takes no account of the flight of time. If he divided his earnings by the number of hours actually worked he would find that he had little enough velvet after paying his bills and storing up coin for a new car, but the genus busman prefers twelve hours' self-employment to eight hours under a master. Finally, in the case of New York, the present operators are spared the cost of a supervisory staff, of printing destination and fare signs and of accident insurance. The public also puts up with conditions of crowding, cleanliness and shabbiness that it would not tolerate from an organization.

When the effect of all these disadvantages is duly weighed one needs no detailed tabulation to see the unlikelihood of a profit from unlimited-ride, free-transfer 5-cent buses. As we have said before, when a municipality enters the transportation field it may obtain auxiliary benefits, such as higher land-tax values, which may more than offset the operating losses of the transportation project. Had the New York Adminis-

tration taken up the motorbus from that standpoint this comment would be superfluous, but inasmuch as the city officials are treating this project as if it were a straightaway transportation undertaking we must protest against assumptions that never can be realized and that can only cause incalculable harm to the one sane method of urban motor-bus development, *to wit*: the operation of non-competitive motor buses at special fares for special services by the local organization—the electric railway—already best acquainted with the transit needs of the community.

The Principal Activities of the A. R. E. A. Convention

AMONG the many transactions accomplished at the Chicago convention of the American Railway Engineering Association last week the adoption of a standard specification for rails, another for iron and steel structures and another for cross ties perhaps stand out as the most important. The rail specifications and the one covering iron and steel structures have been in process of compilation and revision for several years and have been studied by several committees, discussed at conventions and referred back to a new committee, so that it would now seem that the specification adopted must represent the consensus of thought and experience of the railroad engineers.

The specifications for ties came into being in a different way. During the war the United States Railroad Administration drew up a standard specification for ties and directed that it be used on all railroads. The question considered, therefore, by the committee on ties and by the convention was not so much the details of the specification as it was whether this specification, representing a single standard actually in use on all roads for two years, should be continued or whether there should be a return to the several recommended practices of the association formerly in force and the resulting multitude of standards observed by the individual roads. The committee reached the decision that it would be better to continue the single standard, and the convention confirmed this recommendation, giving the association a definite standard for cross ties.

The convention also adopted standards for a steel cut track spike, a screw track spike, for steel, wrought iron and malleable iron tie plates, for manganese steel pointed switches; a standard specification for electric light, power supply and trolley line crossings with steam roads, which was drawn up by a joint committee on which there were three representatives of the American Electric Railway Association; new specifications for creosote treatment of wood and a standard approach warning sign for railroad crossings. This list will indicate the immense amount of work accomplished in the three-day session of the association. Some of the details of interest to the electric railway field are presented in summary on other pages in this issue. Others will follow in an early issue.

One of the most interesting pieces of work undertaken by the American Railway Engineering Association is that embodied in the duties assigned to the committee on standardization, which was only recently created. This is of particular interest to the electric railway field, since it reflects a weakness in the functioning of the railroad association similar to that experienced in the American Electric Railway Associa-

tion and suggests a remedy which the latter may well consider. To this committee was assigned the dual function by the board of direction of sponsoring new standards of practices, equipment and tools and of bringing about the general use of standards by the member companies. More recently the board of direction instructed this committee to confine its duties for the present to the work of securing the use of the standards already set up by the association.

This committee had not been in existence long enough at the time of the recent convention to make any very definite report, but the importance of the work of the committee was appreciated. The real benefits to be gained through the use of standards in an industry are indeed great, but these advantages cannot be realized unless the standards are generally adopted. The A. E. R. A., like the A. R. E. A., has found that many member companies were exceedingly slow about adopting standards or loath to adopt them at all. Perhaps it would be a very fortunate move for the former to create such a committee, which might act as a "selling" organization to put into practice the standards developed through the efforts of the association. We are not unmindful of the efforts of the A. E. R. A. through its committee on standards to promulgate its own standards. Special emphasis was laid upon this subject at the 1919 convention at Atlantic City. There the committee had an interesting exhibit and distributed a pamphlet containing convincing arguments for standards adoption. However, the task is a large one, and much can be gained by co-operation between the two great railway engineering societies along this line.

C. E. R. A. Looks to Economies

THE Central Electric Railway Association has made it a habit to occupy its time at conventions with papers and committee work which are of vital interest to the member companies in connection with their every-day operating practices. This habit prevailed again at the Louisville meeting last week. The attention of the members was first directed to a study of rail bonding as developed in a paper by Ralph H. Rice, which, with the discussion which followed, treated constructively every phase of the subject save one—how to prevent bonds from being stolen. Having discussed the perfection of the return system as one means of conserving power, the convention took up the savings possible in that portion of the total energy which is consumed directly by the cars. Through the able paper of Professor Ewing and some of the constructive discussion which followed, the members were much impressed by the significant economies pointed out as readily obtainable. Mr. Rice's paper was abstracted last week. Abstracts of the economy papers are given in this issue.

The Louisville meeting of the Central Association was thus true to form in providing the members with the knowledge and the impetus for better operating practices. This association has repeatedly demonstrated its great value to the electric railway industry of the Middle West states, yet its opportunities for further and greater service have in no wise been diminished. The study which is now being made looking toward the establishment of a pick-up and delivery express business over all of the interurban lines comprised in the association territory is an example of the big things which remain to be done in the future.

“Maintenance Account No. 12—Removal of Snow, Ice and Sand”

The Vital Thing Is to Prevent Accumulation of Snow—Delay in Attack Causes More Failures Than Anything Except Inadequate Equipment

By R. C. CRAM

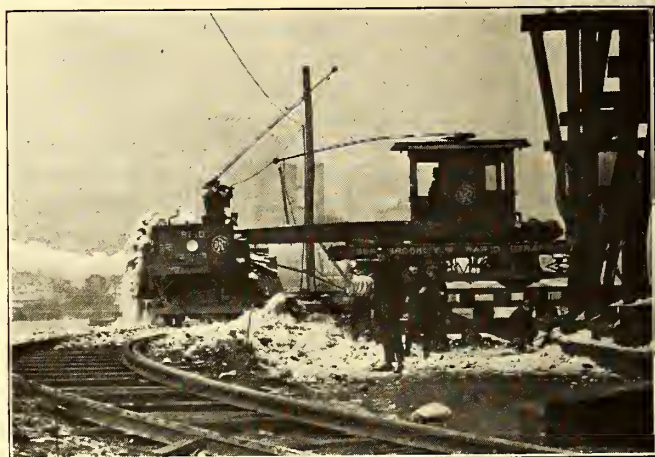
Engineer Surface Roadway Brooklyn Rapid Transit System

THE month of February, 1920, will long remain a milestone in the memories of operating and maintenance men. In several respects the snow and sleet storm which began on Feb. 4 and continued until the morning of Feb. 7 was one which beat the record of the famous blizzard of March, 1888. While less snow fell this year than in that memorable storm, this year's affair had a moisture content of $4\frac{1}{2}$ in. as compared with $2\frac{1}{2}$ in. for the 1888 record. In New York, during the three days of almost constant storm, there were five periods of rain, four periods of sleet and three periods of snow, with only one lull of about $3\frac{1}{2}$ hours' duration. In consequence there is little wonder that the storm has served again to concentrate interest upon the prevailing methods of “fighting” and handling snow. Not only the railway men, in cities at least, but also the civic officials charged with street cleaning have had good reason to think seriously upon the snow removal problem.

It is worth while to note that practically all of our efforts toward the solution of the snow problem have been concerned with the matter of removal and, as one newspaper writer has put it, nearly every scheme has been tried, except possibly that of tempting Providence, to try to prevent snow from falling. However, any analysis of the problem which may be made soon develops the fact that the troubles created by a snowstorm are not due primarily to the snow itself. It is the accumulation of snow which causes the difficulties, just as it is the accumulation of water from a rainstorm. Hence it seems to be rational to suggest that more attention should be directed toward the prevention of accumulation if we are ever to get out of the trenches.

As a matter of fact, the electric railways have concentrated upon this very thing in their adoption and use of snowplows, sweepers, rotaries and special apparatus attached to heavy service cars and these prevent accumulation upon the track area. To these pieces of apparatus more than to any other agencies the railways owed the comparative success of their efforts to keep cars in operation during the first week of last February. Such appliances, combined with frequent car operation, prevented the accumulation of snow upon the track area, which otherwise would have stopped car operation entirely.

While this was the result to be sought, we must acknowledge that the net result of all such efforts was merely the transference of the accumulation from the track space to the cramped roadway areas between the tracks and the curbs. The latter areas thus received more than their share of the accumulation, for in addition these areas are also the places of deposit for all the snow from the adjacent sidewalks, diligently cleaned by the weary property owners. Thus, a further accumulation results, so that a roadway space perhaps 12



PUSHER USED IN BROOKLYN FOR UNLOADING SNOW FROM FLAT CARS

ft. wide becomes the recipient of the additional snow which has fallen over a space 17 ft. or more in width. With a 2-ft. snowfall, the 12-ft. space on each side of the car tracks, instead of receiving say 24 cu.ft. per linear foot, thus receives 62 cu.ft. per linear foot of street. These great mounds of snow confine vehicular traffic to the tracks, seriously impairing car service, and when the snow melts cause the track spaces to be literally “young canals,” carrying several inches of water, through which cars must try to operate.

In cities somebody has to take this accumulation of snow away. In many of them this duty devolves upon the railway companies to a large degree wherever their tracks are found. Having once removed the snow from the tracks they are required again to remove it from the street. With a 3 or 5-in. fall of snow this may not be so much of a job, because the accumulation is not excessive, and the sun and rain probably will assist in the removal work. When the fall reaches 12 in. or more, or whenever the lesser falls drift badly, the burden upon the railways becomes almost unbearable, not only in the difficulty and cost for removal but also in traffic delays and damage to car equipment. Another source of cost lies in the excessive amount of power which is required to propel cars during such periods of weather. Surely there is good reason for further attempts to discover some method of preventing the secondary accumulation upon the roadways which is now the result of the comparatively successful methods of preventing primary accumulation upon the track area.

In spite of all the trouble which it caused, the recent storm has accomplished one good purpose. It has served to bring the fact home to the people that the electric railways are really most efficient snow-fighting machines which are constantly available and always on the job.

In the vicinity of New York, at least, it has been proved beyond cavil that without the aid of the highly organized snow-fighting apparatus of the electric railways our great cities would often be snowbound for weeks, instead of merely being inconvenienced for the few hours or days required to clear the arteries traversed by electric railway tracks.

SNOW FIGHTING IS REGULAR WARFARE

There are three distinct phases in a fight with a heavy snowfall, namely, the attack, the battle and the clean-up. Perhaps the most essential phase is that of the attack. How many of us remember saying: "Next time we'll get those plows and sweepers out as soon as a flake of snow begins to fall." More snow battles have been lost on account of delay in attack than for any other reason, except the lack of adequate apparatus with which to make the fight.

One of the most essential features of the snow-fighting problem lies in the preparation which is made for the attack. In other words, it must all be planned out ahead of time, at least six months in advance. We can never foretell what kind of a storm will come nor can the depth of the fall, the wind velocity, or the moisture content of the snow be predetermined. Consequently, preparations should always be made for the worst kind of a storm even though it involves seemingly excessive and useless expense. It is far better to be over-equipped with snow-fighting apparatus for three seasons than to be even slightly under-equipped in the fourth season. The losses of the latter will far outweigh those of the former.

On suburban and interurban properties the way department assists in preparation for the attack by the preventive measure involved in the erection of temporary and permanent snow fences, set out along the right of way at places on the windward side of cuts where snow is likely to accumulate in the form of drifts. It has been found worth while in these cases to follow steam road practice closely even to the payment of



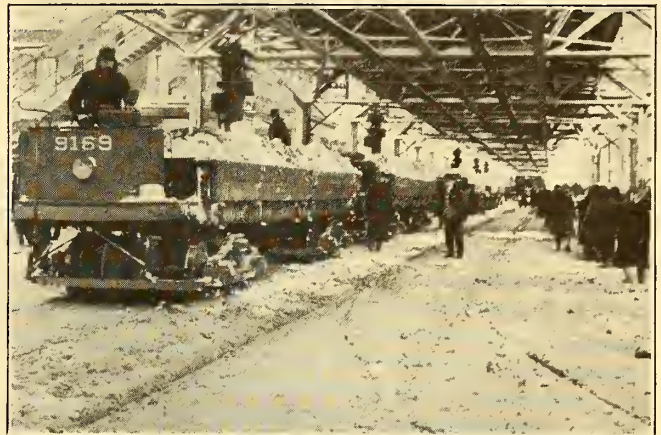
SAFETY CAR DOES MAN-SIZED JOB AT 10 DEG. BELOW AND IN 40-MILE WIND IN LEVIS, QUEBEC

money to adjacent owners who may require this for the use of their land.

It has repeatedly been demonstrated that the chief dependence for efficient snow fighting must be placed upon snowplows, rotaries and sweepers, operated by the transportation department. The amount and character of the equipment necessarily will vary with each property and the most careful planning along this line is required. Inquiry has developed the information that most roads have at least one snowplow or sweeper for

each five miles of track. Next in importance is the actual working of the apparatus thus provided during the period of the snowstorm. Here, again, planning and efficient direction of operation are the price of success in keeping the lines clear.

The work of the way department is subordinate to that of the transportation department during the storm period, but the closest co-operation is needed. Men must be furnished to go along with plows and sweepers to keep switches clear and to pay particular attention to keeping tracks at car storage yards and depots free from snow accumulation. The liberal use of salt in



TRAIN OF FLATS LOADED WITH SNOW IN BROOKLYN

switches in streets provides the surest means of keeping them in working condition.

The work of keeping switches clear has been greatly aided in recent years through the development and use of gasoline or oil-burning torches for melting snow and preventing ice formation, particularly in open yards at split switches, which are very susceptible to clogging by snow and ice. Several of the steam roads have used electric heater unit installations of the Boardman type at split switches for preventing accumulation, with a fair degree of success. (See *ELECTRIC RAILWAY JOURNAL* for Nov. 16, 1918.) These may become ineffective mainly when high winds prevail and the snow is blown along in a direction parallel with the tracks. So far as the writer is aware, no electric railway company has ever tried the Boardman device. Steam roads have also tried the method of equipping the switches with steam coils in yards where a supply of steam is available, but the use of this scheme is not very extensive and it is practically out of the question for most electric railways.

The way department takes up its real snow-fighting job when it begins to remove the accumulated snow after the storm has ceased. On roads having large mileages within city limits the task is not one to be classed as a "cinch," to say the least.

For instance, as the result of the February storm, the writer estimates that the quantity of snow which was piled up in the areas from which the railway companies in Brooklyn had to remove it amounted to 1,400,000 cu.yd. or 46,666 carloads, allowing 30 cu.yd. per car. The weight of such a quantity of snow may be of some interest. The Weather Bureau indicated a moisture content of 4½ in. for the 17.5 in. of snow in the Feb. 4 storm. This gives an equivalent weight of nearly 24 lb. per cubic feet of snow. On this basis the 46,666 carloads of snow weighed about 465,000 tons. As an

engineering problem in handling material this must be considered a man-sized job. Very fortunately the sun and rain assist in the task to a degree which renders it possible for us to cope with it with a fair degree of success.

In meeting such a problem the railways have so far depended largely upon manual labor for loading the cars or trucks. It has always been a custom to arrange for feeding the men, not only of the way department but also of the transportation department, during their work on snow, particularly in the night seasons. Usually arrangements are made with restaurants for furnishing hot food and coffee. It has also been found advisable to set a minimum wage rate for snow work, which is considerably above the regular minimum rate for track laborers. This has the effect of getting the men out and tends to prevent their seeking snow work in other quarters.

Within the last year or two there has been an increase in the use of steam or electric shovels for loading snow whenever there was a sufficient accumulation. Their use is somewhat limited by street widths. Labor shortage and cost have forced the attention toward a study of machines designed specifically to handle snow. Until this winter there has been none developed beyond the "promise" stage, in spite of all the machinery which is available for handling other materials.

The intermittent periods of snowfall, the changing character of the snow and until recently the comparatively reasonable price of labor for manual handling have all tended to prevent experiment and expense necessary to develop the proper machine. Nevertheless, the company with which the writer is connected has spent about \$7,000 upon the development of a snow-handling or loading machine which has so far failed to work with much success. It is believed that with the expenditure of several thousand dollars more the apparatus could be made to give results.

Meanwhile, the persevering Dr. Samuel Friedman of New York has developed, at his own expense and after about fourteen years of effort, a snow-loading machine which is successful to a marked degree. It will not only pick up all kinds of snow and load it into waiting trucks or cars but it will also handle ice in large chunks, after it has been loosened from the pavement and piled ahead of the path of the machine. The problem with Dr. Friedman's machine seems to be one of finding enough trucks to keep up with the loading capacity of the device.

Attempts to melt snow by means of asphalt surface heaters and other forms of apparatus depending upon heat in some form have failed dismally. The capacity is very limited and the cost unduly high. The cost for melting snow with such a device amounted to \$7.33 per cubic yard and for melting ice ran up to \$19.80 per cubic yard according to recent tests made in New York.

The use of sewers for snow removal and disposal has proceeded apace, so that today most large cities permit the railroad companies to use the sewer system to the greatest possible extent. The chief disadvantage often lies in the small capacity of the sewers in territory where there is most need for their use. In addition the manholes are seldom of a size which will permit of rapid disposal without much shoveling. There has been some development of special dumping manholes designed to overcome this trouble. These have so far taken the form of special openings in bridge floors.

Lack of sufficient flow or volume of sewage is also an occasional hindrance, but this can be remedied, first by flushing by means of fire hose with water from adjacent fire hydrants and second, as suggested by the New York Street Cleaning Commission, by providing special connections from hydrants to sewers underground, by means of which the needed additional flow may be more readily provided. In Brooklyn the use of the sewers has

cut the cost of removal about in half through the elimination of the work-car haulage service. Some costs for various methods of snow removal in Brooklyn were given in the *ELECTRIC RAILWAY JOURNAL* for Feb. 21, 1920. In connection with the use of sewers, it will be found desirable to prepare small pocket maps showing the locations of available manholes, so that they may be found readily when covered with several feet of snow.

There have been practically no new developments in methods for opening up blockaded lines where service

has been suspended. If the plows and sweepers have failed to keep them open there is nothing to do but "go at it" with pick and shovel. Fortunately, such blockades are becoming more and more rare. They are now most likely to occur through the occasional breakdown of equipment or derailment thereof, which prevents the frequent passage of snow-fighting apparatus over the line and allows time for the accumulation of snow and the formation of ice.

Motor Buses in New York State

At the close of the fiscal year ended Jan. 31, 1919, the Secretary of State revealed that in New York State there were 22,572 motor buses. In New York City alone there were 9,136. The number of buses registered in the State increased 24 per cent over the year 1918, an indication of their growing popularity for passenger traffic. The ratio of buses to the total number of pleasure vehicles in the State is approximately 5.05 per cent.

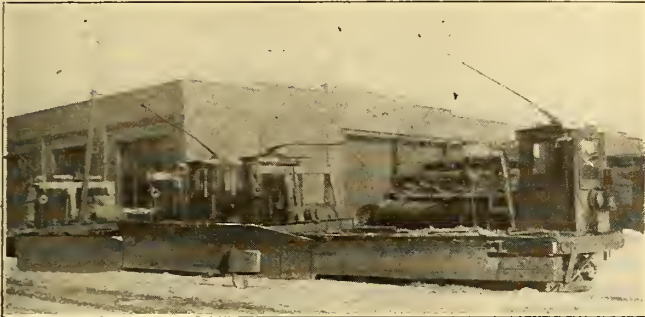
What is said to be the largest jet condenser yet built was recently completed by the Westinghouse Electric & Manufacturing Company, for the Alabama Power Company. It is capable of passing 13,000,000 lb. of water per hour.



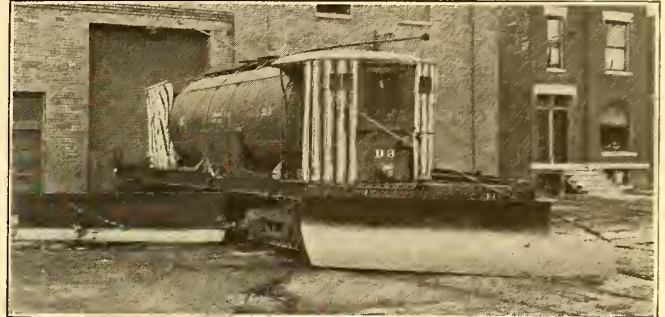
THE FRIEDMAN MACHINE HAS DONE SOME MARVELOUS WORK IN NEW YORK CITY

Snow-Handling Practice East and West

Résumé of Methods Used on Various Systems Outlined from
Answers to Recent Questionnaire



CHICAGO'S IMMENSE WING PLOW PROPELLED BY
THREE WORK CARS



FRONT AND SIDE WING PLOWS ATTACHED TO
SPRINKLER CAR IN CHICAGO

AS A RESULT of the severe storms of February last, many electric railway companies found themselves unprepared to cope with a storm of real magnitude and one which might reasonably be expected to occur during the course of any winter. While the effects of this storm, or series of storms, are still fresh in mind, many companies are casting about to see what steps may be taken as a safeguard against interruptions of a similar nature in the future. In this connection, and at the instance of R. C. Cram, author of the preceding article, a questionnaire was sent out to several electric railway companies to find out how they were prepared to deal with severe storms, and what methods they used to handle the snow after it had accumulated on the tracks. The questionnaire included seven questions as follows:

SOME QUESTIONS AS TO SNOW REMOVAL METHODS

1. In snow removal work, what other equipment do you use besides snowplows and sweepers?
2. What advantages either in reduction of cost or increased facilities of removal of snow have been obtained by use of sewer manholes for disposal?
3. Can you give any costs on a cubic yard or other basis of snow removal?
4. Have you developed any new or special apparatus for snow removal work? Have you used steam or electric shovels for loading snow? If so, what is the cost per cubic yard as compared with hand loading upon cars?
5. What are your obligations as to area of snow to be removed? Do you have any special arrangement with the city whereby you consolidate your obligation area into definite areas, including the whole street between house lines in business districts, as an equivalent for your more unimportant outlying areas?
6. Do you contract for snow removal by carts, etc.? If so, what is the basis of payment?
7. Give an outline of your snow-removal program. How soon after snow begins to fall do you begin its removal?

Four of the replies received to the questionnaire give a résumé of the methods used on systems located in the East, Middle West and West.

In Denver in addition to the usual complement of snow plows and sweepers the Denver Tramway company uses work cars and autos to carry trackmen to salt the switches, and if the storm is so severe that operation has to cease, work cars and flat cars are used upon which to load the snow for removal from the streets. Wing boards are used on flat cars to push the snow farther away from the track.

When the snow is removed from the streets by flat cars, the special mechanical pusher built by the company and described in the issue of the *ELECTRIC RAILWAY JOURNAL* for May 10, 1919, page 924, is used. A few years ago, at the time of a heavy snowfall, three men with this pusher were able to perform the work which otherwise would have required a gang of fifteen shovelers. Flat cars containing from 10 to 14 cu.yd. of snow were loaded at an average rate of 6 min. per car. The pusher running day and night at a cost of \$9 per shift for labor was able to unload more snow than was handled off flat cars by the city at Sixth Avenue with a cost of more than \$80 per shift.

The Denver Tramway has no obligations or arrangements with the city in regard to snow removal, nor is any contract made with outside firms for this work. As soon as the snow begins to fall sweeper crews are ordered to report for duty. The removal work depends upon the weather conditions, the hour of day with reference to peak load, the kind and amount of snowfall, the time of year and the reports of car crews and inspectors as to whether or not the two-motor car lines are beginning to drag. In the event of a complete tie-up of traffic, due to an abnormal snowfall, the method of procedure is outlined in a standing order covering the work in detail. This standing order is corrected each fall to cover any changes in organization, routes, etc., which seem of value as a result of the experience of the preceding year. This organization work was outlined in an article in the *ELECTRIC RAILWAY JOURNAL* for Feb. 17, 1917, p. 304.

INTERNATIONAL RAILWAY HAS AGREEMENT WITH CITY FOR SNOW REMOVAL

The snow-fighting equipment of the International Railway, Buffalo, N. Y., consists of sweepers, snowplows and rotaries, and only in case the line becomes blocked and it is impossible to open it up with any other equipment is shoveling resorted to. This company seldom removes any snow from the streets by carting away or otherwise, as an agreement for this work is in effect with the city, and the company is assessed a fixed portion of the cost. The railway company does, however, remove all snow from the tracks, in which work it is unassisted by the city.

The snow-fighting equipment is placed in operation very quickly after snow begins to fall and before 2 in. has actually accumulated.

In addition to its snow plows and sweepers, the Rochester lines of the New York State Railways use two snow-scraper cars and a car with an ice-cutting attachment, which cuts the ice and snow from between the rails. This company has an agreement with the city by which each pays 50 per cent of the cost of removing snow on streets where car tracks are located and each has a definite area to clean. The company removes the snow from the main street intersections in the center of the city and the city removes the snow between these intersections from curb to curb.

The New York State Railways do not contract for snow removal, but when necessary teams are sometimes hired by the day. Sewer manholes are used for the disposal of snow, and this method results in much shorter hauls. In some cases manholes are

truck has its own route to cover. About twenty salt boxes are distributed at principal locations about the city where there is a large amount of special work.

The railway company has a private telephone dispatching system operated from a central office in the main office building with a telephone at the end of each car line and at other principal locations. This has proved invaluable in carrying out the snow-fighting program.

CHICAGO HAS IMMENSE WING PLOW PROPELLED BY THREE WORK CARS

The snow-fighting equipment of the Chicago Surface Lines consists of ninety-six sweepers, eleven power plows, eighty-one drag plows, forty-nine wing plows, and seven large sprinkler cars converted into wing plows. During the heavy snowfall of two years ago the heaviest drifts were successfully cleared from the tracks and from an area wide enough for other traffic outside the tracks by the use of an immense



HEAVY WORK FOR THE SWEEPER ON THE SAULT STE. MARIE TRACTION LINES

located at the spot where removal of snow is necessary, thereby decreasing the time of snow removal and reducing the cost of hauling.

The city of Rochester is mapped out in routes for the snow sweepers and plows to follow and these are classified as Routes 1, 2, 3, and so forth. This information is posted in each snow equipment for the information of the trainmen so that each crew will know just what streets to follow and clean, and it, in turn, reports back to the dispatcher's office by telephone at the end of each route or line. A record is kept in the dispatcher's office of each equipment location and of streets cleaned, so that at any time during the storm the superintendent and his assistants know where each sweeper and plow is located.

As soon as the equipment is called out, this depending on the density of fall, the location (city, suburban and interurban lines) and what amount of snow is previously on the ground, salters and switch cleaners are dispatched to the main sections of the city, while two trucks are loaded with salt and men are sent to the outskirts to clean and salt the switches. Each

wing plow attached to a work car. Sufficient power to operate this equipment against the heavy drifts was derived by coupling three heavily motored and weighted work cars together. A signal system was connected between cabs so that all three motormen could simultaneously turn on their controllers. This combination appeared to be capable of moving anything, and it was these equipments which made it possible to cope with the unprecedented snowfall without suspension of service.

The practice in Chicago is to clean not only the 16-ft. area over the track, but also, by means of the various wing plows, to push the snow back toward the curbs in order to clear a roadway for trucks and automobiles. This is the only way such vehicles can be persuaded to stay off the tracks. The organization to handle this work is so perfected that upon occasion an army of employees can be called from their homes and put into action in less than an hour's time. Each man knows by prearranged plan just where he is to report and what he is to do if he is called and given the command "snow." The men are fed on the job by the

company, so that there is no stopping of the snow-fighting work through desertion in search of food and warmth.

A liberal use of salt at all switches and special work locations at the beginning of a storm is considered one of the secrets of keeping the cars moving. A very close contact with the Weather Department is another, serving as it does as a means of anticipating what preparations may be necessary.

The Efficiency Mileometer*

This Device Records the Difference Between Power-On and Power-Off Privilege, as Well as Total Mileage

By C. H. KOEHLER

Efficiency Mileage Recorder Company, Louisville, Ky.

THERE has always been a need for a mileage recorder for electric railway cars. Nearly all important statistics of operation in the electric railway industry depend upon the mileage factor for their significance. Revenue, power, life of equipment and maintenance are all determined on a car-mile basis. A speedometer and odometer is considered standard equipment for practically every gasoline-propelled vehicle manufactured today. The need of a mileage recorder for the electric railway car, which covers yearly from 30,000 to 50,000 miles, and represents a far greater investment than the average gasoline car, seems even more logical.

The railway property of today estimates its mileage from dispatcher's train sheets or from conductor's way bills or trip sheets. This work is done by clerks, with resultant clerical errors and attendant clerical expense. Particularly on city properties this mileage is both difficult and expensive to obtain accurately. Where individual car-mileage records are kept, as for inspection purposes and the like, this work becomes even more expensive and less accurate. The advantage and saving in clerical expense of a mileage recorder that automatically corrects for turn-backs, pull-ins and other lost or additional mileage are apparent.

In the past, mileage recorders of two types, mechanically driven and electrically operated, have been tried out. Mechanically operated mileage recorders of almost every conceivable design have been applied to electric railway cars, with generally unsuccessful results. The severe service to which a car is subjected and the fact that a considerable length of flexible shafting is needed properly to locate the register have rendered the everyday speedometer and odometer unadaptable.

As far back as 1900, J. R. Cravath was granted a patent on an electrically operated wheel-revolution counter. Probably due to the fact that in those days electrical contact mechanisms had not been developed to the state they are at present, no commercially successful device resulted.

However, in recent years the cam-actuated electrical contact has been developed to a high degree by manufacturers of magnetos and ignition apparatus. Electrical counting mechanisms and relays have also been used as standard apparatus by many industries with satisfactory results. The application of modern magneto and ignition practice and of modern telephone and telegraph practice have resulted in the development of a simple and satisfactory electrically operated mileage recorder, or

"efficiency mileometer," as it is called, which will be briefly described.

Instead of merely registering total mileage, both total mileage and "power-off" or "coasting" mileage are registered, thus giving means of determining the motor-man's car-operation efficiency. Even the layman realizes that the more miles a car coasts or runs with power shut off the less power is used. This relation between per cent coasting mileage and the kilowatt-hour consumption per car-mile has been proved by extensive tests. In fact, it is possible, after a characteristic curve for a given type of car has been plotted, accurately to determine the energy used per car-mile from the per cent coasting mileage. Another important feature of the device is the efficiency indicator, which tells the motorman at a glance what his operating efficiency is, just as a speedometer tells at a glance the speed.

The complete efficiency mileometer consists of three units—the circuit maker, the register and the resistance box. The circuit maker is an iron-clad make-and-break cam-operated contact device, somewhat similar in operation to a magneto interrupter. It is fastened to the end of the journal in the journal box, and makes one contact per wheel revolution. It is accessible and easily replaced, and interferes in no manner with the packing or removal of the brasses. Due to the use of a wipe type of contact, oil does not affect its operation. Tests over a six months' period tend to bear out the claim that it needs attention only every 40,000 or 50,000 miles, or about yearly, and then only for lubrication. Since the device "floats," secures plenty of lubrication and operates at relatively low speed (300 r.p.m. maximum for city cars), there is practically no mechanical wear.

CONSTRUCTION AND OPERATING DETAILS

The register consists of a magnet coil in series with the circuit maker, actuating the mileage counter and efficiency indicator through a driving pawl, ratchet and train of gears. An electro-magnetic brake operates a planetary transmission, throwing the coasting register out of gear when power is applied. The main or counting magnet coil operates on 30 volts and 0.06 amp., or about 2 watts, by means of a scheme of bridging resistances. There are no high-potential wires in either the register or circuit maker, as the voltage of 600 is mainly impressed on the two enameled resistors comprising the resistance box. There is only one contact in the entire system. The efficiency indicator is merely a lettered wheel rotating in one direction for power-on miles, and in the opposite direction for power-off miles. The cumulative sum of the power-on and power-off miles puts a good man in class AA or A. A poor man, unless he coasts over 50 per cent of the total miles, is always in class C or D.

Voltage variation in no way affects the accuracy of registration. The circuit maker can be timed accurately to register on either an interurban car operating at 90 m.p.h., or a city car at 25 m.p.h., with voltage varying from 600 to 250.

Errors due to wheel diameter variation are corrected for in the following manner: For use on say a 34-in. wheel, the efficiency mileometer is calibrated to read correctly in miles on the average diameter through the life of the wheel, or approximately 32.5 in. For the individual car, when the wheel is new, the mileage records will be approximately 96 per cent of the true mileage, while on an old wheel of 31 in., the records will be approximately 105 per cent of the true mileage. The

*Abstract of discussion of paper by D. D. Ewing, read before Central Electric Railway Association at Louisville, Ky., March 11, 1920, by W. Shaw for the author.

aggregate average wheel diameter of any ten cars with normally new 34-in. wheels will be very near to 32.5 in. Thus the law of averages on a number of cars, or even on one car for say 40,000 or 50,000 miles, eliminates the error due to wheel diameter. Where a system is equipped, corrections for wheel-diameters can thus be neglected.

The per cent coasting-mileage figure is unaffected by wheel diameter variations, as the same error is present in both numerator and denominator.

Wheel slippage has been found to be a negligible factor. In fact, the efficiency mileometer inherently discourages wheel slippage. Wheel slippage means more power-miles. Locking of wheels or skidding in braking is also discouraged, since wheel skidding means less coasting mileage.

SUMMARY OF ADVANTAGES

Summing up, the advantages of the efficiency mileometer might be listed as follows: (1) It gives accurate records. (2) It records the complete efficiency ratio, both numerator and denominator. (3) It tells the motorman at a glance, by means of the efficiency indicator, his class of operating efficiency. (4) It gives a coasting percentage figure that can be used without additional calculation, to determine the slack in schedules. (5) It gives a coasting percentage figure that can, by means of a characteristic curve for given equipment, be used accurately to determine the energy consumption per car-mile.

Claim Records in San Francisco

THE San Francisco Municipal Railway has made public the following figures of its claim department for the years ended Dec. 31, 1918 and 1919:

(GENERAL STATISTICS)

	1919	1918
Total passengers carried during the year.....	63,966,470	55,994,844
Car-miles operated (cars 7,122,005; buses 260,324)	7,382,329	7,070,359.63
Number of passengers to mile.....	9	8
Number of accident reports filed*.....	1,916	2,172
Number of accidents fatal.....	9	10
Number of accidents—personal injuries.....	656	754
Number of claims presented.....	431	487
Number of claims adjusted.....	125	114
Number of suits instituted.....	23	22
Number of suits pending.....	42	22
Number of passengers carried per accident report.....	33,334	25,700
Number of passengers carried per personal injury report.....	97,510	74,264
Number of passengers carried per fatal accident.....	7,107,385	5,599,484
Number of fatal accidents to passengers.....	4	None

CLASSIFICATION

	1919	1918
Car collisions.....	123	206
Auto and wagon collisions.....	1,134	1,128
Boarding moving car.....	156	195
Leaving moving car.....	111	120
Miscellaneous.....	392	523
Total.....	1,916	2,172

	1919	1918
Percentage of accidents to passengers carried.....	0.00029	0.00039
Total receipts.....	\$2,646,682.81	\$2,232,000.29
Total amount paid accident claims, office and miscellaneous expense.....	32,655.40	28,997.15
Ratio to operating revenue.....	0.0123	0.0129

* "Number of accident reports filed" also includes reports of accident shapening near the cars in which the railway was not involved.

RECAPITULATION OF AMOUNTS PAID IN 1919*

Personal damages.....	\$18,739.58
Property damages.....	3,766.00
Expenses of office in adjustment of claims.....	10,149.82
Total.....	\$32,655.40

RECAPITULATION OF AMOUNTS PAID IN 1918

69 Personal damages.....	\$26,771.15
21 Automobile damages.....	1,759.50
3 Wagons and vehicles.....	21.90
13 Damaged wearing apparel.....	124.35
3 Miscellaneous.....	320.25
Total.....	\$28,997.15

Automatic Train Control Discussed

Problem Is to Increase Rather Than to Sacrifice Track Capacity

AT A meeting of the New York Railroad Club held on Friday, March 19, the subject of discussion was "The Automatic Train-Control Problem." A paper on this subject was presented by H. S. Balliet, signal engineer electric division New York Central Railroad. Some of the salient points in the paper were as follows:

The earliest record of an effort to undertake communication with moving trains dates back to 1859. Since that time there have been several experiments but, as the automatic airbrake was not invented until 1872, the use of automatic train-control devices in connection with the brake system was not possible until after that date. There are at the present time seventeen devices for this purpose, comprising five types of automatic train control.

It is not difficult to apply devices to stop a train, but if this only is done track is sacrificed. Automatic train control with speed control must maintain existing operating requirements and, if possible, increase track capacity. Very little progress has been made in meeting the requirements of speed control.

The development of automatic train-control devices and their use to supplement existing automatic block signals are highly desirable. The apparatus must be suitable to operate efficiently on trains at the highest permissible speed and must bring the train safely to a stop without endangering the controlled train or trains on adjacent tracks. Such automatic control devices must be expected to prevent only such accidents as are due to the failure of employees to observe, understand and obey signal indications.

The automatic train-control problem is to provide an appliance which will furnish protection against accidents when employees disregard signal indications or when signals improperly indicate "proceed." The two general classes of control devices are "contact" and "non-contact." The former depends for its operation on the physical contact of an element carried on the train with an element at a fixed location on the roadside. The second depends for its operation on electrical or magnetic impulse without physical contact between the roadside and train elements. There are many important factors entering into this problem such as reliability in operation; inspection, maintenance and tests to insure efficiency; clearance; capacity; interchangeability as between different devices on track used by railroads jointly and co-relation with track-circuit controlled block signaling and air-brake apparatus.

The cost of an automatic train-control system is an undetermined item involving not only the original expense of installation, but also the cost of maintenance and the effect of its operation on the capacity of existing facilities.

The special Libraries Association is taking a census of the special library collections of the country. Information is wanted of all special libraries, subjects covered, name of owner and of librarian, and clientele served. It should be sent to W. F. Jacob, Chairman Library Census Committee, General Electric Company, Schenectady, N. Y., who will be glad to answer any questions relating thereto.

Economical Use of Energy for Car Purposes*

The Author Analyzes the Ways in Which Energy Is Consumed on the Car and Suggests Ways in Which the Consumption Can Be Reduced

BY D. D. EWING

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ACCORDING to the 1917 report of the Bureau of the Census electric railways were then generating seven and a quarter billion kilowatt-hours of electrical energy and purchasing an additional five billion annually. If, of this total, 80 per cent is used for traction purposes then ten billion kilowatt-hours are used in moving our cars to the extent of two and one-eighth million car-miles. This is an average energy consumption of $4\frac{3}{4}$ kw.hr. per car-mile measured at the power-plant switchboard. At $3\frac{1}{2}$ lb. of coal per kilowatt-hour the total consumption is seventeen and one-half million tons or about $3\frac{1}{2}$ per cent of the annual coal production. If, by the proper selection of equipment and by the proper operation of this after it is selected, it would be possible to cut the coal consumption in half, the saving at \$3 per ton would be \$26,250,000 per year. Of the $4\frac{3}{4}$ kw.hr. only about 60 per cent gets to the cars, the balance being "lost in transit." Possibly the transmission losses are as important as those on the cars, especially since it is easier to control the former than the latter.

On the car energy is lost in the friction between trolley wheels and trolley wires, in the friction at the wheel bearing, in the arcing at the wheel wire contact, in the resistance of both the wheel wire and harp wheel contact, and greatest of all, in the main motor circuits. Certain losses occur in the motors themselves, the starting resistance grids take a part, the gears too take their toll, passing on the balance in the form of mechanical energy to the car itself. Another set of circuits, namely, those supplying energy for lamps, heaters, compressors, etc., also add to the energy consumption.

When a man really wants to save money he keeps books; he lists his income and outgo and then analyzes the account. In the accompanying tables are some accounts with the "power bank" for three types of cars. In table I the data for the interurban and the 14-ton city cars are for the most part from actual tests, the segregation of the energy supplied to the main motor circuits, only, being estimated. The figures for the Birney car were estimated. The data were all taken during cold weather, and the lights were on about one-half the time. Carbon lamps were used in the two cars tested, and Mazda lamps were figured on in the Birney car data. The schedule speed for the interurban was 24 m.p.h., and the stops were at the rate of one every two miles. For the other cars the figures are for six stops per mile and a schedule speed of 9 m.p.h. It is understood that the energy and power requirements of electric cars depend upon many different factors, but the data here presented are sufficiently representative for the purpose of the present discussion.

As indicative of the power supply to different parts of a car, while it is operating at balancing speed on straight level track, the data in table II are presented.

The figures are for the same cars, and were arrived at in the same manner as those in table I. The figures apply for the conditions prevailing when all circuits are energized.

Some of the figures in table I look small, but a better appreciation of their significance arises when one remembers that the work which a kilowatt-hour will do is equivalent to raising a ton to a height of one-fourth mile.

MAIN-MOTOR-CIRCUIT ENERGY CONSUMPTION

The tabulated values show that the percentages of energy used in the main motor circuits range from 60 to 95. The items which make up this part of the car's energy consumption are interdependent, a change in one affecting the others. As a general proposition savings may be effected by using improved equipment, by improved operation, or by a combination of both.

As a rule, economical car operation involves (1) rapid acceleration, (2) high braking rate, (3) high coasting percentages, (4) short stops and (5) few stops per mile. These factors may in some cases be incompatible with traffic requirements. The first three are at least partly within the control of the motorman. The duration of stop is partly within the control of the car crew, is partly dependent upon the design of the car and is largely dependent upon the character of the traffic. The number of stops per mile is fixed either by legal or traffic requirements and is largely beyond control.

The energy required for car propulsion, as shown by table I, ranges from 40 to 66 per cent of the total. On some roads the energy required to pull the cars up hills constitutes an important element. The amount required can be reduced by eliminating grades and reducing weight of cars. Curve resistance is not ordinarily an important energy consumer, but on the average road a reduction of 50 per cent in energy consumption due to this item seems possible through control of track curvature, super-elevation of outer rail, shape of rail head and wheel contour, weight of car, and state of maintenance of cars and track structures.

Rolling friction is a minimum with a well-aligned and firm yet elastic roadway. Railhead and wheel-tread shapes and car weights affect it. The energy consumption due to this item could probably be cut in half by proper way construction and maintenance and by the use of cars of lighter weight. Bearing friction also depends on the weight of the car, the kind of lubricant and the method of lubrication. Anti-friction bearings will reduce this friction to a very low figure.

Air resistance, as shown in table II, is important only at the highest speed. Care in designing body shape should result in a reduction of the energy consumption in overcoming this resistance.

Some brake loss is necessary to secure proper car control, and it is a loss partly within the control of the car crew. On many roads it is excessive even where

*Abstract of paper read at annual meeting of the Central Electric Railway Association, Louisville, Ky., March 11, 1920.

TABLE I—SEGREGATION OF ENERGY CONSUMPTION IN DIFFERENT ITEMS OF CAR OPERATION

(a) Interurban Car. Weight 40 tons.			
Item	Kilowatt-Hour per car mile	Percentages	
Car propulsion.....	1.865	66.2	
Motor losses.....	0.396	14.1	
Grid losses.....	0.259	9.2	
Gear losses.....	0.070	2.5	
Total, main motor circuit.....	2.590	92.0	
Headlight.....	0.070	2.5	
Car lights.....	0.079	2.8	
Air compressor.....	0.031	1.1	
Control circuit.....	0.030	1.0	
Total, auxiliary circuits.....	0.210	7.4	
Trolley wheel losses.....	0.017	0.6	
Grand total.....	2.817	100.0	
(b) Single Truck City Car. Weight 14 Tons.			
Item	Kilowatt-Hour per car-mile	Percentages	
Car propulsion.....	1.402	48.5	
Motor losses.....	0.262	9.0	
Grid losses.....	0.438	15.0	
Gear losses.....	0.087	3.0	
Total, main motor circuit.....	2.190	75.5	
Heaters.....	0.666	1.3	
Lights.....	0.033	1.2	
Total, auxiliary circuit.....	0.699	24.2	
Trolley wheel losses.....	0.010	0.3	
Grand total.....	2.933	100.0	
(c) Birney Car. Weight 7½ tons.			
Item	Kilowatt-Hour per car-mile	Percentages	
Car propulsion.....	0.80	40.6	
Motor losses.....	0.15	7.6	
Grid losses.....	0.25	12.7	
Gear losses.....	0.05	2.5	
Total, main motor circuit.....	1.25	63.5	
Heaters.....	0.666	33.8	
Lights.....	0.015	0.7	
Air compressor.....	0.030	1.5	
Total, auxiliary circuits.....	0.711	35.0	
Trolley wheel losses.....	0.010	0.5	
Grand Total.....	1.971	100.0	

TABLE II—ANALYSIS OF POWER CONSUMPTION IN SEVERAL TYPES OF CARS

(a) Interurban Car. Weight 40 Tons.			
Item	Kilowatts	Percentages	
Rolling and bearing friction.....	37.6	26.7	
Air resistance.....	60.0	42.5	
Motor losses.....	30.5	21.7	
Gear losses.....	3.9	2.7	
Total, main motor circuit.....	132.0	93.5	
Headlight.....	2.6	1.9	
Car lights.....	1.0	0.7	
Air compressor.....	4.5	3.2	
Control circuit.....	0.3	0.2	
Total, auxiliary circuits.....	8.4	6.0	
Trolley wheel losses.....	0.7	0.5	
Grand total.....	141.1	100.0	
(b) Single Truck City Car. Weight 14 Tons.			
Item	Kilowatts	Percentages	
Rolling and bearing friction.....	7.8	32.1	
Air resistance.....	3.4	14.0	
Motor losses.....	4.8	19.7	
Gear losses.....	1.5	1.0	
Total, main motor circuits.....	17.5	72.0	
Heaters.....	6.0	24.8	
Lights.....	0.6	2.5	
Total, auxiliary circuits.....	6.6	27.3	
Trolley wheel losses.....	0.16	0.7	
Grand Total.....	24.26	100.0	
(c) Birney Car. Weight 7½ Tons.			
Item	Kilowatts	Percentages	
Rolling and bearing friction.....	4.2	19.2	
Air resistance.....	2.7	12.3	
Motor losses.....	4.6	21.0	
Gear losses.....	1.0	4.5	
Total, main motor circuit.....	12.5	57.0	
Heaters.....	6.0	27.4	
Headlight.....	0.3	1.4	
Air compressor.....	3.0	13.7	
Total, auxiliary circuits.....	9.3	42.5	
Trolley wheel losses.....	0.121	0.5	
Grand Total.....	21.92	100.0	

the brakeshoes are properly adjusted and maintained. Stopping a 40-ton car from a speed of 50 m.p.h. at the rate of 2 m.p.h.p.s. by means of the brakes requires an energy consumption by the brakes of about 2.2 kw.-hr. This loss is decreased by increasing the amount of coasting, while regenerative braking offers some possibilities but as yet has not been worked out in a form practicable for street cars.

Motor losses are dependent upon the design of the motor, the size of the motor (and therefore indirectly upon the weight of the car), the motor speed, the gear ratio, and the operating methods and conditions. As a general rule these losses are reduced by reducing the car weights, increasing the coasting and using slow-speed motors geared to minimum reduction. The motor losses for the Birney car as given in table I could be decreased not to exceed 10 per cent. A greater reduction is possible for the other cars. These reductions are predicated on a decrease in car weight and the proper application of the motor and control equipment. In some cases the reduction might amount to not less than 30 per cent.

Grid loss is always an important loss in city service. It is affected by operating methods and conditions and motor and control design. On the average road this loss could be very likely reduced 50 per cent by proper operation and the use of properly applied motors and control systems.

Gear loss is never a very large item if the gears are well maintained. Except as it is affected by reduction of car weight, there is possibility of but little reduction in the energy consumption of this item, at least not until the time comes when herringbone gears running in oil can be used.

The data in table I indicate that from 5 to 40 per cent of the energy consumption of a car may occur in what might be called the "frills of the car." In light-weight cars it is especially important that the consumption in these circuits be kept low. A few suggestions along this line are given below.

Heater loss depends on the climate, type of car and method of heater control, as well as upon the number of passengers in the car. Between four and five watt-hours per cubic foot of car volume will be required in a lightly loaded car. As ten persons radiate about as much heat as a 1-kw. heater, the amount necessary on a loaded car is less. Thermostatic control of the heater would seem to be the best reducing agency here, savings ranging from 15 to 40 per cent of the energy required for heating having been reported. A possibility that offers much promise is the utilization of the heat dissipated in the grids. For average winter conditions this grid loss on the heavier city cars now in service is but slightly less than the heater requirements.

The use of Mazda lamps for the interior lighting and the headlight reduces considerably the energy required for this purpose, as compared with the use of carbon lamps and arc headlights.

The air compressor runs intermittently, and its energy requirements depend on operating conditions and methods and upon the mechanical condition of the compressor and pressure piping system. A slight leak in the piping may easily double the energy consumption of the compressor, as may also careless handling of the brakes and other air-using devices.

Cars equipped with remote control require a certain amount of energy for the operation of the switch

groups. In some of the modern electro-pneumatic control systems the energy required directly for control operation is only about 20 per cent of that in some of the earlier systems. The demand on the air compressors, however, is increased. A decrease in the time that power is used for propulsion purposes decreases this loss in direct proportion. The loss at its worst, however, is a small one.

Trolley fed signals also require a small amount of energy, but there is little reduction in consumption possible with well designed circuits.

CURRENT-COLLECTING DEVICES

The amount of energy lost at the trolley wheel is small and is of interest chiefly because it is, to a certain extent, a measure of the life of the wheel and wire. Recent tests show that for a city car collecting 50 amp. at 20 m.p.h. with 20 lb. trolley tension, the mechanical loss due to the wheel wire and rotation section is about 30 watts; the electrical loss at the wheel-wire contact, 110 watts, and the electrical loss at the bushing contact, 20 watts. The aggregate is 160 watts. For an inter-urban car collecting 200 amp. at 50 m.p.h. with 30 lb. trolley tension, the losses are about as follows: mechanical, 110 watts; electrical, at wheel wire contact, 400 watts; electrical, at bushing, 180 watts; total, 690 watts.

Briefly summarized, the greatest possibilities in the way of energy saving lie in the use of lighter cars, of proper operating methods and of equipment properly applied to the service which it is to perform. If these possibilities were used to their fullest extent on all the railways of the country, I firmly believe that while we might not be able to save the 50 per cent of the coal mentioned in the introduction to this paper, we should be able to save at least 50 per cent of the 50 per cent now charged against the cars. We should not attempt to save electrical energy at the expense of something else more costly, as such saving is likely to prove to be "saving at the spigot, while wasting at the bung." A saving to be justified must be one considered from the standpoint of the business as a whole. It never pays to spend \$10 in one department to save 10 cents in another.

Track Swings Simplified

By Use of Simple Formula, Track Swings Can Be Properly Constructed by Any Foreman

By W. T. ROSSELL

Superintendent Track and Buildings, South Covington & Cincinnati Street Railway, Covington, Ky.

IT IS often necessary, for the sake of car clearance or in order to meet old work, to swing track to a parallel line. The offset may vary from a fraction of an inch to one or more feet and the length of this reverse curve is often left to the judgment of the assistant engineer or even the foreman. This means that at one point the length of the swing may be 20 ft. and at another 30 ft. for the same offset distance. Often paving must be removed and replaced. The swing should be of ample length to secure easy curves and yet should not be one foot too long. There is no reason why the swing should not be standardized. The complete form is a curve, a short tangent and a curve as shown in an accompanying illustration.

In order to determine all of the functions of this

swing with certain conditions fixed or values known, referring to the illustration:

- Let a = Offset, center line
- R = Radius of curves
- T = Tangent between curves
- D = Over-all length of swing.

Connect the centers of the curves OO'
Draw OP perpendicular to and $O'P$ parallel to the center line of the track.

Then the solution is evident from the right triangle OPO'

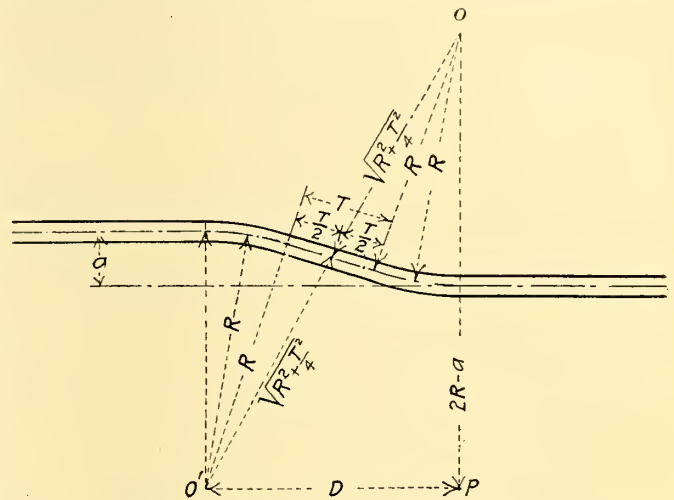
$$D^2 = \left(2 \sqrt{R^2 + \frac{T^2}{4}} \right)^2 - (2R - a)^2$$

$$D^2 = 4R^2 + T^2 + 4R^2 - 4aR - a^2$$

$$D^2 = T^2 + 4aR - a^2$$

$$D = \sqrt{T^2 + 4aR - a^2}$$

Standard values may be selected for T and R and the equation solved for D . If desired T is made zero and vanishes.



ASSUME VALUES FOR T , R AND a , AND SOLVE FOR D

Below is shown a table with T equal to 25 ft., R equal to 500, 1,000, 1,500 and 2,000 ft. respectively and a varying from 1 in. to 3 ft. Intermediate values are interpolated.

$$D = \sqrt{T^2 + 4aR - a^2}$$

a (inches)	500 feet D (feet)	1,000 feet D (feet)	1,500 feet D (feet)	2,000 feet D (feet)
1	28.1	30.9	33.6	35.9
2	30.9	35.9	40.3	44.3
3	33.6	40.3	46.1	51.2
4	35.9	44.3	51.2	57.4
5	38.2	47.9	55.9	62.9
6	40.3	51.2	60.2	68.0
7	42.3	54.4	64.2	72.8
8	44.3	57.4	68.0	77.2
9	46.1	60.2	71.6	81.4
10	47.9	62.9	75.0	85.4
11	49.6	65.5	78.3	89.2
12	51.2	68.0	81.4	92.9
15	55.9	75.0	90.1	103.0
18	60.2	81.4	98.1	112.4
21	64.2	87.3	105.4	120.9
24	68.0	92.9	112.4	128.9
30	75.0	103.0	125.0	143.6
36	81.4	112.4	136.5	156.9

It is difficult to make many foremen place the tangent between the two curves. However, when once they see it properly laid out they are so well pleased with the appearance that they take pride in always doing it right.

A newspaper dispatch from Chamonix, Switzerland, states that French and Italian engineers are making preliminary studies for a tunnel under Mont Blanc, which will give a direct connection between France and Italy.

How Meters Induce Car-Energy Savings*

In Discussing the Paper by D. D. Ewing, the Author Elaborates That Phase of the Subject Which Relates to the Province of the Motorman

By L. E. GOULD

President Economy Electric Devices Company, Chicago

PROFESSOR Ewing has presented an able analysis of the car-energy consumption factors and has shown the proportionate subdivisions of each unit of energy used, not only in useful work but in the various losses between the trolley wheel and the rail. A similar analysis should be found to be most helpful when studying how car propulsion energy can be conserved. Such a study should have for its objective the determination of those losses which can, through better engineering practice and better operating practice, be made to net the largest consistent savings with the least outlay and least hazard. That, perhaps, is a rough definition of our subject, "economy."

Professor Ewing's paper points out that, generally speaking, energy savings may be effected by use of improved equipment, by improved operation or by a combination of the two. My discussion will relate largely to what I think Professor Ewing means by the words "improved operation." For example, consider that road which has paid much attention to effecting economies in power generation, distribution and the return circuit. Likewise it has highly efficient motive-power equipment on cars of consistent weight operated on carefully planned schedules. A road so equipped still affords full opportunity for conservation of car energy.

Substantial savings can be made through better handling of the controller and brakes; that is, through training the men to have in mind conservation of energy in addition to safety and service. And the road with the most highly trained men can still show a very worth-while economy in energy consumption if it will give its motormen an energy-checking device for use as a tool to help them to keep check on their individual improvement.

It is true that motormen are taught to handle their trains most efficiently, and on many roads this part of their service is regularly supervised. Yet we have learned by tests on many properties and by actual installations on nearly fifty roads in the United States that the use of an energy-metering device will so improve the saving accomplished that sufficient net savings are available to wipe off the cost of the installation of the device early in the first year of its use.

The average well-meaning motorman who runs on schedule, but who wastes energy, does this simply because he does not understand how to utilize car energy efficiently; or, perhaps more specifically, because there is no stimulus for him to keep "on his toes" all the time. So far as power saving goes he has no incentive for operating economically. But give this man a power-saving device which will show him how much energy his car uses for his run, for a trip, for a part of a trip, or even for as small an amount as the energy consumed

in climbing a long grade, and the motorman's interest immediately is stimulated to more efficient operation. Then follow substantial energy savings and many other worth-while economies.

With a watt-hour meter on his car the motorman can actually determine for himself some of the important factors set forth in Professor Ewing's paper. He can see just how much saving he makes by proper acceleration. He can see that coasting normally will save energy, and that fanning the air brakes wastes energy. With a meter on his car the motorman can see the power-consuming effect of unnecessary stops and slow-downs when climbing grades, and he can note from watching his meter the relative amount of energy that is being taken when operating on series, on the resistance notches and at free running or balancing speed. In other words, the kilowatt-hour meter on the car gives the motorman, and oftentimes the management, a new view of car operation and therefore increases interest in the work.

The motorman has faith in his meter because, through its open face and its easily read and understandable dials, he can prove to himself which method of operation gives him a low record and which a high record in energy consumption. This is the psychology underlying the success which the Economy meter has had in obtaining sustained records of low energy consumption.

Briefly, the Economy meter is a simple, rugged, energy-measuring device, designed particularly for use on electric railway passenger and freight cars and locomotives. It shows the motorman and the management in clear figures the actual car energy consumption. It is usually connected to measure only the energy consumed in the car motor circuit. It checks the performance of motormen and, in addition, is a constant inspector of the condition of the equipment. It gives all the power-saving results obtainable with other checking devices and in addition affords engineering data of high value.

The watt-hour meter functions while energy is being used, and its rate of functioning is in proportion to the product of the amperes and volts in the circuit at any instant. It registers the actual energy consumption, no matter what operating conditions may be encountered. It is the only rating device which actually and directly compares men on the basis of their relative energy consumption. A motorman may ascertain at any time what progress he is making just as easily as he can read the mileage recorder on an automobile.

The meter checks the motorman directly in terms of the unit he is asked to save; namely, the kilowatt-hour. If an instructor tells an inefficient motorman to operate this way or that way in order to reduce his power consumption, the motorman is inspired with more confidence when he actually tries his own way and then the instructor's way and, by means of the immediate infor-

*Abstract of discussion of paper read by D. D. Ewing at annual meeting of Central Electric Railway Association, Louisville, Ky., March 11, 1920.

mation which the meter gives, finds out that the instructor's way actually does require less energy.

The so-called "power-saving devices" are all monitors to show the management whether the motormen have operated their cars efficiently. These devices stimulate correct operation and thus lower energy consumption, but only to the extent that motormen believe they are being rated and compared fairly. Sustained energy saving will be highest with that device which, under all conditions of operation, most fairly rates the relative operating efficiencies of motormen.

WHAT CAN BE ACCOMPLISHED BY METERING THE CAR ENERGY

The Economy meter measures a man directly in power units. A motorman is asked to save energy and, when rated by a watt-hour meter, he knows absolutely—trip by trip—whether or not his efforts result in actual reductions in energy consumption. With no other devices does the motorman know directly whether power has been saved or wasted. Metering the energy properly credits a man for taking advantage of every opportunity to save power.

One of the simple ways to stimulate energy-saving efforts is to post the number of kilowatt-hours required by the average man for a round trip on a given line. This is a bogie for all men to work against and the meter will plainly show any man how much energy his car has actually consumed as compared with the average trip of the average man.

In considering, for power-saving purposes, the use of the watt-hour meter as compared with devices which measure a time element and not energy consumption, there are several important factors that should be noted carefully.

First, the meter neither introduces a hazard into car operation nor puts any premium on any practice which is contrary to safety first.

Second, the kilowatt-hour is the only unit which gives a motorman full credit for all that he may do to reduce energy consumption while keeping his car on schedule.

Third, the meter gives a motorman credit for consistently fast, smooth feeding, but does not put a premium on so-called "cannon ball" acceleration.

In 1915 J. F. Layng of the General Electric Company presented energy consumption curves which showed the influence of various factors, such as number and length of stops and rates of feeding and braking on the watt-hours per ton-mile for typical cars in typical service. The energy curves for acceleration and retardation have about the same shape. They show that faster feeding and faster braking, up to a certain good rate, will bring about a substantial reduction in energy consumption, but feeding or braking beyond this rate does not proportionately reduce the energy consumption. It does, however, shorten the power-on time and consequently increase the possible coasting time. But these quantities have not the same value in equivalent energy reduction as they have in the parts of the curve represented by slower feeding and braking.

When watt-hour meters are used to measure power savings on the cars, the motormen get credit for pausing on the full series notch if the condition of operation is such that a pause will save energy. Measuring only the time of power on, brakes on, or coasting, puts a heavy penalty on pausing on the full-series notch.

The meter gives due credit for running on full series

in congested districts or, with an interurban car, over slow-speed track, such as through small towns. F. E. Wynne, Westinghouse Electric & Manufacturing Company, has shown speed-time and current curves for a quarter-mile run with an interurban car with the controller on series, as compared with full multiple operation and more coasting. Both running times were the same. Mr. Wynne's study showed that series running under slow-speed requirements meant a saving in the case cited of 18.25 per cent in energy consumption.

Any motorman who has operated a car equipped with an Economy meter will tell you that on slow-order track he can keep his car on time and save considerable energy by running on full series rather than on multiple and coasting. In a test recently conducted on a fifty-car line in Chicago one motorman who had made an extremely low power record for the day, when asked how he operated in order to get such a good record, replied, "By feeding up my controller quickly, by coasting a lot in the outlying sections, and by considerable series running downtown where it's crowded."

A large number of roads in the British Isles—even more than 75 per cent—have their cars equipped with meters and therefore the power-saving instructions, based on many years of experience, are of particular interest. Note this rule of the Aberdeen Corporation Tramways:

Get off the resistance notches, as quickly as possible without rushing the notches, onto full series or parallel. Never run on parallel unless you can take full advantage of the last notch. It is simply wasting power to throw off on the first or second parallel notches. The resistances have used up the most of it; the motors have only gotten a fraction of the power consumed. The same work could have been done with series at half the cost.

Meters give motormen full credit for operating on full series and on full multiple position. They penalize them for running on resistance notches.

No interurban road can boast of never having low voltage, and necessarily this condition should be taken into consideration in the choice of a power-saving device. Low voltage will materially increase the power-on time if a car or train is to be kept on schedule. And the lengthened power-on time directly lowers a man's rating, through no fault of his own, if he is rated by a power-saving time device. A watt-hour meter measures the actual energy consumption at the lower voltage, and this is not materially greater than at normal voltage—what increase there is being due to the slightly decreased efficiency at which the motor operates on low voltage. Therefore, when line voltage is low the watt-hour meter assures a motorman a fairer standing when compared with other men who did not operate under low voltage conditions.

BY-PRODUCT SAVINGS OF THE METER

Referring to Professor Ewing's mention of equipment savings, there are, in addition to a direct reduction in energy consumption, numerous other economies which follow the installation of watt-hour meters on cars and locomotives. For example, if rehabilitation is in order, the sum of the meter readings averaged for any comparative period will assist in the determination of the most efficient types of equipment. For instance, one large user of Economy meters was able, through a change in wheel size, to reduce the average consumption of a substantial number of cars from 123 to 105 watt-hours per ton-mile. Without meters this possible economy could not easily have been discovered.

Meter readings will show the relative power cost for

giving service with different combinations of train make-up. The Chicago, North Shore & Milwaukee Railroad has every motor car equipped with a meter. This road operates every variety of train, from safety cars to heavy five-car, high-speed trains, each car equipped with four 160-hp. motors. The meter records readily show the actual power cost of operating each type of train—a substantial advantage when rearranging schedules and service.

All power-saving devices bring about a reduction in brakeshoe and wheel wear; and because less energy is used there is also a substantial reduction in the roasting of coils and grids.

With watt-hour meters on cars both the transportation and the mechanical departments can at once realize the high cost of binding brakes, tight side and center bearings, nosing trucks and similar defects which come about from natural causes and which should have prompt repair. Often, however, for various reasons, such repairs are deferred. But when their cost is directly shown by the high energy consumption which they bring about, there is a natural tendency to make repairs, and it is easy to justify expenditures with which to do so promptly. In other words, the use of the car-energy meters serves as a strong influence to keep defective cars off the line, and this in itself will result in a substantial power saving.

Economy on the car itself and long life to the electrical equipment, as well as good service, demand a good average line voltage. Therefore, the amount of loss between the substation direct-current feeder switch and the car motors is a most interesting subject for study. On several tests conducted during the past two years we have been able to obtain accurate readings of the direct-current send-out and compare these with the sum of the Economy meter readings on the cars. The difference between the two values shows the line loss, the rail return loss and the miscellaneous consumption of energy along the right of way and on the car. We have obtained figures on this direct-current loss plus miscellaneous use, varying from 9 per cent on a trunk-line city route to 30 per cent on typical interurban lines in Indiana. With such figures available the engineers of a property can easily and accurately look for the weakest points in their distribution systems and thus remedy them and conserve substantial losses of energy.

Another desirable benefit which follows from the installation of energy-saving devices is that the distribution system is relieved of part of its load and thereby the average car operates at higher average voltage and can more easily maintain its schedule.

Another by-product of the Economy meter installation which is not strictly power saving on the car but is closely allied to it and results in money savings of such amount as to warrant the installation for this purpose alone is that of utilizing the meter to tell when the car should be inspected. One road equipped with 1,300 meters has been on the kilowatt-hour car inspection basis since November, 1918, and reports savings which would more than wipe off the cost of the meters the first year. This property is the Eastern Massachusetts Street Railway, known as the "Bay State System." We are also manufacturing, or have on order, meters with the special car inspection dials for the Union Traction Company of Indiana, the Atlantic City & Shore Railroad, the Seattle Municipal Railway, the Philadelphia Rapid Transit Company and others.

The use of the meter to determine when cars should

be inspected is based on the fact that kilowatt-hour consumption between car inspections is the safest, most efficient and most readily available measure of the work done by the essential parts that wear and need inspecting. The kilowatt-hour is a measure of the work done. Mileage run, or the total power-on time, the elapsed coasting time, or the braking time, are none of them so accurate a measure of the work done as is the kilowatt-hour, and with an Economy meter on the car the total kilowatt-hours are easily available for determining that a car has done sufficient work to need inspection.

By providing a simple means for accurately and automatically showing when inspection is needed, the inspection-dial meter also shows at a glance how much work a car can do before inspection is needed. Or, in the case of a road failure, how much work has been done previous 150. And yet the factor of safety has not been as to whether an inspection has been missed. All this is had without any clerical labor. The result is that more thorough inspection is maintained for the same labor cost; or the previous standard of inspection is maintained for reduced labor cost. For example, on the Bay State System, from one carhouse there are operated twenty-one cars, five in regular service and the others during rush hours. Under the previous method of inspection each car was inspected every four days—a total of 150 inspections per month. Under the kilowatt-hour basis of inspection the average inspection period is a little over twenty days, or a total of thirty-two inspections per month compared with the previous 150. And yet the factor of safety has not been changed for those cars which did the most service. The average time necessary to make an inspection is about two hours and the resulting saving of 236 hours thus represents a saving in inspection time of about ten hours per car per month, which may either be absorbed in more thorough inspection or in a reduction of the inspection force.

The savings which will accrue to a large city property from inspection of equipment on the kilowatt-hour basis of work done are great. One metropolitan system which has studied this method for nearly a year estimates that car inspection by this method will bring about a reduction of more than \$75,000 a year in the inspection cost.

A Way to Get Rid of High Ice Centers

IN ORDER to attack the high ice centers which sometimes form between rails in snowy winter weather, the Pittsburgh Railway Company constructed an ice cutting machine. This machine is simple in nature, as it consists merely of applying some specially cut old gears to the axles of wheels on a flat car.

Some well worn 24-in. gears were selected, and two out of every three teeth were cut from the gear, leaving only every third tooth on the spider. These teeth in the well worn gear were already fairly sharp and were sharpened still more. Several of these gears so treated were then pressed onto one of the axles of a flat car having 23-in. wheels. The platform of the flat car was heavily loaded and when the flat car was pushed ahead of a motor car the gear teeth cut into the ice of the high center and chipped the top of the ice so that it could be easily swept away by following machinery.

There was at first some trouble keeping the flat car on the track, but this was soon conquered and the mechanism worked very satisfactorily.

Saving Electrical Energy on the Car*

The Author, Who Was Until Recently Master Mechanic of the Indianapolis Traction & Terminal Company, Comments Item by Item Upon the Points Raised by Professor Ewing

BY L. M. CLARK

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IN A discussion at this time of the economical use of energy for car purposes it appears advisable to consider the three phases of generation, transmission and utilization. Speaking broadly as to the first phase, a gradual but marked increase in the efficiency of generation has been attained, until now most of the electrical energy used by railway cars is being produced at a point approaching maximum efficiency. But the efficiency of transmission has not kept pace with that of generation. There remains considerable to be accomplished in the way of increasing the efficiency of direct-current negative returns and reducing the costs of conversion from alternating to direct current. The question of utilization is extensive and complex, due not only to the wide limitations of car and equipment design, operating schedules and the use of auxiliary devices, but to the human equation, the all-important factor with which we have at the present time to deal.

In reality, the problem of the economical use of energy for car purposes can be regarded as commencing with the contact of the current-collecting device with the trolley wire or third rail, terminating with the car wheels on the track rails, and taking into account the translation of a given amount of electrical energy in accomplishing useful work and overcoming attendant losses.

Car weight constitutes one of the principal contributing factors in the amount of energy required for propulsion. Not until recent years has such consideration been given to designs of minimum weight commensurate with safety in operation and durability in maintenance, weight reduction having been made possible by the substitution of steel for wood construction. The safety car has been steadily growing in favor and has well established the advantages of weight reduction from the standpoint of power economy.

SCHEDULE SPEED AND ENERGY ECONOMY

The next contributing factor, one of far greater importance because it is sufficiently flexible to permit economical adjustment, is schedule speed. This, with given weights of cars and loads, governs the capacities of motor equipments and the gear ratios required, very materially affecting the energy required for car propulsion. With present car equipments, taking into consideration light and loaded weights, motor capacities and characteristics, rates of acceleration and braking, number and length of stops, and roadway and power conditions, the most economical speed can be determined from the calculation of fixed charges and platform expenses per car-mile as compared with the power input and equipment maintenance expenses set up on a similar basis.

While it not infrequently becomes necessary to deviate from the employment of maximum economical speeds in order to expedite the handling of traffic, or to give service of a definite character, opportunities exist on many properties for furthering the economy of energy consumption by readjustments of schedules, taking into account the varying traffic conditions throughout the daily period of operation and any irregularities in the proper equalization of time between timing points.

In the attainment of maximum power economy the question of gear ratios should not be overlooked, particularly with the older equipments. The writer knows of material reductions in power consumption by the change of a single tooth in gearing under severe operating conditions, coincident with decrease in motor maintenance and increase in the ability of the equipment to maintain schedules. On larger systems, where a variety of equipments are operated, it is frequently possible to increase efficiency in energy consumption by redistribution of the various types of equipments, assigning them to the different lines consistent with their ability most efficiently to meet the service conditions.

The correct grading of motor resistors between the different points of the control affords a means of saving energy by making possible more rapid acceleration without excessive current peaks, which would otherwise result in slipping wheels, damage to the equipment and rough handling of cars.

Train resistance is an element which greatly reduces the efficiency of energy translation into useful work. It is composed of a number of factors varying widely according to the conditions of operation and that of the track and equipment. In cutting down resistance losses bearings of the anti-friction type offer one means, but their efficiency from a maintenance standpoint has not been satisfactorily determined. Coincident with the foregoing are reductions in losses resulting from friction between the car wheels and brakeshoes, caused by improper suspension or adjustment. With some of the older types of trucks, as well as those which have been in service for several years, the question is quite complex with regard to the brakeshoe adjustment that will promote the greatest economy in energy consumption. For example, with trucks which have become unduly worn in the journal boxes, pedestal bearings, bolster wear-plates and center bearings an adjustment of the brakeshoes which minimizes free-running friction will oft-times decrease the efficiency of braking to such an extent as considerably to increase the power consumption required to maintain a given schedule. Thus a closer adjustment, incurring greater free-running friction, might more than compensate for the increase in braking efficiency.

However, the real solution of the problem lies in the proper maintenance of trucks, as a result of which

*Abstract of discussion of paper read by D. D. Ewing at annual meeting of Central Electric Railway Association, Louisville, Ky., March 11, 1920.

correct brakeshoe adjustments may be maintained, particularly by the employment of automatic slack adjusters. These in conjunction with the use of proper braking pressures will reduce friction losses to a minimum and effect a means of maintaining maximum braking efficiencies.

Coming now to the energy required for the operation of auxiliary devices, among these electric heaters consume the most power, the amount as compared with traction power varying considerably with the type of equipments and climatic conditions. Thermostatic control affords a means of conserving energy consumption at this point to a degree which appears to warrant consideration. The use of combustion heaters largely reduces, or entirely eliminates, the item of energy required for heating, but with the increase in the cost of attendance labor, as compared with power, it becomes questionable if the electric heater is not the more economical to operate, particularly on city cars where the results of power interruption would not be serious from the heating standpoint.

In the illumination of cars a considerable saving in energy can be secured. Attention should be given to minimizing the hours of burning, not only in carhouses and yards, but during periods of service operation.

Further economies can be effected by looking after the operation of motor-driven compressors, maintaining them in good condition, keeping the brakes as well as other pneumatically operated devices on cars properly adjusted, and eliminating air leaks in the equipment and pipe connections. The proper operation of the brakes also helps in attaining this objective.

WHERE THE MOTORMAN COMES IN

Having discussed the subject in a general way with regard to the factors involved in the car equipment and schedule speeds, let us now take up the element of utilization which affords a direct and profitable means of attaining increased efficiency, namely, the motorman.

With all the progress that has been made in the other lines touched upon in this paper, comparatively little has been accomplished in the way of increasing the efficiency of power utilization in so far as the motorman is concerned. Of the three fundamental factors of car operation quoted in order of their relative importance, namely, safety, time and economy, the attention of operating departments has been concentrated on the first-named two. The relative efficiency of motormen has been judged largely by their ability to operate cars with a minimum number of accidents and adherence to schedules, little consideration being given to the question of energy economy.

This condition existed in the absence of any available means for determining the comparative status of the motorman with regard to the degree of efficiency with which he utilizes the energy consumed in propelling a car over a given schedule, with such number of stops and length of standing time as are incurred by operating conditions.

In most cases, a student motorman is put through a schedule of instruction, supplemented by a number of trips on a car under the tuition of an instructor-motorman, and afterward he is examined with regard to his knowledge of the equipment and its operation before being put to work. Failure on the part of the motorman to attain normal efficiency is largely attrib-

utable to inability to know, from trip to trip or from day to day, what he is accomplishing other than possibly the fact that he is keeping out of trouble and on schedule time.

By the provision of a checking device, correct in principle, dependable in action and expressing its units of measurement not only on a basis of true comparison but in a manner most appealing to his sense of judgment, the average motorman is influenced to increase his personal efficiency, comparable not only with his previous records but also with those of his fellow motormen.

The efficiency of a motorman is based upon his ability to utilize the stored-up energy in the moving car in propelling it, and the unit of measurement which takes this factor into account directly indicates his true efficiency in a manner least affected by operating factors not under his control.

STANDING TIME SHOULD BE CONSERVED

Of the several operating factors entering into the energy input required for car propulsion, it may be pointed out that most of them are fixed in so far as the motorman is concerned, so that there remain only the factors of acceleration, retardation and standing time, by the correct utilization of which he is able to economize in the use of power. Of these three factors the one by which the greatest economies can be secured is the conservation of standing time. This can be conserved not only at stops in loading and unloading passengers, but at terminals as well by elimination of all lay-over time not called for by schedules.

Next in importance is the act of retardation, in which economies in energy consumption are attained through the employment of one-application stops, involving braking pressures commensurate with car speeds, and by the avoidance of the so-termed "fanning" of the brakes, which is usually the outgrowth of habit or of erroneous ideas on the part of motormen.

Last comes acceleration, which offers means of decreasing energy consumption by eliminating running on resistance points and all unnecessary series operation. Although with a certain number of motormen further economies can be effected by the employment of more rapid acceleration, by the time the "fast feeders" are brought down to the point of consistency the net gain here is comparatively small.

Increasing the efficiency of a motorman is in reality a study of human nature combined with psychology. The interjection of technical principles or arguments beyond the scope of his judgment only tends to complicate the matter and promote retardation in progress. A direct appeal to his sense of reasoning and the establishment of environment tending to create and maintain his interest will inevitably secure his co-operation, the key-note in the attainment of successful results.

In conclusion, the writer has endeavored to bring out in a general way the more important elements entering into the subject under discussion, but from a standpoint of investment returns, he believes that no greater opportunities await the electric railway industry for economizing in the use of power and increasing the efficiency of operation than through an educational campaign among the motormen, supplemented by the use of checking devices and a follow-up system of instruction, in order to insure results of a permanent character.

Do Power-Saving Devices Actually Save Power?*

These Devices Are Merely "Measuring Sticks,"
Designed to Provoke a Spirit of Emulation
Among the Car Operators

By WILLIAM ARTHUR

President Arthur Power-Saving Recorder Company,
New Haven, Conn.

NEVER in the history of the electric railway industry has there been such need for rigid economy as now. The rising cost of everything that the street railway uses, the competition of the jitneys, the difficulties of obtaining increased fares, all make it an absolute necessity for economy in operation. There is, therefore, no need at this time to attempt to prove that the subject of saving power on street railways is of the greatest possible importance, and one which every progressive railway man has, or ought to have, in his mind. In studying this matter one of the first questions we are likely to ask ourselves is whether power-saving devices actually do save power?

The answer to this question is, emphatically, No! Power-saving devices do not save anything at all, and this thought cannot be brought out too clearly. Power-saving devices are a means to an end. They are measuring sticks. Their purpose is to induce a spirit of friendly rivalry between motormen who operate electric cars under the same general conditions, but it is the motorman who saves. The whole power-saving situation may be summed up by saying that what we are trying to do is to get the motormen to vie with each other and, as it were, to run a race. The power-saving device merely tells who wins the race and the order in which the contestants pass the winning post.

The question at once naturally arises, cannot this spirit of rivalry be brought about without the need of power-saving devices? This experiment has been repeatedly tried and it has always been found that although something could be done to work up the motorman's interest by instruction, circularizing and other such means, yet the improvement disappeared just as soon as the first enthusiasm had passed. What is needed, if a power-saving campaign is to be effective, is something on the car which will at all times indicate whether or not the motorman has operated his car efficiently, and thereby permit of suitable comparisons being made between men. Even if a good power-saving device is used, however, very doubtful results will be obtained unless the power-saving campaign is carefully planned and the follow-up work consistently carried out.

Granting then that economy is needed, and that power-saving devices are necessary to effect any substantial economy in power consumption, the question naturally arises, how much power can be saved? To answer this question, careful and exhaustive experiments have been made in many parts of this country, and in other countries. The results of the experiments and the experience of those who have gone into the matter most thoroughly show that there is approximately a two to one ratio between a good motorman and a poor motorman; that is, between a motorman who would be considered one of the best on a property and a motorman who would be considered one of the worst. This ratio

of two to one means that the poor motorman is using just about twice the power for the same service that a good motorman is using. For instance, if on a property the average power consumption is 3.5 kw.-hr. per car-mile, then the first-class motorman is probably making his run with a power consumption of a little less than 2½ kw.-hr., whereas, the careless motorman, on the same run, is using from 4½ to 4¾ kw.-hr.

Recently, on a large property, and before a power-saving campaign was started, a car containing fifteen chief motormen was operated over a given route under test conditions, these conditions being that each motorman should operate the car in his own way, making stops at specified points and running at a given schedule. The power consumption per car-mile was measured. The car was then operated over the same route, making the same schedule and the same stops but operated by an expert engineer, and again the power consumption was measured. The saving made by the engineer was 35 per cent.

It is the writer's belief, based upon close study of this whole matter, that as a whole on a large property the motormen waste about 40 per cent of the total power drawn from the overhead wire. This does not mean that 40 per cent can be saved as a general proposition on any property, for the reason that all motormen are not operating as carelessly as the worst to begin with, nor can all of them be trained or worked up to the point where they are all as good as the best man.

In any large power-saving campaign the most that can be hoped for as a practicable thing and without spending too much money for the follow-up work is from 15 per cent to 20 per cent, and although this is only about half of the total amount wasted, yet it represents a worth-while saving.

It is interesting to study just the value of the energy used on a trolley car each day. A car in ordinary service runs about 150 miles a day, with an average consumption of 3.5 kw.-hr. per car-mile, and the cost for energy at 1½ cents per kilowatt-hour gives a total of \$7.87 as the cost of the power used per car per day. Taking 15 per cent as a reasonable figure as to the amount which can be saved by a well-organized and well-followed-up power-saving campaign, the saving per day per car works out at \$1.18. Deducting for the cost of clerical work, following up the records, instruction, maintenance, stationery and other incidental expenses, there is left a saving of approximately \$1 per day per car.

In conclusion I would point out that our country, which usually is the leader in progressive means and in methods of organization and efficiency, is in this matter of power saving very much behind. In England 98 per cent of the cars are equipped with some form or other of power-saving device, and as a former English railway manager recently expressed it, when visiting over here, "English street railway men would as soon think of operating their trolley cars without wheels as without something on the car to check the motormen and prohibit the excessive and wasteful use of power." In our country fewer than 10 per cent of the cars so far are equipped. I believe, however, that we are right now confronted with the situation which makes it imperative for us to use not only this means of economy, but every other means, if our street railways are ever to get into that prosperous condition again which we should all like to see and help to bring about in so far as this lies in our power.

*Abstract of discussion of paper by D. D. Ewing, read before Central Electric Railway Association at Louisville, Ky., March 11, 1920, by W. Shaw for the author.

Snow-Removal "Tank" With Possibilities

Device Which Has Undergone Severe Tests in New York City Gives Promise of Furnishing a Snow-Handling Solution

A LARGE conveyor equipment which has been developed by Dr. S. Friedman of New York City for the removal of snow from city streets, country roads and car tracks has recently come much into the limelight through tests which have been conducted in New York. The machine is called a "snow tank." It is motor operated with four speeds ahead and one reverse and has a speed of 2 to 10 m.p.h. The dimensions are: Length 26 ft., width 9 ft. 6 in., height 12 ft. 6 in., and the weight of the "tank" complete is 22 tons. The motor is a 150-hp. Sterling Marine and the drive is Christie four-wheel.

As is shown in an accompanying illustration of a front view of the tank the snow is picked up by shovels attached to an endless chain conveyor. These shovels cut into the snow or ice as the machine moves forward



AT LEFT, ON DEMONSTRATION THIS SNOW "TANK" LOADED FIVE TRUCKS IN THREE MINUTES. AT RIGHT, THE "TANK" DIGS INTO A SNOW BANK WITH SHOVELS ON AN ENDLESS CHAIN CONVEYOR

and convey the material to a hopper at the top of the "tank." The bottom of this hopper is a movable platform operating in a horizontal transverse direction to the first conveyor. The hopper conveyor can be kept in simultaneous operation with the machine, thus depositing a steady stream of material into a flat car or truck or at the side of the road, or the hopper may be filled and then dumped in one spot. The capacity of the hopper is 10 cu.yd.

It is claimed that the machine will pick up material and fill a 10-cu.yd. truck in one minute. Under demonstration for a distance of one block this was actually accomplished in an average of three-quarters of a minute per truck. Other claims made for the machine, which seem to have been verified under test, are these: It will fill a flat car with soft snow at the rate of 30 to 50 cu.yd. per minute or with frozen snow at the rate of 10 to 20 cu.yd. per minute. It will clear a path in a 6-in. snowfall at the rate of 8 m.p.h., in an 8-in. snowfall at 7 m.p.h., in a 12-in. fall at 5 m.p.h., and so on up to a 24 in. fall at 2 m.p.h. The machine is said to accomplish the work of 750 to 1,200 men.

In some comparisons of costs of loading an 8-cu.yd. truck with snow by "tank" and by hand compiled by

Dr. Friedman as a result of tests, it is stated that the hand-loading costs \$6.12, while the "tank"-loading costs 64 cents, a difference of \$5.48. This includes wear-and-tear and overhead in the case of the "tank." Allowing two hours daily for rest, filling the machine with "gas" and oil and making adjustments, it is estimated that 1,300 loads per day can be removed at a saving of \$7,000 per machine per day.

Electric Snow Melters Stand the Test of Severe Storms

Snow Melters in Use on New York Central Electric Division Keep Switch Points Clear During Most Severe Weather in February

THE snowstorms of February, 1920, will long be remembered for their severity. Not only did a greater quantity of snow fall than during an equal period for many a previous year, but in addition the snow this year had a moisture content much greater than that of earlier memorable storms. For these reasons the past winter has been a most excellent test

period for various snow-melting and snow-handling devices.

In the issue of the *ELECTRIC RAILWAY JOURNAL* for Nov. 16, 1918, page 881, the electric snow melters developed under the direction of Francis Boardman, division engineer, New York Central R.R., were described. During last February when snowstorms, especially in the eastern parts of the country, seriously tied up and delayed transportation, switches on the electric division of the New York Central, where the snow melters were installed, were kept clear for prompt operation of passenger trains. The efficiency of these melters was one of the important reasons which permitted suburban service to operate substantially on time during the storms. The electric heaters placed just under the rail prevent snow from accumulating between the switch points and the track rails, or around the switch connections to switch stands or interlocking machines.

The Boardman melter was originally designed in an effort to find the most economical way to dispose of snow around switches. This year, however, it has been not only a question of economy, but one of necessity, for it has been literally impossible to secure enough men to shovel or sweep snow away during a storm, and thus



THIS ILLUSTRATES THE EFFECTIVENESS OF THE HEATERS AT HARMON, N. Y.

permit anywhere near normal switch operation. This was particularly true when the storms occurred at night and during the early morning hours.

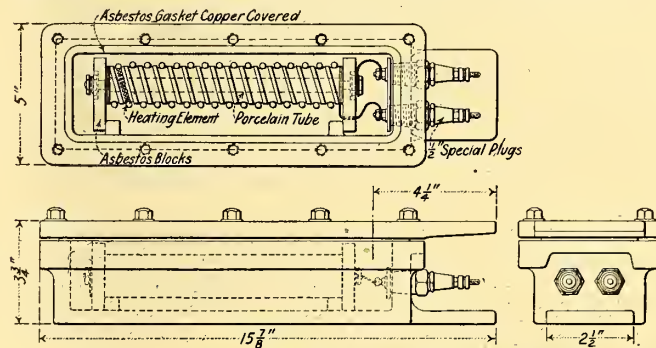
On the New York Central lines one of the most difficult places to keep clear of snow has been the interchange point between steam and electric power at Harmon, some 32 miles from New York City. This is along the Hudson River and it is exposed to high winds. The location cannot be protected in any way by snow fences. Approximately 191 trains a day pass through this point, of which eighty-three change from steam to electric power or *vice versa*, the time allowed for this change being only four minutes, including the switching change necessary and a considerable number of switch movements.

During the heavy storms of last February this plant, through the use of electric snow melters, was kept open with no delay to trains. A foreman and from eight to fifteen laborers ordinarily handle the work at this point, but during the worst of the storm there were only eight laborers available, and some of their time was spent in keeping clear the hand-thrown switches adjacent to the main line.

Another vulnerable point on the system is the junction between the Harlem and the Hudson divisions at Mott Haven. Here 508 trains pass daily, and over three-fourths of this number make some detouring movement by a turnout from one track to another. This location was kept clear during the worst of the storms by the use of the snow melters, together with a foreman and three laborers.

The snow melters were first used on the electric division where the propulsion circuit was available. They have since been developed commercially into 110-volt units so that by proper wiring they can now be applied to any electric circuit which is in common use for lighting and similar purposes. That the device has also been simplified is shown by the drawing below. The wiring connections can now be made through a spark plug and this wire connection is easy to make even though the operator is not skilled in the work.

The heating units are inclosed in a cast-iron box, the over-all dimensions of which are 15 7/8 in. x 3 1/2 in. x 5 in. The box is water-tight and can be allowed to remain in water or melted snow without danger of injury. The melters are designed for use with either alternating or direct current and at 110 volts consume 5.2 amp. This gives a power consumption per unit of something less than 600 watts. Under extreme weather conditions about sixteen of these units are necessary to keep turnouts clear of snow where the switch points are 15 ft. to



DETAILS OF IMPROVED ELECTRIC SNOW MELTERS

16 1/2 ft. long. This results in a power consumption of approximately 9 kw. for each turnout.

The installation of the melters is very simple if the wiring can be brought near the turnout as a trunk line as the heaters are laid loosely in the ballast just under the rail. The cost of operation is the cost of the energy consumed during a storm and depends upon the price paid for such energy. If this price is 2 cents per kilowatt-hour, the cost per hour for keeping the turnout clear would amount to approximately 18 cents. If the cost of the current were 8 cents per kilowatt-hour, the cost of keeping the turnout clear during the storm would amount to approximately 72 cents, etc. The expense continues only during a storm, when it is necessary to keep the snow from accumulating. The current can be turned on and off by a switch placed at some convenient point along the line or near the turnout, and this operation can be accomplished without any difficulty whatever by any employee who is on duty. As soon as the storm is over, the current can be turned off and there is no further expense involved. The illustration above indicates certain changes which have been made in this melter since it was previously described.



THE ELECTRIC SNOW MELTERS ARE INSTALLED AT SWITCH POINTS IN THE BALLAST UNDER THE RAIL

Electrification for England's Suburban Lines

AT THE recent annual meeting of the shareholders of the Great Eastern Railway, Great Britain, the general manager was instructed to prepare, in consultation with other experts, a scheme of electrification for its suburban lines. It was felt that such electrification would be profitable on account of traffic density.

A. R. E. A. Holds Active Convention

Engineering Association Meeting in Chicago Approves Rail Specifications and Discusses Screw Spikes and Substitute Ties

DEFINITE progress in important technical matters was accomplished at the annual convention of the American Railway Engineering Association held in Chicago last week. The convention lasted three days and during each session reports of considerable importance were presented and acted upon. The actual progress made in the adoption of specifications and recommendations indicates that the members present were there for business and that the railroads are entering upon their new era of private operation with a determination which is promising of wonderful accomplishment.

In his annual address, delivered at the opening session, President Earl Stimson dwelt upon the membership drive conducted during the past year. This brought into the association 180 new members, making a total of 270 since the last convention. The total membership is now 1,639. He also discussed co-operation with the American Railroad Association and explained how the A. R. E. A. had acted as the construction and maintenance division of the engineering section of that body. The problems immediately ahead of the association now, he said, are maintenance rather than construction problems.

The new officers elected for the ensuing year were: President, H. R. Safford; vice-president, L. A. Downs; treasurer, G. H. Bremner, and secretary, E. H. Fritch. The directors elected were: Edwin B. Katté, J. M. R. Fairbairn and F. E. Turneure.

Some of the reports which contain material of particular interest to electric railway men are abstracted very briefly in the following paragraphs. Abstracts of the remaining papers of interest will appear later.

REPORTS OF INTEREST TO ELECTRIC RAILWAY MEN

Roadway—The two subjects which received chief consideration in this report were subsidence under embankments and shrinkage of embankments. In the former investigation subsidence of soil under weight of railway fills was found to be a general condition, existing to some extent under all such fills. Not only was grading material found to have subsided but also quantities of cribbing, mattress work and timbers. The subsidence appears to average 1 per cent per foot of height of fill. In the matter of shrinkage the committee found 10 per cent to be the average figure for earth and a swell of 25 per cent for solid rock.

Ballast—The report of this committee included information as to the proper depth of ballast, standardization of ballast tools, instructions for ballasting on an operated line, specifications for stone ballast and the use of reinforced concrete slabs to assist the ballast in distributing the load on soft roadbeds. The larger part of the report was devoted to the last-named subject.

The reinforced concrete slab construction has been tried with success by several roads and includes two distinct types, one having the ordinary ballasted track laid upon a slab, while in the other the rails are carried by wood blocks or stringers laid directly upon the concrete. The practice of, and results obtained on, nine different roads was described in considerable detail. The committee stated that it was satisfied that the use of these types of reinforced concrete construction will solve the

difficulty experienced over "soft spots." The expense was stated to be considerable, but not unduly high, when the traffic is heavy and the cost of upkeep is reduced to very small proportions. A resolution on this subject, submitted by the committee, was adopted without discussion.

Economics of Railway Labor—This committee confined its work to a study of methods for training and educating engineering and maintenance department employees. The gist of the committee's report was that the training and education of railway engineers in the practical and economic features of their work is without method on most railways, with the result that the development of the individual is almost wholly that which comes from his being thrown upon his own resources. Systematic training and organization methods are urged as necessary for the production of an efficient engineering staff. The committee makes definite suggestions for carrying out this work.

Rail—The report of the committee on rail included statistics on rail failures. These were abstracted in the issue of the ELECTRIC RAILWAY JOURNAL of March 6, 1919, page 468. In regard to the intensity of pressure due to wheel loads the committee says that experiments indicate that moderate unit pressures may be expected where rail and wheel conform, but where this is not the case very severe kneading of the steel in the head of the rail may be expected. Specifications for carbon steel rails were submitted and recommendations were made for standardizing the drilling of rails. Both the specifications and the recommendations were adopted after some discussion.

Track—The committee on track presented specifications for (1) steel cut track spikes, (2) steel tie plates, (3) steel screw track spikes, (4) wrought iron tie plates and (5) malleable iron tie plates. Sixty plans were also submitted for turnouts, crossovers, slip switches and double crossovers, with details including such incidentals as tie plates, rail braces, riser plates, etc. Specifications were submitted for the various uses of relayer rail. Specifications 1 and 2 were referred back to the committee for further consideration.

Ties—On the subject of screw spikes this committee made recommendations as to good practice, stating that as an advantage in quick repair work and as beneficial in treating four holes should be bored in each plate-bearing area even though only two spikes were used. The committee believes it difficult accurately to measure the damage done to a tie by a screw spike until some of the modern installations have been longer in service, because as longer tie life is obtained by preserving there is more chance of spike killing being a limiting factor.

In reporting on the best methods for controlling tie renewals the committee believes that either (1) yearly field inspection by section foremen or their immediate superiors or (2) yearly field inspection by special inspectors will bring safe and economical results. On the matter of substitute ties, the committee made an extensive report on the use of some fifteen to twenty substitutes and stated that while a substitute tie, satisfactory for use in high-speed heavy-traffic main tracks has not been fully developed, there are several substitutes which have given service satisfactory enough to warrant further extensive tests. A recommendation for the continuance of the tie specifications formulated by the United States Railroad Administration was adopted.

Wood Preservation—This committee submitted

specifications for treatment with zinc chloride, with creosote oil (full-cell process), with zinc chloride and creosote oil, with creosote oil (empty cell process with final vacuum) and with creosote oil (empty-cell process with initial air and final vacuum). These specifications were adopted. Service test records were presented covering results obtained on the Delaware, Lackawanna & Western Railroad and the committee urged that all roads keep such records.

A special report was made on the treatment of Douglas fir. This described the perforating process which the committee recommended for cross ties. The committee described and gave directions for the use of the iodine-potassium, ferrocyanide-starch color reaction test for determining zinc chloride penetration. A demarcation line following approximately the 100-deg. line of latitude was submitted by the committee indicating where it is regarded as safe to differentiate between the use of zinc chloride and creosote. It was stated that even in the territory west of this line, designated for use with zinc chloride, if creosote is available its use is desirable.

Tie Treating and Handling

American Wood Preservers' Association Discusses These and Allied Subjects, Submitting Figures on Service Tests

IN HIS annual address before the recent convention of the American Wood Preservers' Association President J. B. Card stated that the wood preserving industry is in a better position today than ever before in its history. He emphasized the necessity of giving more attention to the wood-block branch of the industry without delay. This represents a sum amounting to millions of dollars and is "running wild with little attention after deliveries are made." Specifications have been prepared, but very few cities have changed over from the old method of laying the blocks on a sand cushion. President Card stated that if the association does not act soon to correct this fault the end of the wood block paving business is not far off. The association, he said, cannot afford to have failures in any branch of its business.

During the report and discussion on tie service tests, J. H. Waterman presented statistics covering ten years of service with treated ties on the Chicago, Burlington & Quincy Railroad. Of beech ties, treated with creosote, 0.2 per cent had been removed in ten years; of those treated by the Card process (zinc creosote) 2 per cent had been removed; of those treated with zinc chloride 5.3 per cent had been removed; and of untreated ties 96.1 per cent had been removed.

With hard maple ties 0.8 per cent of those treated with creosote and 1 per cent of those treated with the Card process had been removed in ten years, while with this tie untreated 98 per cent had been removed in that time. No creosoted red oak ties had been removed during ten years of service, while 0.6 per cent of those treated by the Card process had been removed, as likewise had 1.9 per cent of those treated with zinc chloride. Of the untreated red oak ties 93.7 per cent had been removed at the end of ten years.

The report of the committee on plant operation covered the subject of mechanical handling of treated material, dividing the devices into seven classes as follows: (1) Stationary stiff-legged derrick with movable boom; (2) cable-ways; (3) stationary crane with electric hoist;

(4) movable electric hoist, gantry type; (5) movable electric hoist, monorail type; (6) locomotive crane; (7) miscellaneous. Tests made with these various mechanical devices resulted as follows:

RESULTS OF TESTS

(1) With this equipment whether hand or power operated ties can be loaded into open top cars in tram-car lots for about 1½ cent each. (2) This device is of only limited usefulness. (3) This equipment capable of lifting a tramload of ties is operated by two laborers. On a test 138 ties per man-hour were handled. (4) Three men are required to operate this hoist. On a test 194 ties per man-hour were handled. (5) The steel framework of this crane is erected longitudinally over a standard-gage track and the crane slings of the gantry crane are replaced by a pair of grapple hooks large enough to handle a tramload of ties at one time. Two men are required to operate this crane. On a test, 276 ties per man-hour were handled. (6) With an eight-wheel M. C. B. truck-type crane, with a boom having an effective working radius of 10 to 35 ft. and a maximum lifting effort of 15 to 20 tons at the minimum radius, two or three men besides the crane man are required. On a test ties were loaded into coal cars at the rate of 360 ties per man-hour. (7) Under this heading the Angier tie loader was considered. This is a device for loading treated ties into closed cars, saving much of the heavy lifting incident to hand labor. It is operated by day laborers or piece workers and effects savings of about ⅓ to ¼ cent per tie on the piece work basis.

OTHER SUBJECTS DISCUSSED

In a paper on "Rapid Deterioration of Sap Pine Ties," the conclusions reached were that pine cross ties should reach the treating plant as quickly as possible and be treated at the proper time. Many plants estimate the age of cross ties when arriving at the plant and add to this age the customary time allotted for the proper seasoning, treating the ties at the expiration of this time. This system should be corrected by the use of the dating hammer as soon as it can be applied.

In a discussion on the effect of preliminary steaming in the treatment of air-seasoned ties, it was stated that tests showed that due to the use of preliminary steam, the net absorption in the treatment of red oak ties was increased 12.6 per cent and the net absorption in the treatment of sap pine ties was increased 52.2 per cent.

The iodine-potassium, ferrocyanide-starch color reaction tests for determining the penetration of zinc chloride in cross ties was described. It was stated to be evident that in treating wood with water-soluble salts some indicator is necessary to determine the penetration of the colorless solution into the wood. The iodine method for determining zinc-chloride penetration is based on the principle that zinc ferrocyanide liberates free iodine, and free iodine in turn gives a dark blue stain with starch solution, thus making the depth of penetration clearly visible.

The fact that duration of employment is a factor in accident reduction was brought out recently in an investigation made by the Ford Motor Company. An inspection of the last twenty-five accident cases occurring before the report showed that of the employees involved, twelve had been in the company's employ less than six months and only one more than a year.

Applying the Automatic Substation*

General Principles Are Stated and Illustrated by Details of a Proposed Installation on an Interurban Line in the East

BY C. A. BUTCHER

Westinghouse Electric & Manufacturing Company,
East Pittsburgh, Pa.

IT IS estimated that there are 15,000 railway and lighting substations in the United States and that 40,000 men are required to operate them. If half of these men can be released for other work they will help to meet the crying need of today for increased production. This can be done by making the stations automatic.

An illustration of what can be saved by automatic control is furnished by the following summary of a report recently made on an Eastern property operating a double-track line between two cities of approximately 200,000 population each and 80 miles apart. Its sched-

ule is essentially one car each way every 40 min. Local cars are operated on a schedule speed of 23 m.p.h. and limited trains at 30 m.p.h. Power is supplied to the line from duplicate three-phase, 25-cycle, 33,000-volt high-tension lines which parallel the right-of-way. The trolley wire is fed at 600 volts from eight substations spaced approximately ten miles apart and which may be switched to either high-tension line. There is a No. 0000 trolley wire over each track, and in addition two 500,000-circ.mil feeders run the entire length of the line. Rails are 70 and 90 lb. per yard, all well bonded. A number of the substations are each equipped with a spare machine and transformers.

as spare apparatus in other stations. This will make a total of seven new buildings and eleven automatic control equipments, together with high-tension switching for each station. Alternate stations will be connected to either transmission line. In addition to manual sectionalizing of both lines at the power plant located near the center of the line, four substations will be equipped with automatic high-tension transfer switches so that in case of trouble on one line the station will immediately and automatically transfer to the other. After the trouble has been cleared and the line returned to normal service the station will immediately and automatically transfer itself back to the line to which it is regularly connected. This transfer switching requires an additional high-tension breaker for each of the four substations, together with necessary control and potential transformers with relays, etc., for testing out the line preliminary to the switching operation. With this scheme of operation but one station will be thrown out of service in case of trouble on either line.

It is planned to make the above changes in four steps and in such a way that the salvage value of copper taken down may be made available for carrying on the work. The accompanying table shows the whole thing in a nutshell.

The labor saving shown in the table is based on two 12-hr. shifts of one man each per substation. An 8-hr. shift will soon be demanded, so that it is safe to assume that the item of labor will soon be increased by a third. Under this condition the net annual saving would be increased to \$23,878, thus making the return, including interest, 50.8 per cent, or a net return of 44.8 per cent. Thus the investment would be returned in approximately two and a quarter years.

At the present time this railroad has an enviable record for a high percentage of trains on time and it is believed that very little improvement in that line is possible. However, by the new arrangement, the average trolley voltage at the car will be increased by 20, thus making possible the above tabulated annual energy saving. In addition the improved trolley voltage will give greater leeway in the schedule because of the increase in running speed thus made possible. With one substation out of service the average voltage drop between stations on either side of the one that is idle will be 109 volts, compared to the present normal average drop of 74.5 volts. However, even with one station out of service, under the new arrangement the average over the entire line will be increased by 13 volts over the present normal average voltage.

In conclusion it may be well to say that automatic operation is not an economy in every proposition and in others it is not to be recommended. But by far the greater number of substations can be operated automatically with economy and improved service.

New substations automatically operated offer an economical and very satisfactory solution of the problem where increased capacity is required.

To insure continuity of operation, many substations contain spare equipment. In some cases new buildings can be erected at intermediate points and the spare apparatus when moved can be made automatic. The whole cost of this might be covered by the salvage value of the feeder copper removed.

Each proposition is a study in itself, so that here, in only a general way, has the attempt been made to point out the advantages and the savings that are to be had.

BALANCE SHEET FOR PROPOSED INSTALLATION OF AUTOMATIC CONTROL ON INTERURBAN LINE

Investment Required:		
Seven new substation buildings.....		\$20,000
Eleven automatic switching equipments (including oil circuit breakers, lightning arresters, automatic high-tension transfer switching and auxiliaries).....	125,400	
Freight.....	575	
Installation of switching equipment and moving old rotaries and transformers.....	16,300	
Total.....	\$162,275	
Replacing 18.52 miles 500,000-circ.mil copper messenger with 7-16 in. galvanized messenger at \$325 per mile.....	\$6,030	
Taking down and reeling 66.58 miles 500,000-circ.mil copper feeder at \$50 per mile.....	3,330	
Extension of transmission line.....	4,350	
Gross investment.....	\$175,985	
Credits:		
85.1 miles 500,000-circ. mil copper feeder at 18 cents per pound (scrap value).....	\$123,000	
Salvage other material.....	6,000	
Total.....	\$129,000	
Net investment.....	\$46,985	
Annual savings:		
Operators' wages eliminated.....	\$22,330	
Power saved.....	2,860	
Coal saved (substation heating).....	200	
Total.....	\$25,390	
Annual charges:		
Inspectors' wages.....	\$4,725	
Fixed charges (except interest) on net investment.....	4,230	
Total.....	\$8,955	
Net annual saving.....	\$16,435	
Return on investment (including 6 per cent interest).....	34.9	
Return on investment (less interest), per cent.....	28.9	
Total investment would therefore be returned in approximately 3½ years.....		

ule is essentially one car each way every 40 min. Local cars are operated on a schedule speed of 23 m.p.h. and limited trains at 30 m.p.h. Power is supplied to the line from duplicate three-phase, 25-cycle, 33,000-volt high-tension lines which parallel the right-of-way. The trolley wire is fed at 600 volts from eight substations spaced approximately ten miles apart and which may be switched to either high-tension line. There is a No. 0000 trolley wire over each track, and in addition two 500,000-circ.mil feeders run the entire length of the line. Rails are 70 and 90 lb. per yard, all well bonded. A number of the substations are each equipped with a spare machine and transformers.

It is proposed to retain five of the present substations and to equip each of them with automatic control and high-tension oil circuit breakers to replace the present stick-type breakers. Four of the present substations are to be moved to new locations and there will be four additional substations made up of equipment now used

*Abstract of paper read at meeting of Wisconsin Electrical Association, Milwaukee, March 25, 1920.

Tie Rod Specifications Assist in Reducing Failures

The Specifications for Tie Rods Used by the Public Service Railway of New Jersey Are Given with Comments on Their Essential Features

BY HOWARD H. GEORGE

Assistant Engineer Public Service Railway, Newark, N. J.

TWO preceding articles on truck material specifications have covered spikes and bolts. The present one deals with specifications for tie rods. Failures of tie rods are not uncommon, especially where they have been installed in old track for the purpose of regaging. The original base of the rail may have been comparatively narrow or it may have been reduced by rusting or other causes so as to leave the rail base in an unstable condition. This condition is generally more noticeable where old and partly decayed ties are allowed to remain in the track, and it is likely to occur more frequently in track constructed with 9-in. than 7-in. rails. Failures also occur more often where rails are located so that the center of the wheel bearing does not coincide with the center of the rail web. In this case there is a tendency for the rail to tilt outward and the load is distributed unequally over the base of the rail to the tie. The unit compressive stresses in the wood fibers are thus much greater along the outer edge of the rail base than along the inner edge. Consequently the rail cuts the tie much more quickly and produces excessive play of the rail, a loosening of the spike fastenings and wide gage of the tracks. The function of the tie rod is to prevent the spreading of the rails and, since this action is more severe on curves, it is very desirable to install both tie rods and either rail braces or brace tie plates on them.

It has been found that a spacing of tie rods on 6-ft. centers has given very satisfactory results in most cases, although some engineers recommend a spacing as low as 5 ft. Tie rods should be located as near the head of the rail as possible in order to be of the greatest value. The vertical play of the rails develops bending stresses in the tie rod in addition to the direct tensile stresses caused by the spreading action. The greatest bending occurs just outside the inside nut, and it is believed that most of the failures of tie rods occur at this point or somewhere between it and the point where the section changes from flat to round, although some breaks have been known to occur between the two nuts. It is believed, however, that in the latter instances failure has been caused by loosening of the nuts sufficiently to permit play between them. It is because of these bending stresses that it is essential that a certain ductility in the material be provided for in the specifications.

Several years ago the Board of Supervising Engineers, Chicago Traction, made some tests on tie rods of various descriptions to determine the actual tensile strength of each.* Three types were tested, the first made by welding a round terminal to a flat bar, the second made by reducing the flat portion and upsetting to make the round terminals, and the third made by

turning over the ends of the flat portion and upsetting to make the round terminals. The second method was followed in the manufacture of the tie rod shown herewith. In every case the rods made by the first two methods failed at the junction of the round and flat sections, each type developing practically the same tensile strength. Those made by the last method failed in the threaded terminal, but developed a higher tensile strength than the specimens made by the first two methods.

Still another method of manufacture which has been tried is by rolling the flat section from 1-in. round bars. This has never been very extensively adopted, probably on account of the difficulties and increased cost of manufacture. Some railway companies have also used tie rods of a circular section throughout. The advantage of course lies in the fact that they can be readily made in any machine shop, since commercial sizes of round bars are readily obtainable from stock and facilities for threading are generally close at hand. However, while these may answer admirably in open track or where the paving is macadam, there are too many objections to their general use to warrant very serious consideration. The principal objection to the round tie rods is that their diameter, which cannot well be made less than $\frac{7}{8}$ in. and will more often be 1 in., is such that entirely too wide a joint is produced in the paving. The round rod also offers practically no resistance to turning as does the flat rod, and this element might tend to cause the nuts to loosen. Another advantage of the flat rod is that it lends itself more easily to installation on account of its greater flexibility, this feature being especially desirable on those roads which have been using tie rods with threads of equal length on the two ends.

Attention is called to a feature of the design of the tie rod reproduced in connection with these specifications which, while not entirely peculiar to our own property, is still far from being in general use throughout the country and is decidedly advantageous. A length of 3 in. has been threaded on one end and one of 6 in. on the other to eliminate the necessity of trackmen bending the rods in order to get them through the holes in the rail webs. As a further aid to the trackmen in making the installation, the specifications provide that all nuts must be fitted to turn by hand. If a nut can be turned all the way back on the threads by hand, the trackman will do this and the rod can then be placed without bending, but if a nut turns hard he is very apt to bend the rod rather than turn the nut back with a wrench.

In determining the length of the threaded section on each end of the rod for any particular property, consideration must be given to the thickness of the webs of all the rail sections in actual use, together with

*See second annual report, page 189.

Steel and Iron Tie Rods

1. Material:

If steel, it shall be made by the open hearth or other approved process. If necessary, heat treatment may be used to secure the desired physical properties.

If of iron, the iron shall be double refined, tough and fibrous and uniform in character and quality throughout. It shall be thoroughly welded in rolling and be free from cracks, flaws, blisters and other surface defects. If necessary, heat treatment may also be used to secure the desired physical properties.

2. Chemical Composition:

The steel in the finished tie rod shall conform to the following chemical analysis:

Carbon — from 0.20 per cent to 0.35 per cent.

Manganese — from 0.60 per cent to 0.90 per cent.

Phosphorus — not more than 0.04 per cent.

Sulphur — not more than 0.07 per cent.

Silicon — from 0.10 per cent to 0.20 per cent.

3. Physical Properties and Tests:

The steel shall conform to the following physical requirements:

(a) Elastic limit not less than 30,000 lb. per square inch.

(b) Elongation not less than 20 per cent in 8 in.

(c) Reduction of area not less than 40 per cent.

(d) Elastic limit shall in no case be less than 50 per cent of the ultimate strength.

(e) The ductility of the steel in the rods shall be determined by the cold bend test, which requires that the material used in the rods shall bend cold through 180 deg. and flatten itself without fracture on the outside of the bent portion. The bend shall be made on the unthreaded portion of a finished rod. It is not necessary that the rod shall bend double in the threaded portion.

The iron shall conform to the following requirements:

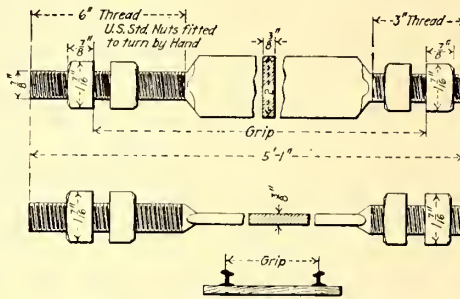
(a) Ultimate strength, not less than 50,000 lb. per square inch.

(b) Elastic limit, not less than 50 per cent of the ultimate strength.

(c) Elongation, not less than 18 per cent in 2 in., with the fracture wholly fibrous.

(d) Reduction of area not less than 25 per cent.

(e) The finished tie rod, when bent back on itself through 180 deg. and hammered down, shall show no signs of fracture on the outside of the bent portion. The bend shall be made on the unthreaded portion of a finished rod.



SECTION	GRIP	SECTION	GRIP
200-9 in. Tram	4'-9 1/2"	406-9 in. Guard	4'-9 3/8"
208- " Guard	4'-9 3/8"	407- " "	4'-9 3/8"
273- " Trilby	4'-10 1/2"	445- " "	4'-10 1/2"
234-7 in. Guard	4'-9 1/2"	443-7 in. "	4'-10 1/2"
212- " "	4'-9 1/2"	338- " "	4'-9 3/8"
243- " Trilby	4'-9 3/8"	434- " Trilby	4'-10 1/2"
206- " T	4'-11 3/8"	357- " "	4'-9 3/8"

TIE ROD FOR 4 FT. 8 1/2-IN. GAGE

In either case, a sufficient number of tests shall be made to satisfy the railway company's inspector that the material meets the specifications in every respect, and he shall have the privilege of selecting the specimens to be tested.

4. Workmanship and Finish:

The form and dimensions of both the steel and iron tie rod shall conform to the drawings submitted by the railway company and forming a part of these specifications, subject to the following permissible variations from the dimensions shown on the drawings.

(a) The length shall not be more than 1/8 in. shorter, nor more than 1/4 in. longer, than that shown in the drawing.

(b) The diameter of the threaded portion or terminal shall not vary more than 1/16 in. from the diameter shown on the drawing.

(c) The length of the threaded portions or terminals of the rod shall not vary more than 1/8 in. from those shown on the drawing. The threaded ends of the rod shall conform to the U. S. standard cut thread.

(d) The outside dimensions of the nuts shall not vary more than 1/32 in. from those shown on the drawing. Each terminal shall be fitted with two hot pressed square nuts, four nuts to each rod. Each nut must be fitted to turn by hand.

(e) The width of the flat portion of the rod shall not vary more than 1/8 in. from that shown on the drawing.

(f) The thickness of the flat portion of the rod shall not vary more than 1/32 in. from that shown on the drawing.

5. Inspection:

When required, the manufacturer shall furnish samples of rods from a preliminary rolling before proceeding with the filling of the order and shall give sufficient notice in advance of the date when they will be ready for inspection.

The railway company's inspector shall have a free entry at all times, while the work on the contract of the purchaser is being performed, to all parts of the manufacturer's works which concern the manufacture of the material ordered.

The inspection shall be made at the mill and the manufacturer shall afford the railway company's inspector, free of cost, all reasonable facilities to satisfy himself that the rods are being furnished in accordance with these specifications. The tests and inspection shall be so conducted as not to interfere unnecessarily with the operation of the works.

Three test specimens shall be selected at random from each 100 of the finished rods by the railway company's inspector. If two of them meet the requirements of the specifications the lot will be accepted, but if two fail the lot will be rejected.

If, after shipment, any rods are found to be defective, due to poor material or bad manufacture, they may be rejected.

6. Marking and Shipping:

When the rods are shipped, they shall have the nuts applied for at least the length of the nut and shall be properly oiled to prevent rusting. They shall be securely wired together in bundles of five rods each, and each bundle must be plainly marked as to material, name of manufacturer, length of rods, and name and shipping address of consignee.

the maximum and minimum amounts by which the gage lines are offset from the webs, so as to permit the determination of the maximum and minimum grip that must be provided for. The total length of the rod and the length of the longest thread which will be required to permit installation of the rod when one nut is threaded back as far as it will go, without bending the rod, can then be figured. On some properties like our own, where it is necessary to operate over more than one gage of track, rods of suitable lengths must be provided for the several gages.

It was shown in preceding articles that the cost of inspecting track spikes and bolts is very low and the same is true in the case of tie rods. Inspection can be made at present at the rate of about \$1.60 per net ton. Since the average weight of the tie rod shown is approximately 13.5 lb. the cost of inspection amounts to about 1 cent each. As to the cost of the tie rods themselves, this of course will vary considerably, but will probably be somewhere between 65 and 80 cents each at present, so that the percentage increase in unit cost is so small due to inspection as to be practically negligible.

Co-operation Between Traction Company and Farmer

Express Department of Connecticut Company Has Practical Plan for Cutting the "H.C.L."

BY V. S. CURTIS

General Traffic Agent the Connecticut Company,
New Haven, Conn.

DURING the week of Feb. 9 to 14 the Connecticut Company's express department maintained an exhibit in the agricultural and manufacturers' display, conducted in the State armory in Hartford, for the purpose of showing the utility of the company's service in transporting produce from the farms directly to consumers in the cities.

Some three years ago an effort was made to introduce the "home hamper" idea which had been successfully operated by the Long Island Railroad, but the plan was interrupted by the war. Recently the project was taken up again and by the aid of the farm bureau and the city market experts the active co-operation of a group



EXHIBIT OF CONNECTICUT COMPANY AT AGRICULTURAL AND MANUFACTURERS' DISPLAY

of progressive farmers was enlisted. The State Grange, through its master, has taken an interest in the proposition and the officials of the State Agricultural College at Storrs have encouraged the trolley management.

The State farmers produce only about 16 per cent of the farm products consumed in the State, and they are keenly alive to the business opportunity presented by the plan of the Connecticut Company. A reference to the straight-line map seen in the exhibit will show the territory served by the express department.* At the principal cities wagon service is maintained. The company is prepared to secure lists of persons of assured credit in the cities and by correspondence or otherwise introduces them to reliable farmers vouched for by the Grange Farm Bureau or market reporting service. The consumers will be advised of the kind of products of the farm that each farmer can supply and orders will be placed with the farmers. Crates or hampers have been planned which hold six 2-qt. baskets each. These will be packed by the farmer in a careful and attractive manner and taken by him to the point on the electric line nearest to his farm. They will be picked up by the crews of the express cars and delivery will be effected by the regular

*Details of the work of this department were given in an article in the issue of this paper for Nov. 3, 1917, page 802.

express wagons of the company, the consignee paying the transportation charges by check.

At the exhibit two hampers prepared by David A. Clark of Milford, for customers in New Haven, were shown. One hamper contained a home-cured and smoked ham, a fine chicken, potatoes, carrots and turnips. Its value was not stated by the shipper but it was appraised at about \$9 by the city market expert and on consultation with the shipper it was found that the expert had exceeded Mr. Clark's estimate by about twenty cents. This fact is mentioned because it is proposed to follow closely the fluctuations of market prices, and differences of opinion as to fairness of prices that may arise between shippers and consignees will be arbitrated by the city market experts. These gentlemen and the Farm Bureau and Grange experts will also pass on the quality of goods sent, and any tendency to unload low-grade goods or defective products will be checked. The plan generally will result in the consumer getting high-quality goods direct from the farm at a low retail price and the farmer will receive something better than a high wholesale price. The consumer will be sure that the corn from the farm has not been aged sufficiently to turn to starch nor handled and re-handled by team or motor-truck from farm to city market, to huckster, to retailer and thence to him. The tomatoes and peas will have no chance of being bruised and heated. The lettuce will be fresh and crisp, not wilted and crushed.

The slight publicity accorded the exhibit by the daily press has resulted in many inquiries from hopeful consumers, and the problem confronting the sponsors of the scheme is to find the farmers. It may be necessary to plan community or neighborhood effort in rotating crops, and in this the granges locally and the country Farm Bureaus will assist.

Douglas Fir for Ties

ACCORDING to a statement in the *Railway Maintenance Engineer* a test of Douglas fir cross ties installed in the main line of the Great Western Railway of England resulted in only twenty-three out of 616 ties originally laid being removed after seventeen and a half years of service under heavy traffic.

The original ties upon which records were kept consisted of high-grade Douglas fir timber, sawn to size, 10 in. x 5 in. x 9 ft. The ties were comparatively dry when received, and were kept in stock only nine weeks to finish the seasoning process before they were subjected to the preservative process. The method of preserving consisted of impregnating the ties with a creosote oil, the total amount of absorption averaging about 0.8 gal. per cubic foot of timber treated.

The ties were placed in service May 1, 1898, in main-line track where the maximum grade was 0.06 per cent, descending on a 4 deg. curve. The subgrade at this point was an embankment composed of marl and gravel, and the ballast used was crushed rock. The track construction consisted of standard 45-ft. rails, of bullhead cross-section and weighing 92 lb. per yard, supported by chairs. Upon inspection all ties were found in serviceable condition until October, 1915, when twenty-three were removed on account of decay.

The National Safety Council has, through its educational committee, just secured the co-operation of the national organization of Boy Scouts.

Letters to the Editors

Anent Standard Track Spirals

SOUTH COVINGTON & CINCINNATI STREET RAILWAY
COMPANY, INC.

COVINGTON, KY., Feb. 23, 1920.

To the Editors:

I am pleased to see that the sub-committee on standard track spirals of the committee on way matters has gathered and submitted data. It will be of great value to both the manufacturer and the street railway to have standard spirals. However, any system of spirals that may be adopted must, to secure general use, be as good as any now employed and should be flexible enough to meet any condition that may arise in ordinary track work.

The method of numbering and developing the suggested spirals is excellent, but there is some criticism of the particular spirals selected. Compare the proposed spiral No. 5.3 with the Lorain spiral No. 2-A. The initial radius of Lorain spiral No. 2-A is 560 ft. while that of the proposed standard spiral No. 5.3 is 304 ft. Spiral No. 2-A is, however, shorter and I believe is better suited to street railway work, because of the shorter arc length and smaller initial angle.

I suggest that the initial angle and angular change be made twenty minutes rather than 1 deg. This would result in shorter arc lengths and a better and more flexible spiral. Numbering as in the proposed standards, a spiral number denoting the length of arc of that spiral in feet and tenths, I would suggest spirals No. 1, 2, 2.5, 3, 4, 5, 7.5 and 10. It seems to me that the standard spirals proposed by the committee are not correctly proportioned to the radii of the curves with which they are to be compounded.

No spirals should be adopted by the association as standard without the widest possible discussion.

W. T. ROSSELL,

Superintendent of Track and Buildings.

[NOTE.—Upon receipt of the communication from Mr. Rossell the editors referred it to E. M. T. Ryder of the committee on way matters in order that a reply to the suggestions might appear in the same issue with the original communication. Mr. Ryder's reply is printed below.—EDITORS.]

THIRD AVENUE RAILWAY SYSTEM

NEW YORK, N. Y., March 10, 1920.

To the Editors:

Such comment on standard track spirals as is made by W. T. Rossell, superintendent of track and buildings, South Covington & Cincinnati Street Railway, in his letter of Feb. 23 to the JOURNAL is of interest in bringing out particular points in regard to the standards proposed by the committee on way matters of the American Electric Railway Engineering Association.

Mr. Rossell brings up the question of arc length and length of initial radius, and compares proposed spiral 5.3 with the Lorain spiral 2-A, calling attention to the fact that the "initial radius of Lorain spiral 2-A is 560 ft. while that of the proposed standard spiral 5.3 is 304 ft." He evidently regards the longer initial radius

as of advantage and also suggests the use of shorter arc lengths with correspondingly smaller initial angles.

Theoretically the length of initial radius of the spiral can be increased any desired extent by shortening the arc lengths. For practical purposes, however, with any spiral of the Searles type, which has a uniformly increasing rate of curvature, the one really important function is the total length of the spiral. This total length may be obtained in a spiral of four chords or eight chords or sixteen chords, with no particular difference as regards the riding qualities of the curve provided the chords are not so long as to give an angular change abrupt enough to give a shock in the same way, although in less degree, as is experienced in changing abruptly from a tangent to a circular curve. The difference between Searles or similar spirals of the same total length and with various arc lengths is astonishingly small.

I happen to have before me a blueprint of a drawing prepared many years ago by Wm. Wharton Jr. & Company, Inc., comparing a spiral of eight arcs with one of four arcs, holding the same extreme tangent points and total angle. The differences between the two sets of ordinates from the tangent to the compounding points of the curves, the figures being decimals of a foot, are: At the first compounding point, — 0.0061, second — 0.0067, third + 0.0078, fourth + 0.0024, fifth — 0.0050, sixth — 0.0010, seventh + 0.0054.

There is on the other hand a practical objection to having very short arc lengths in that it increases the cost of manufacture both on account of increased expense in the engineering department and in the shop. In the spirals proposed by the way committee the length of arc for those spirals which will be in most common use does not differ greatly from the gage of the track and the total variation of those spirals which it is proposed to use for branch-offs is from an arc length of 4 ft. to an arc length of 8 ft. 6 in.

Mr. Rossell's comment that "no spirals should be adopted by the association as standard without the widest possible discussion" is very sound and it is to be hoped that other engineers will follow his example and give the way committee the benefit of their ideas on this subject.

E. M. T. RYDER,

Engineer, Maintenance of Way.

Beam Type Track Weak in Tie Between Rails and Short on Bearing Area

THE KANSAS CITY RAILWAYS

KANSAS CITY, Mo., March 23, 1920.

To the Editors:

The type of construction which provides for the laying of concrete paving in one mass with the concrete that is used in the track foundation is undoubtedly good, but in the type that is described in the article on page 609 of ELECTRIC RAILWAY JOURNAL, issue of March 20, 1920, I see some structural weaknesses that are bound sooner or later to cause trouble. It is stated that this track and pavement have given satisfactory service over a term of about four years. I do not question but that such results may be obtained on track so constructed under light traffic, under favorable soil conditions and in mild climate, but one should not be led to use a construction of this type under any and all conditions, particularly in wet clay soils and in climate where the frost penetrates far below the surface.

In the construction described the heavily reinforced beam is undoubtedly of sufficient strength to give the effect of very deep rail and longitudinally the construction is sound; but the two rails are only bound together by a light tie bar and a 5-in. concrete pavement. This is not a sufficient bond between the two rails and the settlement of one beam more than the other will cause longitudinal cracks in the concrete. Failure of the pavement inside or outside of the rails will result in change in gage that will be aggravated from day to day under traffic and it will result eventually in corrugation and the general breaking up of the structure. To guard against matters of this kind it is essential that the rails be bound together at some point below their base by means of ties of steel or wood or a mass of concrete, so that with any pressure from frost or any settlement of the track the two rails are bound together and move as one. The fact that one rail can settle independently of the other has been the principal factor in the failure of the beam type of construction.

I am not advised of the unit cost of this construction, which is a matter of vital importance, but I am of the opinion from the comparison of the amount of material required and the estimated amount of labor, as based on our local conditions, that this track would cost 25 per cent more than track with a similar rail section with white oak or steel ties constructed upon a solid slab of concrete. I judge from the cross section of the track described that there would be a great deal of difficulty in the placing and maintaining of the rails to the proper surface and line while the work of concreting is in progress and that the handling and placing of so many separate parts would result in excessive labor costs.

It is also pointed out that only the area of the bottom of the beam on the soil can be depended on to carry the load to the subgrade, an area of 2 sq.ft. per lineal foot of track; whereas with ties on ballast or concrete the area in practically every other type of construction is 9 sq.ft. per foot of track.

The theory of the beam type of construction is unsound and the use of this form of construction has almost invariably resulted in failure and will only give satisfactory results temporarily and under favorable conditions.

A. E. HARVEY,
Chief Engineer.

Illinois Committee Appointments

At a joint meeting of the executive committees of the Illinois State Electric Association and Illinois Electric Railways Association and the board of directors of the Illinois Gas Association two joint committees were appointed, one to be known as the Joint Public Policy Committee, composed as follows: For the electric railways, E. C. Faber, chairman; Britton I. Budd and J. R. Blackhall; for the electric lighting companies, Frank J. Baker, R. S. Wallace and H. E. Chubbuck; for the gas companies, W. M. Willett, A. D. Mackie, Bernard J. Mullaney and R. V. Prather. The second committee will be known as the Relations to Educational Institutions Committee and will be composed as follows: R. V. Prather, chairman; for the electric railways, H. E. Chubbuck and E. C. Faber; for the electric lighting companies, B. J. Denman and Frank J. Baker; for the gas companies, H. H. Clark and A. D. Mackie. This is another progressive step by these associations in line with the work of the committee on public utility information.

Association News

Mr. Henry Before I. C. C.

Argues That Electric Railways Should Not Be Included in Properties Covered by Transportation Act

AN INTERPRETATION of the transportation act as it applies to interurban electric railways was asked of the Interstate Commerce Commission on March 22 by Charles L. Henry, chairman of the committee on national relations of the American Electric Railway Association. He explained that there is uncertainty among the operators of interurban lines as to the application that will be made of the clause in the bill which excludes from the operation of the law such interurban electric railways as are not "engaged in the general transportation of freight." Mr. Henry urged that the commission interpret the clause so as to exclude at least all interurban lines whose freight receipts do not exceed one-half of their entire revenue.

Mr. Henry told the commission that it would be very unfair to include interurban lines under the act, thereby grouping them with the steam railroads and subjecting them to the provisions of the law covering valuation and the fixing of rates so as to yield 5½ per cent on the capital invested. While such a return might be fair to the well-established steam roads, it would in no way be an adequate return to the interurban lines, since the steam roads are in a position to get money much cheaper than are the interurban companies. It would be necessary to increase the percentage to seven or eight in order to be fair with the interurban lines, Mr. Henry declared. If the commission should interpret the act so as to bring any considerable number of the interurban lines under the transportation act, Mr. Henry declared that it would serve to check the development of the industry.

No one of the commissioners asked questions during Mr. Henry's presentation, and as a result there was no indication as to what ideas the commissioners may have in the matter. Mr. Henry expressed the personal opinion that it would be so economically wrong and so manifestly unnatural to bring the interurban lines under the purview of the transportation statute that he feels certain that no effort will be made to claim jurisdiction over any interurban lines excepting those which receive more than one-half of revenue from the transportation of freight.

Mr. Henry has recently taken over the management of the Washington office of the American Electric Railway Association and is making plans to render a complete Washington service to the member companies of the organization. An outline of his plans was given in the issues of this paper for March 6, page 483, and March 13, page 546.

On March 19 a meeting of the committee on national relations of the association was held at Mr. Henry's office in Washington. In addition to Mr. Henry those in attendance were: A. W. Brady, Anderson, Ind.; L. S. Storrs, New Haven; C. L. S. Tingley, Philadelphia; Frederick S. Pratt, Boston; C. E. Thompson, Chicago, and E. B. Burritt, secretary of the association.

Equipment Committee Meets

A MEETING of the Engineering Association committee on equipment was held in New York City on March 18 and 19. Those in attendance were: vice-chairman H. A. Johnson, Metropolitan West Side Elevated Railway, Chicago; W. S. Adams, the J. G. Brill Company; H. A. Benedict, Public Service Railway; E. D. Priest, General Electric Company; F. W. Sargent, American Brake Shoe & Foundry Company; C. W. Squier, *ELECTRIC RAILWAY JOURNAL*, and J. W. Welsh, special engineer of the association.

The large amount of material which was presented by the various subcommittees for consideration showed the activity and interest that was being manifest in the work. A form of questionnaire for obtaining information on the life of wearing parts was approved, and this will be sent to various railways soon.

An additional subject, that of obtaining information of value in fighting snow and safeguarding equipment under extreme weather conditions, was assigned.

New England Street Railway Club

Noted Speakers Address Five Hundred Members and Guests at Twentieth Annual Banquet

ABOUT 500 members and guests attended the annual banquet of the New England Street Railway Club held at the Copley Plaza Hotel, Boston, on the evening of March 25. After the dinner I. A. May, comptroller the Connecticut Company, the newly elected president, expressed his appreciation of the honor of his election and then introduced as toastmaster for the evening Hon. Samuel L. Powers, one of the State trustees of the Boston Elevated Railway. Mr. Powers acted most acceptably in introducing the four scheduled speakers. Hon. Calvin Coolidge, Governor of Massachusetts, made the first address and expressed a plea for the collection, not the dissipation, of capital. If its production is secured its distribution follows. He also urged the building up and strengthening of the transportation utilities as of benefit to the public.

Mayor Andrew J. Peters of Boston, who followed Governor Coolidge, described the railways as an essential part of the public life and advocated a close co-operation between them and the public.

Governor William C. Sproul of Pennsylvania, the third speaker, discussed principally the necessity of all citizens taking an active interest in political affairs and insisting upon the administration of national and state undertakings on a business basis. He also stressed the importance of good transportation to the nation's prosperity.

Matthew C. Brush, now president American International Shipbuilding Company, the final speaker, congratulated the club that speakers of such prominence had addressed them and expressed such opinions on the necessity of fair treatment of the railways. He urged team work and support of both the club and the American Association. Railway men should not be required to apologize for asking for the things they need to give good transportation service. They should also take an active interest in the selection of authorities who will give a business administration. Mr. Brush then gave an extended account of the work of the American International Shipbuilding Corporation at Hog Island.

The entertainment of the evening concluded with an

exhibition of moving pictures of the Hog Island ship yards, with explanations by Mr. Brush.

At the annual election in the afternoon the following officers were chosen: President, I. A. May, comptroller the Connecticut Company, New Haven, Conn.; Vice-President, John Lindall, superintendent of rolling stock and shops, Boston Elevated Railway; Joseph S. Goodwin, manager Bridgeport division, the Connecticut Company; T. H. Kendrigan, superintendent and claim agent, Manchester & Derry Street Railway, Manchester, N. H.; S. S. Nicholson, vice-president Rutland Railway, Light & Power Company; Alfred Sweeney, general manager, the Androscoggin & Kennebec Railway, Lewiston, Maine, and Walter C. Slade, superintendent of power and lines, the Rhode Island Company, Providence; secretary, John W. Belling, Boston, Mass.; treasurer, Fred F. Stockwell, Cambridge, Mass.

Comparison of Costs of Heating Rivets

THE Berwick Electric Rivet Heater Company has given out some costs for heating rivets by various means which were compiled from tests made in its own plant. The company states that from 12 to 14 gal. of fuel oil is required to heat 100 lb. of rivets. At a cost of



HEATING RIVETS IN AN ELECTRIC HEATER

fuel oil of 6 cents a gallon delivered in the plant tanks, the cost of heating is from 72 cents to 84 cents per 100 lb. of rivets. To this must be added the maintenance cost of three furnaces, re-bricking, etc., amounting to 2 cents per 100 lb. Where coke is used for fuel, it requires approximately 135 lb. of coke to heat 100 lb. of rivets. With coke at \$7.80 per ton delivered, the fuel cost is 45 cents per 100 lb. of rivets, to which must be added 25 cents for carrying the coke to the furnace and removing the

ashes, plus also a 2-cent maintenance charge. The total heating cost is 72 cents per 100 lb. of heated rivets. The cost of heating rivets with coal is approximately the same as that with coke.

It requires approximately 432 cu.ft. of gas to heat 100 lb. of rivets, so that with gas at 70 cents per 1,000 cu.ft. plus a maintenance charge of 4 cents there is a total of 34 cents per 100 lb. of heated rivets.

For heating rivets by electricity approximately 20 kw.-hr. is required to heat 100 lb. With electrical energy at 1½ cents per kilowatt-hour the cost is 25 cents per 100 lb. of heated rivets. The maintenance cost of an electric heater, as judged by the experience of the company over a period of five years, is very small, consisting only of wear on the copper electrodes and contacts.

The accompanying illustration shows the type of electric rivet heater which has been placed on the market by this company. The heaters are constructed with several types of electrodes to meet various conditions.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION

PERSONAL MENTION

Labor Not a Commodity

Report of Industrial Conference Reflects Increased Respect in Which Labor is Now Held

The President's Industrial Conference has reported. It proposed to the President and to Congress a national system for dealing with industrial disputes based on three cardinal principles which were recognized by the conference in forming its conclusions. These are:

WORKERS HAVE RIGHT TO STRIKE

1. That labor is not a commodity, but a human relation which must be adequately organized.
2. That workers have a right to strike. In recognition of this, the conference refused to recommend legal prohibition of strikes.
3. That adjustment of the grievances of any group must be made in co-operation with the other party to the dispute. This principle is recognized in all the machinery recommended by the conference.

The report is a document of 20,000 words. It goes into every phase of labor relations and conditions of employment. Its most significant recommendations are for:

1. Establishment of employee representation in shops or plants.
2. Acceptance of the principle of collective bargaining.
3. Creation of machinery for settlement of all industrial disputes.
4. A new system of food marketing and development of co-operative buying and selling of food products to stop speculation and profiteering.
5. Fixing of a minimum wage to give reasonable living conditions and protect community and individual from the ill effects of lack of competence.
6. Extension of Government machinery to investigate living costs.
7. Establishment of "gain-sharing" as opposed to profit-sharing.
8. Promotion of the insurance principle and for converting Liberty loan savings into some form of annuities.
9. Fixing hours of labor on a weekly basis, with preferably forty-eight hours a week and a Saturday half holiday.
10. Final determination of hours of labor on the basis of studies of fatigue and the effect of work in a particular calling on the one hand and studies of hours that will give maximum production on the other.
11. Prevention of child labor and enforced schooling and physical upbuilding.
12. Special safeguards for women in industry as to hours and conditions of work, and equal pay for equal skill and production.
13. Better housing.
14. Prevention of labor turnover.
15. Relief from present economic conditions for Government workers and school teachers.

PROFIT SHARING NO PANACEA

The report opposes:

1. Profit sharing as a panacea for labor ills.
2. Restriction of production by labor.
3. Strike by United States employees or public servants, such as police and firemen.
4. Affiliation of policemen and firemen with organizations that use the strike weapon.
5. Encouragement of overtime work.

As applied to public utilities other than railroads under the Esch-Cummins act, the report provides that a regional board shall have only one panel member on each side, while two

members shall be appointed by the Government authority or commission authorized to regulate the utility in which the dispute arises. The unanimous findings of such a board are morally binding upon both parties to the dispute unless disaffirmed in writing within specified periods. Appeals to the national board in utilities cases are to be decided by majority vote (including one of the public members). Mr. Gregory and Mr. Stuart, of the conference, were in favor of making strikes in essential industries unlawful, but the majority were unwilling to go so far.

10 Per Cent Wage Increase in Pittsburgh

All employees of the Pittsburgh (Pa.) Railways working on an hourly basis are to get a wage increase of 10 per cent, effective on April 1. Charles A. Fagan, S. L. Tone and W. D. George, the receivers, made this announcement on March 18. About 7,000 men, chiefly manual workers, are affected. The increase will cost the railway about \$1,000,000 additional annually.

Patrick J. McGrath, secretary of the union, declared that the receivers' 10 per cent increase will have no effect upon the demands about to be made by the motormen and conductors for more wages. These demands, he declared, will be pushed. He said:

We received notice of the 10 per cent increase and it was read at the meetings of the men last night and to-day. No action was taken on it, of course. We were informed the receivers intended to put the increase into effect and we have no objections to their plans. Our agreement with the receivers expires on April 30. Under that agreement each side must give notice of changes desired a month before the expiration of the agreement. We will give such notice about April 1, unless the receivers ask an earlier meeting. We will not announce publicly what we are going to ask for until we have first submitted it to the receivers.

Changes in certain working conditions also will be demanded by the men. The 10 per cent wage increase will give them a minimum pay of 58.3 cents an hour and a maximum of 62.7, against 53 and 57 as at present. It is understood that the men will demand 15 per cent more.

Last April, when the receivers failed to meet the demands of the men, a strike resulted, paralyzing the entire electric transportation system of Greater Pittsburgh for three days and causing a loss to mercantile and other interests of upward of \$10,000,000.

Elsewhere in this issue extended reference is made to the report of the Public Service Commission with respect to fares in Pittsburgh and to the value of the property as found by the commission.

Will Discontinue Park

Company at Fort Wayne Finds Automobile Keen Competitor and Operating Cost Prohibitive

Robison Park, for a quarter of a century the recreation point for citizens of Fort Wayne, Ind., is to be closed. This has just been announced by the Indiana Public Service Corporation, owner of the property. Last year was the biggest the park has ever had in point of attendance and receipts.

Robert M. Feustel, president of the corporation, in announcing the intention to sell the buildings and ground and junk the 7-mile double-track line to the park, declared that the park had never paid and that it is out of the question for the corporation to continue the operation of the resort. Mr. Feustel said:

The railway has had no real choice in the matter. The company's open cars are no longer in condition to operate. The company feels that real protection to its patrons is the first consideration and so does not care to risk the lives of patrons on the old open cars. Regarding the earnings side of the matter the story at Fort Wayne has been the same as with all other electric railway parks over the country where a long haul was made over a route which was not used all the year round in regular service. These parks have never paid. Last year the total receipts from the car operation were \$28,498, which was about 18 cents per car mile of operation. This cost barely paid the wages of trainmen and actual power costs. It left nothing for car or track maintenance and other miscellaneous expenses.

SOME TRAFFIC FIGURES

During the past six years the earnings of the park line together with number of passengers carried have been as follows:

CAR MILES OPERATED—1914, 137,546; 1915, 111,359; 1916, 139,134; 1917, 120,044; 1918, 135,523; 1919, 153,788.

PASSENGERS CARRIED ON CARS—1914, 178,472; 1915, 120,391; 1916, 170,909; 1917, 167,284; 1918, 162,322; 1919, 197,232; Total, 996,610; average per year, 166,102.

TOTAL EARNINGS—1914, \$24,765; 1915, \$16,644; 1916, \$22,158; 1917, \$22,461; 1918, \$24,910; 1919, \$28,498.

TO PARK IN AUTOMOBILES—1914, 20,861; 1915, 22,133; 1916, 34,187; 1917, 46,796; 1918, 44,218; 1919, 57,491.

TOTAL AT PARK—1914, 199,330; 1915, 142,524; 1916, 205,096; 1917, 214,080; 1918, 206,540; 1919, 254,723. Grand total, 1,222,296; average per year, 203,716.

It is estimated that the replacement value of the thirty or more buildings at the park, the double-track line, etc., is close to \$500,000.

Fort Wayne will not be without an amusement park during the coming summer, as George F. Trier, who conducted the dancing pavilion at Robison Park, has organized a \$200,000 company to erect and operate an amusement park just beyond Foster Park at the edge of the southern city limits and within a short walking distance of the Broadway line of the Indiana Public Service Corporation.

Mr. Doherty Ready to Sell to City

Will Accept \$11,000,000 for Railway Property at Toledo, With Discount for All Cash

The commission appointed by Federal Judge Killits to draw up an ordinance providing for the municipal ownership of the railway system of Toledo, Ohio, has been busy making preliminary inquiries. The members asked Henry L. Doherty what his price would be on the lines, asked for legal aid from the city law director and Mayor Schreiber, and solicited the co-operation of a sub-committee of the Council.

OFFER TO SELL WAS TELEGRAPHED

Mr. Doherty wired from New York that his engineers determined the value of the property at \$16,000,000, but that he would take \$11,000,000, 20 per cent cash and the remainder in first mortgage bonds. He also indicated that he might discount this sum for a total cash purchase price. The city's valuation figures were \$7,111,000. Mr. Doherty's answer to Mayor Schreiber's question directed by the commission was as follows:

I have discussed with my associates a sale price for the railway properties. We feel that under the federal decisions we are entitled to present value of the inventory property. This, according to our engineers, would be approximately \$16,000,000, which we can substantiate by competent and reputable experts in this line. According to the Goodwillie commission the property showed a value in excess of \$12,000,000.

Your telegram does not say in just what manner you purpose to make payment, but as you had previously expressed the desire not to use the entire debt power of the city I assume you will want to pay about 20 per cent in cash and the balance in bonds.

To secure a settlement of the matter we would be willing to take \$11,000,000, but would, of course, prefer to have cash and would discount the above if the city should desire to make entire payment.

READY TO ACCEPT \$2,200,000 CASH

Mr. Doherty has not yet given an answer to the Mayor on what his discounted price would be.

The appraisal of the property by Service Director Goodwillie, Prof. Riggs of Ann Arbor and Frederick W. Ballard of Cleveland, which was accepted by the service-at-cost commission and which some of the municipal ownership commissioners believe is too high, can be successfully defended in court, the experts declare.

Mr. Doherty's price of \$11,000,000 would indicate that he regards the price of \$7,111,000 as below what might be secured on the bonds in the open market. He proposes to accept a cash payment of \$2,200,000 and first mortgage bonds for the balance of \$8,800,000. These bonds then would have the railway property as their only security.

The commissioners have proposed condemnation through court proceedings since the receipt of Mr. Doherty's price. The Mayor and legal experts are preparing the plan of operation for the commissioners to carry out. They have made little progress thus far on account of the fact that there is no precedent in Ohio for the condemnation of a railway property and very little precedent

anywhere for condemnation of public utilities.

The commissioners have indicated that they might not wish to recommend the purchase of the entire system, but that some of the lines ought to be abandoned and others re-routed, supplemented, possibly, by a bus system.

"If the city was dealing with a man for any other property and he made a reply like Mr. Doherty has sent, I am sure the city would cease to negotiate and proceed to condemn," declared Henry W. Ashley, chairman of the municipal ownership commission.

The city has been asked to look into

the matter of "damages" to which the company would be entitled if not all the lines were bought by the city.

Chairman Ashley declared in a meeting of the commission that he had secured legal advice that the company would have no claim to damages if the city took only parts of the present system.

While the municipal ownership commission is battling to draft an ordinance to submit to the people at the same time that the cost-of-service measure is up for ratification, the cost-of-service commission is waiting the written objections and suggestions for improvement of their document from Henry L. Doherty and the company.

It is thought that both measures may be ready to submit to the people at one election about June 15.

The Worst Is Over

Stone & Webster Look for Continued Betterment of Conditions Affecting the Public Utilities

Stone & Webster have prepared an analysis of conditions in the public utility field which sounds one of the first optimistic notes heard since the beginning of the war. They summarize general conditions as follows:

1. Electric light, power and gas companies have demonstrated an ability to readjust rates and operating conditions to offset increases in operating expenses and continue a satisfactory return on the investment.

2. Street railways are gradually but more slowly readjusting rates and methods of operation, and promise ultimately as satisfactory results as those which have been obtained by electric light and power and gas companies.

3. Present indications all point to the conclusion that operating costs in 1919 reached approximately the highest point to which they will be carried by war conditions.

4. Improved methods of operation are introducing economies which will at least partially offset increases in costs of labor and materials.

5. There is a constantly increasing demand for public utility service of all kinds, including the service of street railways. This is reflected by constantly increasing gross earnings.

6. Improved operating conditions existing or in prospect have not yet been reflected in security values.

RECENT PUBLIC UTILITY FINANCING

The engineers state that more money was raised for public utilities last year than in the six years since 1913, and present the following table to show what proportion of the financing was done through the medium of bonds, notes and stocks in that period:

	Bonds	Notes	Stocks
1914	\$196,000,000	\$107,000,000	\$43,500,000
1915	149,000,000	137,000,000	38,000,000
1916	383,000	114,000,000	43,000,000
1917	148,498,200	145,645,600	69,069,470
1918	167,395,000	261,563,900	22,044,750
1919	272,335,300	252,408,500	66,108,890

The analysis also says that figures showing what proportion of this financing was for purposes of refunding and what for new construction were not available, but that "it is certain that the demand for increased service and consequent additions to plant is constant and of large volume."

With regard to the street railways Stone & Webster say in part:

Street railways obviously have suffered more than other public utilities from conditions brought about by the war. In most cases the problems involved do not, however, differ fundamentally from those of other utilities; they are simply more difficult and require longer to work out because of the long established precedent of the 5-cent fare.

THE STREET RAILWAYS

The exhaustive investigation and study given to the street railway industry during the past two years is making it constantly clearer that the question involved in most cases is solely the need for an equitable readjustment in the rate of fare to offset the decreased value and purchasing power of the nickel. In most cases the railway is not asking an increase in fare in terms of commodities. Its needs will be fully met by receipt of a fare having a purchasing power in other commodities equal to that formerly possessed by the nickel.

When the nominal rate of fare is increased, there is usually some reduction in volume of riding. This is due in part to a feeling of misunderstanding toward the railway and in part to a natural but mistaken feeling on the part of the rider that the car fare in relation to his income has increased and that he cannot afford to pay this increase; that this reduction in riding is temporary and will gradually disappear as the situation is better understood is already evident. In cities where an increase in fare has been in effect for a reasonable period, the riding per capita is gradually returning to its normal pre-war basis.

As will be shown in figures later in this statement, much progress already has been made in bringing about a flexible and adequate fare system, and when the readjustment of fares now in progress is completed we may expect financial results as satisfactory as those which have already been brought about in other branches of the public utility industry. As this takes place street railway securities should gradually increase in value and again be recognized as one of the most desirable forms of investment.

RAILWAY SERVICE ESSENTIAL

A complete and unified system of transportation is an essential of urban life without which the business and other activities of the communities must cease. That such a system, to give adequate and satisfactory service, must depend primarily upon the use of tracks in public streets, on elevated structures or in subways, we firmly believe. On this obvious need for service and on the material progress which has already been made toward readjustment of the fare system we base our optimism for the future of this business.

During the year a most complete investigation of the street railway industry has been made by the Federal Electric Railways Commission appointed by President Wilson. The report of this commission has not yet been made, but its broad activities in accumulating information and in holding hearings has been very helpful

in securing recognition of the need for a general fare readjustment to enable the industry adequately to serve the public.

PROGRESS IN FARE INCREASES

We give below statistics indicating growth in recent months in the number of cities in the United States in which higher railway fares have become effective:

	May 1 1919	Jan. 1 1920
No. of cities in U. S. paying 10-cent fare	29	59
No. of cities in U. S. paying 9-cent fare	0	1
No. of cities in U. S. paying 8-cent fare	19	21
No. of cities in U. S. paying 7-cent fare	100	147
No. of cities in U. S. paying 6-cent fare	164	185
	312	413

These figures mean that a population amounting to more than 33,000,000 is paying higher fares. The total population served by the street railways of the country, including the interurbans, is approximately 45,000,000. In other words, about 70 per cent of the people in the United States served by such railways are now paying higher fares.

STREET-CAR RIDING CONSTANTLY INCREASING

There is an impression on the part of some people that the street railway business has been seriously affected by the automobile. Although this may be true in the case of some street railway mileage serving scattered communities, an analysis of companies under the management of our organization operating in cities, widely distributed geographically, indicates that while the population of the cities served increased from 1,247,800 in 1909 to 1,776,300 in 1919, or 42.3 per cent, the actual riding has increased approximately 77 per cent, or an increase in per capita riding of 24.3 per cent. In other words, each person in 1909 averaged 108.6 rides per annum and each person of the larger population in 1919 averaged 135 rides per annum. This undoubtedly can be taken as a fair index of the street railway industry as a whole, and shows that along with the growth in the use of the automobile there has been a steadily increasing demand for street railway service during the last ten years. The street car, in short, is more than ever the people's vehicle.

THE ONE-MAN SAFETY CAR

The use of this type of car has proved to be most important in reducing expenses which helps to offset the unavoidable increase in the cost of labor and material. While the safety car alone is not a cure-all, it comes near being such when taken in connection with recognition of the economic need of higher fares, and it will be of great benefit both to the public and the companies.

OPERATING EXPENSES

Present indications all point to the conclusion that operating costs in 1919 reached approximately the highest point to which they will be carried by war conditions. During the latter months of the year, especially, the wage situation was less acute, as evidenced by fewer strikes in the industry as a whole; moreover, the cost of materials, except for articles made up of wood, showed a tendency either to remain stationary or advance only slightly.

Stone & Webster feel confident that the public utility field at this time, after making due allowance for the present market rates for money, offers an unusual opportunity to purchase at exceptionally low prices securities of many companies which have weathered successfully the difficulties of the war period, and that the companies which have suffered most from the effects of the war will gradually readjust their affairs on a sounder basis than ever before.

The opinion of Stone & Webster in this connection is confirmed by circulars and other matter issued from other sources pointing out wherein the outlook for the industry as a whole is much improved and citing specific instances where the particular property is doing very well.

Atlanta Wage Contract Signed

The contract between the union carmen and the Georgia Railway & Power Company, Atlanta, Ga., for 1920, covering wages and working conditions, has been formally signed. It provides that the wage scale recently decided upon by a board of arbitration shall be retroactive to Jan. 1, 1920. The new scale grants a 15 per cent increase in wages. Dissatisfaction with the terms that have now been accepted resulted in the recent strike.

Additional terms of the contract give the company the privilege of maintaining an open shop, though it is agreed that any of the motormen or conductors may join the union if they so desire, and that there shall be no discrimination on the part of the company for or against any employee because he may be a member of the union. It is also provided by the 1920 contract that any disputes which may arise between the company and the men shall be settled by a board of arbitration and that the decision of this board shall be final.

In the current issue of *Two Bells*, a weekly paper published by the company, it is pointed out that the increase of 15 per cent granted the carmen provides annual salaries ranging from about \$1,550 to about \$2,015, while the average pay of Atlanta policemen and firemen is only \$1,380 a year. Last year the railway employees received from \$1,350 to \$1,750. It is further pointed out for the edification of the general public that the lowest paid motormen and conductors under the old scale of pay received about as much as the average firemen and policemen of the city, while under the increase that has been granted the railway men will receive considerably more than the classes of public servants which have been mentioned.

The average pay of motormen and conductors who worked twelve hours per day last year was \$1,680. This year the average for the same hours will be \$1,872.

As this average is slightly in excess of \$35 weekly, the company points out in the current issue of *Two Bells* that motormen and conductors have no cause for complaint. Public opinion in that respect is with the company.

Danbury Road Hard Hit by Fire

The Danbury & Bethel Street Railway, Danbury, Conn., has been hard hit by the fire which destroyed its car-house. So far as the building and several of the cars are concerned the company's loss was small, but the loss of eleven open summer cars is severe. These cars were income producers during the summer season and came in very handy during the week of the Danbury Fair. They were old cars, but they answered the purpose of the company. J. Moss Ives, the receiver, has already ordered six safety cars. The company was insured, but it is doubtful if it can get present-day valuations for its rolling stock; that is, re-

placement value. These cars were not worth much on the market, but they were worth a great deal to the company. It is said that the receiver will make an effort to secure some second-hand open cars from the Connecticut Company, as that company cannot use open cars to advantage with its new zone system.

Wages Increased in Los Angeles

The Pacific Electric Railway and the Los Angeles Railway Corporation announce substantial increases in pay of trainmen, effective on April 1. The increases on the Los Angeles Railway Corporation's Los Angeles city lines apply to motormen and conductors. On the Pacific Electric Railway's city and interurban lines the increase in pay will affect motormen, conductors, brakemen, switchmen, trolley men and yard foremen. The raise schedule for the Los Angeles Railway Lines is as follows:

First three months' service, new rate of pay 44 cents per hour; next nine months, 46 cents per hour; second year, 47 cents per hour; third year and thereafter, 49 cents per hour. Additional wages for one-man car operators are scheduled in addition to the above raises and are as follows:

On Main Line cars, 4 cents per hour additional wages are given above the rates of pay so increased in the general service. On shuttle cars, 2 cents per hour additional wages.

The rates of pay of motormen and conductors in train service on the Pacific Electric Railway are as follows:

STREET CAR SERVICE	
First three months	44 cents an hour
Next nine months	45 cents an hour
Second year	46 cents an hour
Third year	47 cents an hour
Fourth year and thereafter	48 cents an hour
INTERURBAN SERVICE	
First three months	46½ cents an hour
Next nine months	47½ cents an hour
Second year	48½ cents an hour
Third year	49½ cents an hour
Fourth year and thereafter	50½ cents an hour
ON SINGLE TRACK INTERURBAN LINES	
First three months	49 cents an hour
Next nine months	50 cents an hour
Second year	51 cents an hour
Third year	52 cents an hour
Fourth year and thereafter	53 cents an hour
FREIGHT AND WORK TRAIN SERVICE	
Motormen (Flat rate)	57 cents an hour
Conductors (flat rate)	57 cents an hour
Brakemen and switchmen (flat rate)	52 cents an hour
Trolley men (flat rate)	47 cents an hour
Yard foremen (flat rate)	57 cents an hour

On the Pacific Electric Lines the above rates will apply, and in addition thereto the annual twelve days' vacation with full pay will be continued, no option being allowed with reference to this vacation.

In addition, the granting of passes for meritorious service and other pass concessions will continue in effect as covered by the company's "Rules Governing Transportation." Furthermore, passes will be issued to employees who may live on the lines of the Pacific Electric, for travel to and from their work, as has been the practice since June, 1919.

This increase alone on Pacific Electric Lines will amount to approximately \$170,000 additional per annum.

The two companies operate 1,480 miles of electric railway.

Participating Profit Certificates for Employees Railway President Announces Profit-Sharing Plan Different from Most Proposals of the Kind

David I. McCahill, Pittsburgh's young lawyer-traction official, plans to distribute \$1,000,000 of common stock among the 400 or more employees of his Pittsburgh, Butler & Harmony Consolidated Railway & Power Company and its subsidiaries and to give them representation on the board of directors. Mr. McCahill believes that by making his employees a "part of the works," he is improving their financial and social condition, and at the same time making more money for his company. Aside from taking his employees into the company, Mr. McCahill has provided many other benefits for them, such as old-age pension and sick and death funds.

SIX TRAINMEN BECOME DIRECTORS

The election of six trainmen to the board of directors will likely take place next week. Three men will represent the so-called Harmony road and three the Mars road. Mr. McCahill suggested that the men nominated be inducted by at least twenty other employees and requested that the names be placed in the hands of the superintendent of the company not later than April 1.

Announcement of his intention to do these things was made by Mr. McCahill. H. E. Etheridge, vice-president in Butler, Pa., the Northern terminus of the line. He arranged two get-together dinners—one at 11 o'clock in the morning for the night shift, and the other at 7 o'clock in the evening for the day shift. Mayor Heineman of Butler presided at the meetings. Judge Reiber, of the Common Pleas Court of Butler County, praised the plan and told the trainmen they ought to be very thankful to have the opportunity that was being provided them by Mr. McCahill. H. E. Etheridge, vice-president and general manager of the traction interests, also was one of the speakers.

PROFIT PLAN OUTLINED

The plan suggested for allowing the employees to share in the net profits of the properties was outlined by Mr. McCahill as follows:

A block of the common stock of the holding company, approximately \$1,000,000, face amount, will be set aside under a trust agreement with some bank or trust company, such stock to be held in trust by such depository and any dividends declared thereon to be distributed to the employees in accordance with profit certificates which would be issued to each employee who has been in the service of the company for a period of at least a year. The fund which would result from dividends being declared on the common stock so held in trust would be divided equally between all the employees entitled to share therein as above mentioned, so that each employee would be interested in holding down the number of employees to as few as possible, because the greater the number of employees, the less amount each would receive, as his proportionate equal share of the dividends declared into this fund. The certificates would entitle the holder to his proportionate share of the dividends during the time he remained in the employ of the company, but if at any time

he should leave the employ of the company, either voluntarily or upon request, the certificate would be forfeited, and his rights thereto would cease.

In case an employee died while in the service of the company, his widow, during her lifetime, and after her death any minor children he might have, would be entitled to his share in the fund. Upon the death of such minor children, or, if there be no minor children, upon the death of the widow, or, if there be no minor children nor widow upon his death, the certificate would be cancelled and his interest would lapse.

The right to vote the common stock so held in trust would remain with Mr. McCahill and his associate, Mr. Etheridge.

In order that the employees might have representation even greater than that which they would have if they had full voting power on the common stock, not less than three employees would be elected to the board of directors of the Harmony Road and the Mars Road, these directors to be selected by the men themselves, according to such rules as they may adopt, subject to the approval of Mr. McCahill and Mr. Etheridge, as to fairness. As directors these men will have full voting power on such boards. This will give a greater representation on the board of directors of each of these roads than could be secured by voting the common stock which would be placed in trust direct by the employees.

Mr. McCahill proposes to make the plan effective for a trial period of five years. Every employee will be entitled to share in the plan.

DETAILS OF SECURITIES OUTSTANDING

The Pittsburgh, Butler & Harmony Consolidated Railway & Power Company has issued and outstanding \$1,800,000, par value, of 6 per cent cumulative preferred stock and \$4,500,000, par value, of common stock. It owns \$2,745,000, par value, of common stock of the Pittsburgh, Harmony, Butler & New Castle Railway, out of a total of \$3,000,000, par value, of stock issued and outstanding. This company is known as the Harmony Road. The Harmony Road owns all of the \$25,000, par value, of the common capital stock of the Harmony Electric Company, issued and outstanding. The Harmony Road also owns all of the capital stock of the Ellwood Koppel Bridge Company.

The holding company also owns \$95,500, par value, of the capital stock of the North Pittsburgh Realty Company, out of a total of \$164,250, par value, of stock issued and outstanding. The holding company also owns \$999,500, par value, of the capital stock of the Pittsburgh, Mars & Butler Railway, out of a total of \$1,000,000, par value, of stock issued and outstanding by that company. This company is known as the Mars Road. The total indebtedness other than debts for current operating expenses is as follows:

The Harmony Road, \$2,900,000 first mortgage 5 per cent bonds, due 1936; \$176,000, face amount, demand notes.

Ellwood Koppel Bridge Company, \$150,000 first mortgage 5 per cent bonds due 1943.

Mars Road, \$900,000 first mortgage 6 per cent bonds due 1946.

North Pittsburgh Realty Company, approximately \$100,000, face amount, demand notes in addition to certain purchase money mortgages secured by mortgage on the respective parcels of land purchased.

A conservative estimate of the present value of the property of the entire

system owned by the various companies above mentioned is between \$8,000,000 and \$8,500,000.

Large Detroit Registration

Municipal Ownership Issue Stirs All Detroit to Action—Lively Campaign in Progress

The number of voters registered in Detroit, Mich., up to the closing date on March 20 indicates that a large ballot will be cast on the proposal of the city to spend \$15,000,000 in starting a municipal railway. From the large registration, it appears that the people intend to follow out Mayor Couzens' admonition to vote. The Mayor, on several occasions, stated that the small vote cast on former occasions was a great disappointment to him.

The settlement ordinance containing the counter proposal of the Detroit United Railway for extensions was returned to the company by Corporation Counsel Wilcox, who stated his reasons for not approving the ordinance as to form.

Among the reasons enumerated was the claim that the title of the ordinance was misleading in that it did not state that the instrument was a thirty-year franchise, which the Corporation Counsel believes it to be. Failure on the part of the company to list in detail all the lines which it now operates, failure to state whether the company was a corporation, a partnership or an individual, lack of definition of terms as to what were to constitute operating expenses, maintenance items, depreciation and other lawful expenses, and lack of stipulation of a penalty to be imposed on the company for failure to operate city built subways and elevated lines, were enumerated as flaws in the ordinance.

Mandamus proceedings were instituted by the Detroit United Railways to compel the Corporation Counsel to approve the company's initiatory ordinance. A hearing on the mandamus action will probably be held before a court of three circuit judges. In the meantime petitions are being circulated among the proponents of the company's plan to obtain the required number of signatures.

A committee of citizens has been organized who are opposed to municipal ownership to endeavor to defeat the Mayor's plan.

Mayor Couzens maintains that the Detroit United Railway will be forced into a transfer agreement when the city lines are in operation, but the company states that it will not be possible for the people to avoid paying two or more fares with two systems operating, whereas one fare would be charged under a unified system.

Abner E. Larned, Sydney D. Waldon, and Francis McMath, former members of the Street Railway Commission, state that 7 to 10 cent fares will be necessary if the piece-meal plan is carried out. They also state that even if the

Detroit United Railway is forced in the end to grant concessions, the surrender will come after a "siege of litigation," during which there will be no transfer interchange.

In regard to the assertion that the city can prevent interurban cars coming into Detroit until the Detroit United Railway grants the transfer privilege, it is asserted that aside from the ability of the Detroit United Railway management to dodge trouble through use of trackage still within its control, the business of the city would be impeded and action would be taken by the Michigan Railway Commission in case the municipal government interfered with the free play of intrastate commerce.

John C. Frost, general manager of the Detroit Elevated Corporation, announced to the City Council his willingness to build a trial crosstown elevated line on approval. No action, however, was taken on this proposal.

Electrification Rumor Unfounded

There is no basis in fact for the report from Pittsburgh that the Pennsylvania Railroad is taking preliminary steps at this time looking toward the electrification of the Pittsburgh, Fort Wayne & Chicago division, although the railroad, for a number of years, has realized that ultimately it will be advisable to install electricity at a number of points on the system in addition to those where such power has already been adopted. As is well known the road out of New York is electrified between the Pennsylvania Station in New York City and Manhattan Transfer, just outside of Newark. This stretch takes in the Hudson Tubes. The company has also electrified the suburban portion of the main line between Broad Street Station, Philadelphia, and Paoli, and between Broad Street Station and Chestnut Hill. These are two sections of extremely heavy commutation travel.

It is realized that it would be desirable in a similar way to electrify the suburban zone around Pittsburgh, also to electrify between Philadelphia and Wilmington, through the tunnels at Baltimore and over the mountain grades just west of Altoona. A further development would complete the electrification from New York to Philadelphia, and Philadelphia to Washington. All of these matters have been talked about for a number of years. There is nothing new to report regarding them at this time. The company is not prepared to go ahead at present or in the near future with any of these projects, and there is no likelihood that the work near Pittsburgh will be executed soon.

Capital Traction Increases Wages

The Capital Traction Company, Washington, D. C., on March 19 granted its motormen and conductors an increase of 5 cents an hour and a 10 per cent increase in pay to all other employees, effective on March 31.

The new wages of the trainmen will be: For the first three months of serv-

ice, 51 cents an hour; for the next nine months, 54 cents, and after a year, 56 cents. The men asked for 65 cents an hour. The present rates are: For the first three months, 46 cents; for the next nine months, 49 cents, and after a year, 51 cents.

The new wage rates are part of a new agreement entered into between the company and Division No. 689 of the Amalgamated Association. The new agreement is to remain in force until March 30, 1923, with the provision that either side may move to change the wage scale at the end of each year upon giving thirty days' notice.

In the new agreement the District Commissioners no longer are designated as arbitrators of disputes which the company and the men cannot settle in conference. Under the new plan there will be a board of arbitration composed of three men—one chosen by the union, one by the company and the third selected by these two to represent the public. If after five days the first two arbitrators have failed to name a third to represent the public the Commissioners will be empowered to name him.

News Notes

Wage Offer Rejected.—After two hours of discussion on March 3 the trainmen in the employ of the Dubuque (Ia.) Electric Company refused to heed the plea of their president, C. C. Mead, to accept a temporary compromise wage offer, and taking the situation in their own hands called a walkout.

Twelve Per Cent Wage Increase.—The Harrisburg (Pa.) Railways has increased the wages of its trainmen and other employees. The increase will total \$70,000. It became effective March 15. The new scale for trainmen is 48 cents an hour the first year, 49 cents an hour the second year and 50 cents an hour the third year and thereafter. The increase is approximately 12 per cent over the scale that has been in effect.

Want Wage Increase in Winnipeg.—A sub-committee of the union of employees of the Winnipeg (Man.) Electric Railway has been working for some time on a proposed revision of wages. It is said that an increase from 60 to 80 cents an hour will be asked. The present rates are from 39 to 55 cents an hour. Better working conditions and shorter hours are also among the concessions to be asked. The program as thus outlined is of course subject to approval by the entire union.

Wage Demands Threaten Life of Suburban Line.—The employees of the New Jersey & Pennsylvania Traction Company, Trenton, N. J., have pre-

sented demands for a wage increase of 25 per cent to take effect by April 1. Gaylord Thompson, general manager of the company, has issued a statement to the effect that if the new wage scale is insisted upon the company will be forced out of business. In the new contract the men ask \$1 an hour for operating one-man cars; 60 cents for motormen and conductors and double pay for Sundays and holidays.

New Franchise Proposed in Lima.—Prospects appear to be good for negotiations to commence soon for a new franchise for the Ohio Electric Railway in Lima, Ohio. Attorneys for the joint committee of citizens have prepared a tentative franchise. This has been presented to the City Council. It is said that except for a few minor changes the proposed new grant will be presented to the railway just as received from the committee. The Council is said to be opposed to one-man cars. James B. Dugan, resident manager of the railway, says the company is ready to proceed with the negotiations.

Trial Operation by City Suggested.—Elton S. Wilde, vice-president and general manager of the Union Street Railway, New Bedford, Mass., told a councilmanic committee recently that the six months' agreement under which the company is maintaining service between Lunds corner and Sassaquin is about to expire and when it does the company will be willing to furnish power and the cars and let the city operate the line. Under the present arrangement the city pays \$200 a month to the Eastern Massachusetts Street Railway for the rental of the tracks and whatever revenue there is goes to the Union Street Railway.

Back to Private Life.—F. H. LaGuardia, president of the Board of Aldermen of New York, in an address to the New York Board of Trade and Transportation, said in regard to the local transit matter: "No matter how this question is decided, the men who decide are politically dead. I expect to go back to law practice in two years. We don't need any legislation. What we need is management, and above all we need a higher code of ethics, a better realization of duty to the public that is served. The whole trouble has been one of management, and to put it mildly the management has been rotten."

Program of Meeting

National Immigration Conference

A national immigration conference will be held on April 7 in New York City in the Engineering Societies Building, 29 West Thirty-ninth Street. National leaders in American industry and finance will discuss the shortage of foreign-born labor and the loss of production due to unrest among the workers, and measures will be taken for united action to relieve this condition. Further details may be secured by addressing Coleman du Pont, chairman of the board, the Inter-racial Council, 120 Broadway, New York.

Financial and Corporate

Financing Plan Changed

\$4,000,000 Loan Renewed — Dividends Passed Will Be Applied to Its Liquidation

The directors of the Northern Ohio Electric Corporation, Akron, Ohio, have decided that the amount and number of subscriptions received to Class A 8 per cent first preferred stock were insufficient to justify their acceptance and that the plan for the readjustment of the finances of the company referred to in the *ELECTRIC RAILWAY JOURNAL* of Jan. 24, page 215, be abandoned. This action was taken after conference with and approval of the bankers holding the \$4,000,000 loan which it was sought to retire.

LOAN WILL BE EXTENDED

It is announced that the company has arranged with the banks for an extension of the loan for one year and has agreed with them that dividends will be deferred until such time as financial conditions will permit the sale of securities to retire the loan. The company will apply the equivalent amount of such dividends to the reduction of the principal.

The directors felt that under the circumstances the best interest of all the stockholders was being conserved by this course. The preferred stock dividends are cumulative and the directors have every confidence that the accumulations will be paid in full. It is explained that every dollar applied to the liquidation of the loan places the stock in that much stronger position. The sum of \$100,000 has been paid on account of the note and like payments will be made quarterly. This amount is approximately the equivalent of the 6 per cent dividend on the preferred stock.

The loan of \$4,000,000 made by the Northern Ohio Electric Corporation became due on Feb. 1. It was proposed to liquify the loan through the issue of \$4,000,000 of Class A 8 per cent first preferred stock. The present 6 per cent preferred stock was to have been exchanged for new Class B 7 per cent preferred stock, providing the holder subscribed for 66⅔ per cent of Class A preferred at par and also paid \$10 per share held for the privilege of the exchange.

The loan which it was proposed to take up was made at the time of the original financing of the company in 1916. At that time the issuance of \$6,000,000 of preferred stock, 75,000 shares of common stock without par value and a \$4,000,000 one-year loan provided for the purchase of approximately \$9,000,000 of common stock of the Northern Ohio Traction & Light Company and also furnished about \$900,000 of working capital. This one-year loan was secured by a pledge of the Northern Ohio Traction & Light Company common stock purchased. It has been renewed from year to year owing to the unfavorable financial condition attributable to the war.

Two Reorganization Plans Drastic Cuts in Fixed Charges Are Proposed in Tentative Rhode Island Proposals

Two plans have been presented for the reorganization of the electric railways in Rhode Island controlled by the Rhode Island Company. One plan represents the ideas of the receivers of the United Traction & Electric Company and the Rhode Island Suburban Railway. The other plan represents the ideas of the committees acting for the bondholders of these companies. Both plans call for a material reduction in the fixed charges of the companies. The plans differ in their essentials, however, and it is said that little hope exists of the differences being ironed out. This is purely a matter of unofficial information.

PROPOSALS ONLY TENTATIVE

As for the plans themselves there would appear to be little reason at this time to go into the proposed basis of the exchange of securities. The proposals are only tentative. Moreover the likelihood of the failure of the present Legislature to enact favorable permissive measures may alter the situation materially.

The plan outlined by the receivers is addressed to Governor Beeckman. The purpose of this plan is to assure a comprehensive system of transportation under one company, which shall operate all of the properties heretofore operated by the Rhode Island Company. The plan contemplates private management under state supervision. It recognizes the necessity for fixing the capitalization of the new company on a conservative basis, and for making provisions for present financial needs and future development of the properties. It calls for \$2,000,000 in new money for rehabilitation.

REVENUE REQUIREMENTS SMALL

The fixed charges to be paid out of annual revenue are reduced to a minimum. To accomplish this result the plan provides that all accrued interest on present securities be forfeited; that 4 per cent bonds be issued in exchange for the existing 5 per cent bonds of United Traction & Electric Company; that the Rhode Island Suburban Railway bondholders take stock in exchange for \$500,000 of their present bonds, and that the United Traction & Electric Company stockholders receive \$7,000,000 par value stock in exchange for their existing \$8,000,000 stock of the Traction Company.

It is the opinion of the receivers that the lower revenue requirements provided by this plan constitute an element of safety and go far to insure the suc-

cess of the reorganization. The plan seeks by this means to avoid the necessity of raising fares in the future.

The receivers are in accord with the views heretofore expressed by the Governor that relief from taxation should only be granted as part of a plan which provides for contribution by the holders of existing stock and bonds. It is for this reason, as well as to insure the success of the reorganization, that they have provided for the material contributions on the part of holders of existing stock and bonds. The plan is conditioned upon the passage of the remedial legislation for which it provides. It is pointed out that without such legislation it is not possible under present revenue conditions for a reorganization to succeed.

The plan advanced by the security holders also provides that representatives of the various classes of security holders and of the public are to be associated in the management of the company. There will be a single new company with \$22,600,000 of securities outstanding. The success of the whole structure is presaged on the company obtaining suitable legislation.

PLEA FOR BONDHOLDERS' PLAN

Stephen O. Metcalf of the committee representing the bondholders of the United Traction & Electric Company said for this plan that the generous scaling down of the securities of each class and the greatly reduced fixed charges over any other plan yet submitted should recommend it to the public. That the plan in this respect is drastic is instanced by the provision that the holders of the United Traction & Electric Company and the Rhode Island Suburban Railway shall forego the defaulted interest on their bonds to the amount of \$1,200,000. In addition to this, to cite another example, the holders of the bonds cut their principal \$1,400,000 and receive \$1,400,000 in common stock. Under the plan of this committee the reorganized company would obtain \$1,000,000 in new money.

Preferred Dividend Passed

Owing to the expense entailed by the severe storms and the extremely cold weather of the past winter, the New Brunswick Power Company, St. John, N. B., has been compelled to pass the dividend on its preferred stock. The heavy February storms completely interrupted the railway service for several days, and also damaged the electric light and power distributing systems. The total loss will aggregate \$40,000. The narrow margin afforded by the rates allowed prevent the company from accumulating a surplus adequate for such contingencies.

Norfolk Adopts Broad Policy Toward Public Utilities

City Council and City Public Utilities Commission Unanimously Agree to Safeguard Capital Both as to Principal and Return

In what will probably prove a noteworthy example, and an outstanding leading case, the City of Norfolk, Va., acting first through its Public Utilities Commission and second through its Council, has adopted a definite policy of encouraging public utility development in that city. The platform or principle is that "Capital legitimately invested in public utility properties must be safeguarded and protected by municipalities, both as to principal and as to a just and inviting return thereon after reimbursement to the company for expenses incurred in providing service."

CITY ADVOCATES SQUARE DEAL

This was unanimously adopted by both bodies. In other words, the city has definitely gone on record that it believes in dealing in a business-like manner with those business undertakings which are known as public utilities. It guarantees safety and an adequate return to money invested in developing public utilities and thus hopes to encourage capital to undertake that development and benefit therefrom.

The particular case which caused this action is one in which the City Gas Company of Norfolk, included in the system of the Virginia Railway & Power Company, petitioned for an increase of gas rates from a base rate of \$1.20 per thousand cubic feet to \$1.60. Norfolk is fortunate in that the five men who compose its City Council are apparently foresighted, broad-gauge business men who deal with the city's interests in a business and not political manner. The same type of men are on its Public Utilities Commission.

The commissioners frankly admitted their own lack of familiarity or expertness in the public utility business, and in order to secure data upon which they could give a fair judgment they called in A. Merritt Taylor as a person mutually satisfactory to the city and the company. Mr. Taylor's former experience as Transit Commissioner of Philadelphia, as manager of the Division of Passenger Transportation and Housing of the Emergency Fleet Corporation during the war and as a public utility builder and operator encouraged them to believe he could advise intelligently with the various interests involved.

VALUATION SCALED DOWN

With his associate, Charles B. Cook, Mr. Taylor made a valuation of the gas property, scaling down from an apparent book value of \$3,603,203, the company's valuation, to \$2,383,908, a figure finally agreed upon by the Public Utilities Commission, the gas company and Mr. Taylor.

In 1896 the two gas companies then

in Norfolk merged into the present company, the valuation at that time being placed at \$971,621. Since about \$500,000 of this amount represented stock for which no cash or equivalent had been advanced, other data tending to show that the actual fairly invested capital in 1896 was just under \$500,000, that figure was adopted as a base.

HISTORICAL INVESTMENT \$1,421,690

Actual additions, subsequent to 1896, were established and a total historical investment of \$1,421,690 was arrived at for the property as of January, 1920. This basis was used in contradistinction to the company's contention for present-day high prices. This figure does not include going concern, land increments and working capital. The final valuation was arrived at as shown by the following figures:

Total historical cash investment, January, 1920	\$1,421,690
Going concern value (15 per cent of above item)	213,000
Increment in land value as determined by appraisal committee appointed by city and company	488,660
<hr/>	
Total property value, Jan., 1920	\$2,123,350
Working capital	130,000
Additional investment now being made	130,558
<hr/>	
Total value for rate base...	\$2,383,908

Upon this base, a return of 8 per cent cumulative was set up and adopted as a part of the city policy of guarantee to the company. This means 34.6 cents per thousand cubic feet of gas. A detailed analysis of the cost of producing gas showed \$1.294 per thousand, thus making a price of \$1.640 legitimate. The company's request of \$1.60 was thus substantiated and allowed by the city. However, it was agreed by the city and company that variations in price of oil used in gas manufacture would cause corresponding variations in the price of gas to the consumer.

NO FIGURES IN REFUTATION

From the reports of the various steps in the proceedings, the Council and Public Utilities Commission maintained an attitude of fairness to the utility, at the same time conserving the city's interests in the broadest possible manner. There was some objection at times by some members of the Chamber of Commerce, but the Public Utilities Commission took the attitude that the Chamber's representatives were very tardy in presenting their views, not appearing until a vote was to be taken. No figures were presented to refute the conclusions of the commission, Council and Mr. Taylor.

The company was criticised for the dirty and rundown condition of portions of its plant, but this condition was found to be due in part to causes beyond the company's control and the company promised immediate attention

to the plant to put it in first class order, showing evidence of much already done in that line.

While there are many more details of the situation of special interest from the gas standpoint, the chief interest to all public utilities lies in the fundamental principle adopted by the city as to its attitude toward such business. Whether this attitude will be recognized and sustained by the State Corporation Commission remains to be seen. The City Council has authorized the chairman of the city's Public Utilities Commission, the city attorney and Mr. Taylor to submit a copy of Mr. Taylor's report to the State Corporation Commission when it hears the case on March 29. They are also authorized to present the city's resolution upholding the report with its platform and valuation as representing the viewpoint of the city and the manner in which the city desires to treat and deal with public utilities within its borders.

VALUATIONS UNDER WAY

Valuations are now being conducted of the railway properties of the company in Norfolk. It is expected that the data in connection with these cases will be ready for presentation within sixty days. In this instance also Mr. Taylor has been retained by the City of Norfolk.

Receiver for Chicago Ten-Cent Bus Line

United States Judge K. M. Landis has appointed the Central Trust Company of Illinois receiver for the Chicago Motor Bus Company following the filing of the bill of complaint by New York holders of \$150,000 of bonds of the company. Counsel for the petitioners said that the bonds were due in January, 1920, but were not taken up by the company at that time. The Chicago Motor Bus Company has been operating a 10-cent motor bus service on the north side of Chicago along the Lake Shore and through Lincoln Park.

In spite of the rosy predictions of those who financed the company, hearings held before the Public Utilities Commission of Illinois in May, 1919, revealed that the company was having difficulties in making bare operating expenses. The facts were developed in the competition for motor bus franchises on the south side between the Chicago Motor Bus Company and the Chicago Stage Company. In a decision handed down Jan. 20, 1920, the commission criticized the methods of the Chicago Motor Bus Company and granted the desired franchises to the Chicago Stage Company. In the hearings in May, 1919, it was contended that high maintenance expenses, which were responsible for deficits, would be reduced sufficiently to permit operation at a profit if the company could operate additional buses on the south side. The commission, however, was not satisfied with the method of financing the company or the design of the coach proposed.

Mr. Mitten Increases Net

Philadelphia Rapid Transit, With Its Nickel Fare and Three-Cent Transfer Does Increased Business

That the methods employed by the Philadelphia (Pa.) Rapid Transit Company in conducting its business have proved beneficial not only to its investors but to its patrons is reflected in the annual report just issued covering the year ended Dec. 31, 1919.

Passenger revenue for the year increased 13.64 per cent over the previous

for the larger number of accidents occurring during the war-time period.

Deductions from gross income increased \$106,098. These deductions now represent 27.55 per cent of the total railway operating revenue. This increase is caused mostly by the payment of interest on passenger cars secured by lease from the United States Government. The net corporate income increased slightly, being 11.79 per cent over the previous year, and is equivalent to a 5.72 per cent return on the \$29,991,660 of outstanding capi-

Common Dividend Resumed

New Jersey Company Votes 1 Per Cent for First Quarter of New Year—Railway Doing Better

The directors of the Public Service Corporation of New Jersey, Newark, N. J., have authorized the payment of \$500,000 in dividends on common and preferred stock for the first three months of 1920. Although a return has been paid regularly in the past on preferred, the 1 per cent declaration voted on common stock is a resumption of payment after the passing of the dividend for the last three months of 1919.

LOWEST RATE SINCE 1909

Two per cent for the quarter year will be paid on the \$10,000,000 of preferred stock outstanding and 1 per cent is authorized on the \$30,000,000 common stock.

The payment of a 1 per cent dividend, or at the rate of 4 per cent for the year on common stock, while a resumption of payment, is at the lowest rate the company has paid since 1909. Last year, with three quarterly payments, the total for the year was 4½ per cent. Dividends have been paid since 1907.

The first increase over 4 per cent was in September, 1909, when the rate was made 1½ per cent quarterly. The following year 6 per cent was paid and in 1915 another quarter per cent was added to the annual return. In 1916 7¾ per cent was paid, followed in 1917 by 8 per cent. In 1918 the yearly return dropped to 6 per cent.

After the meeting Thomas N. McCarter, president of the company, issued the following statement:

After full consideration of all the circumstances of the corporation's affairs the board of directors of the corporation felt it to be proper to resume the payment of dividends to the extent of a quarterly declaration of 1 per cent upon the common stock of the corporation.

The electric company and the gas company are now functioning properly and making satisfactory earnings. The railway company, as is well known, has been allowed a rate sufficient to keep it going; that is to say, to enable it to pay its operating expenses and fixed charges. The rate does not provide sufficient revenue to yield any substantial return upon the investment of the corporation in the railway's stocks.

This situation, it is expected, will be cured during the next few months. The railway company, too, has suffered from excessive operating expenses caused by the abnormal weather conditions of the present winter.

OUTLOOK GROWING BETTER

The early months of the year are relatively lean months in the public utility business, the larger profits being made in the latter part of the year. The showing, however, of the corporation, as a whole, for so much of the year as has elapsed is so satisfactory and the estimate of the earnings for the year is so promising that the directors felt justified in taking the action above set forth.

The pending quarter will be only the second time in the history of the corporation that a dividend declared at this season of the year will have been earned by the corporation in the specific quarter to which the dividend is applicable.

It is expected that the detailed report of operation of the company for the year will be available for publication soon.

INCOME STATEMENT OF THE PHILADELPHIA RAPID TRANSIT COMPANY

Year ended Dec. 31	1919	1918	Per Cent Change + Inc.—Dec.
Gross passenger revenue.....	\$34,739,589	\$30,568,788	+ 13.64
Other operating revenue.....	618,882	515,025	+ 20.17
Total railway operating revenue.....	\$35,358,471	\$31,083,813	+ 13.75
Way and structures and equipment—maintenance and renewals.....	\$4,707,012	\$3,780,800	+ 24.47
Power—maintenance and operation.....	3,450,486	3,319,199	+ 3.96
Conducting transportation.....	11,387,653	8,923,021	+ 27.62
General.....	2,697,091	2,088,218	+ 6.97
Total railway operating expenses.....	\$22,242,242	\$18,111,238	+ 22.82
Net operating revenue.....	\$13,116,229	\$12,972,575	+ 1.108
Taxes including paving tax.....	\$2,345,750	\$2,428,819	— 3.42
Operating income.....	\$10,770,479	\$10,543,756	+ 2.15
Non-operating income.....	\$681,049	\$620,614	+ 9.74
Gross income.....	\$11,451,528	\$11,164,370	+ 2.57
Interest.....	\$927,926	\$981,652	— 5.38
Rentals.....	8,687,725	8,527,902	+ 1.875
Sinking fund—city contract.....	120,000	120,000
Total deductions.....	\$9,735,651	\$9,629,554	+ 1.102
Net corporate income.....	\$1,715,877	\$1,534,816	+ 11.79

year and represented 96.5 per cent of the gross earnings. The number of passengers transported to give this revenue was 723,610,228. Operating expenses, however, increased 22.82 per cent, due to the increased wages paid in the transportation department, so that the increase in net operating revenue was only 1.108 per cent. Main-

tenance and renewals amounted to \$5,766,322, equivalent to 16.32 per cent of the railway operating revenue. In other words, this charge was more than \$10,000 per annum for each mile of route now in operation. Deferred maintenance of the war-time period has largely been caught up by the use of reserves established for this purpose. The increase of 6.97 per cent in general

tenance and renewals amounted to \$5,766,322, equivalent to 16.32 per cent of the railway operating revenue. In 1918. Two semi-annual 2.5 per cent dividends were paid during the year. Rentals paid for leased lines were 1.875 per cent greater than in 1919 and were equivalent to 15.2 per cent over the total funded debt of \$57,073,425 of the twenty-eight leased lines. Taken as a whole the capitalization of the

STATISTICAL INFORMATION OF THE PHILADELPHIA RAPID TRANSIT COMPANY

	1919	1918	
Average total miles operated.....	671.42	661.45	+ 1.51
Surface.....	648.09	638.12	+ 1.56
Elevated.....	16.71	16.71
Subway.....	6.62	6.62
Revenue car miles to car hours—speed in M.P.H.....	9.07	8.77	+ 3.42
Revenue passengers, at 5 cents.....	672,021,657	593,494,427	+ 13.25
Revenue exchange passengers, at 3 cents.....	51,588,571	43,791,710	+ 15.12
Total revenue, passengers.....	743,610,228	637,286,137	+ 13.52
Free transfer passengers.....	149,145,171	130,472,269	+ 14.35
Total passengers handled.....	872,755,398	767,758,406	+ 63.64
Gross passenger revenue.....	\$34,739,589	\$30,568,788	+ 13.64
Average fare:			
Per revenue passenger (cents).....	4.81	4.79	+ 0.417
Per total passenger (cents).....	3.98	3.98
Revenue per mile of track.....	\$51,800	\$46,200	12.10
Operating revenue—per cent.....	63.0	58.2
Taxes—per cent of gross revenue.....	6.52	7.67

tenance and renewals amounted to \$5,766,322, equivalent to 16.32 per cent of the railway operating revenue. In other words, this charge was more than \$10,000 per annum for each mile of route now in operation. Deferred maintenance of the war-time period has largely been caught up by the use of reserves established for this purpose. The increase of 6.97 per cent in general

Philadelphia Rapid Transit System amounts to \$86,453,040 in stock and \$42,653,867 in bonds. The total rentals, dividends, interest, etc., paid on these securities represents a return of 8.6 per cent on the \$129,106,907 of securities outstanding.

The accompanying tables give in detail the income account and statistical information concerning the traffic handled.

Wheeling Lines Foreclosed

The West Virginia Traction & Electric Company, Wheeling, W. Va., and all its holdings were bought in by the first mortgage holders of the concern at public auction at Wheeling on March 15. G. H. Walbridge, representing the bondholders' protective committee of New York, was the only bidder. He paid \$760,000 for the property.

The property was first offered for sale as a whole. The bid was \$750,000. The property was then divided in parcels and each sold singly. The Morgantown property was first offered. Mr. Walbridge bid \$700,000. The next parcel was the holdings in Wheeling, for which the same bidder offered \$50,000. The third bid was \$10,000 for the 495 outstanding shares of the City & Suburban Gas Company.

A reorganization is probable and new corporations will be formed to conduct the business. The bondholders were represented by G. H. Walbridge and Attorney Gerrard Glenn. Receiver Whittemore and Attorney J. J. Coniff looked after the company's interests.

Snow Cleaning Cost \$221,000

For the period ended with Feb. 20, 1920, the cost of snow removal for the entire system of the Eastern Massachusetts Street Railway, comprising about 780 miles of track, the expenditure for labor alone was \$221,000, or an average of about \$333 per mile. The highest cost per mile was \$568, for the Salem district. The lowest cost per mile is \$181 for the Taunton district.

The additional cost of rehabilitation of the rolling stock together with maintenance will bring the total for this period up to about \$500,000.

The crippling of traffic due to the fall of snow, more than 35 in. for the Massachusetts district, reached an acute stage. On March 1 only two lines of the entire system were running 100 per cent service. These lines were the Lynn and Lawrence divisions.

The conditions early in March were so bad that it was expected it would take some weeks before normal service could be resumed.

Rainier Valley Value \$765,760

W. H. Moore, a Councilman of Seattle, Wash., appointed by the City Council to investigate the value of the Seattle & Rainier Valley Railway, has submitted a report to the utilities committee. He has placed a value of \$765,760 on the properties. This does not include a sum the company spent in raising tracks and filling right-of-way to the present grade. This sum will be added as soon as it has been estimated.

It is uncertain whether the report by Mr. Moore brings the matter of the purchase of the lines by the city any nearer to consummation, as E. W. Sampson, president of the company, has refused to negotiate on the basis of the report. An appraisal of the property made in 1913, when the city

contemplated the purchase of the road, fixed the value at \$1,264,072. In 1918 Mr. Sampson offered to sell the Rainier Valley lines to the city for \$1,600,000. Shortly after the city of Seattle purchased the railway lines of the Puget Sound Traction, Light & Power Company the Seattle & Rainier Valley line secured permission from the State Public Service Commission to raise its rates to 7 cents. This resulted in a movement on the part of residents of the Valley to induce the city to purchase the system.

Wants Bridge Traffic Restored

Deputy Public Service Commissioner Morgan T. Donnelly of the First District is making an effort to get surface line traffic restored across the Williamsburg Bridge. He has held hearings relating to this subject and has also conferred with representatives of the New York Railways and the Fourth & Madison Avenue Railroad for the purpose of learning what is the attitude of the operators of those lines toward the resumption of service across the bridge. The so-called green car lines carried about 20,000 passengers daily in rush hours to and fro across the Williamsburg Bridge previous to the elimination of the service. The Brooklyn Rapid Transit surface lines operating across the bridge carried about 16,000 persons daily in the rush hours previous to the elimination of green car service, and have carried about 15 per cent additional since that time, while there has been a large diversion of traffic to the Brooklyn Rapid Transit elevated and subway lines which run over the bridge. The hearings will be resumed and Commissioner Donnelly will endeavor to determine what actual steps can be taken to restore service.

Charlotte Suburban Line Sold

The Charlotte (N. C.) Rapid Transit Company, which went into the hands of a receiver in 1918, has recently had its last effects sold at auction. These consisted of 2 miles of track and trolley, with some additional poles, ballast material and other supplies. The property mentioned was bid in by Paul Chatham, former president of the company, at \$10,000.

The Charlotte Rapid Transit Company was organized ten years ago with a capital of \$75,000. It began operation in 1911 of a storage battery car from the end of a line of the Southern Public Utilities Company, which operates the railway in Charlotte, to the country club. The storage battery service was not a success and in May, 1913, the Southern Public Utilities Company began the operation of cars over the Rapid Transit line under a contract with the latter company. This service was discontinued on May 19, 1918, because the owners of the suburban line were not able to meet the deficit incurred through the operation of cars over the line.

For the past two years a consider-

able residence addition at Chatham Estates and Chantilly has been without railway service. It is reported that residents of that section will endeavor shortly to take over the effects of the defunct company from Mr. Chatham and enter into a new contract with the Southern Public Utilities Company for the operation of cars over the line. The latter company is now using one-man safety cars on some of its lines in Charlotte, and it is believed that through the operation of such cars and with increased patronage there will be little if any deficit on the line now abandoned.

Financial News Notes

Increase in Chicago City Dividend.—The Chicago (Ill.) City Railway has declared a quarterly dividend of 1½ per cent, payable on March 31 to stock of record March 25, thus placing the stock on a 6 per cent basis. The former basis was 5 per cent.

Two New Directors Elected.—Stockholders of the Dallas (Tex.) Railway met recently for the annual election of officers. J. T. Owens and Sam P. Cochran, both of Dallas, were elected directors to fill vacancies caused by the resignations of F. B. Bissell and LaMonte Daniels.

Suspension of Service in Weymouth.—The Eastern Massachusetts Street Railway has suspended indefinitely all service in the town of Weymouth, Mass., in consequence of the refusal of the town authorities to furnish financial aid in meeting the expense of maintenance and operation.

Service Suspended.—The Albany (Ga.) Transit Company has reduced service to a single car. Complete suspension and the junking of the line are threatened. It is said that the principal owners will sell for \$45,000. The suggestion has been made that the city take over the road and operate it.

Abandonment Threatened.—The Bridgeton & Millville Traction Company, Bridgeton, N. J., has threatened to abandon the road and tear up the tracks if forced by Common Council to pay a share of an extensive street paving program. Members of the Council will confer with the traction officials in an effort to adjust the matter.

Fights for Present Worth Ruling.—The St. Joseph Railway, Light, Heat & Power Company, St. Joseph, Mo., has petitioned for an injunction in the United States Court to restrain the Missouri Public Service Commission from basing the valuation of the railway properties on the initial cost instead of on present worth in determining a basis for establishing equitable rates. The company states that its

properties are now worth \$11,000,000, as compared with a valuation of approximately \$5,500,000 fixed by the commission.

Appraisal for Nashville.—Prof. Albert S. Richey of Worcester, Mass., has been retained by the Tennessee Railroad & Public Utilities Commission to represent it in an appraisal of the property of the Nashville Railway & Light Company. Robert M. Feustel, consulting engineer, Fort Wayne, Ind., has been retained by the company as its representative. The city of Nashville has not yet indicated whether it will appoint an engineer to represent it in the appraisal. The order of the commission makes it optional with the city as to whether it will or will not join in the work.

Long Island Line Ordered to Resume.—Deputy Public Service Commissioner Alfred M. Barrett of the First District has directed the New York & North Shore Traction Company, operating in the northern portion of Queens, to resume service immediately. The company shut down several weeks ago, when its tracks were blocked with snow and ice, and it became impossible for the company to obtain funds to clear them sufficiently to resume operation. The company has replied that it is now endeavoring to obtain \$20,000, which it believes will be a sum sufficient to put its tracks and equipment in proper shape to restore service.

Public Utilities Doing Well.—Continued progress is reported by the utility companies included in the Cities Service Company, New York, N. Y., these properties not only reporting the largest gross revenues in their history but also showing improvement in net revenues. From present indications 1920 will be the greatest year from the viewpoint of net earnings in the history of the public service division. The demand for central station electric power at all properties controlled by Cities Service Company continues unabated and if these demands are to be met much additional generating equipment must be installed at the central station properties.

Interest Payments Authorized.—Interest amounting to \$190,200, due on April 1, 1920, on the company's general mortgage $4\frac{1}{2}$ per cent refunding bonds will be paid by Lee C. Bradley, receiver for the Birmingham Railway, Light & Power Company and the Birmingham Tidewater Railway. Judge William I. Grubb, of the United States District Court, rendered a decree March 18 authorizing the receiver to pay the interest due on April 1 and authorized him to pay such instalments of the company's Federal income tax as are due. The receiver was also authorized to extend for a period of not more than six months receivers' certificates when they become due and payable.

Hyde Park Line to Discontinue.—Corporation Counsel Arthur D. Hill and Assistant Corporation Counsel Joseph P. Lyons, representing the city of Boston, have informed the trustees of the

Eastern Massachusetts Street Railway that the city does not intend to aid the road financially so that its lines in Hyde Park can continue operating. As a result of the disclosure of the city of Boston's position, the trustees say that it will be necessary to discontinue all service in Hyde Park on April 1. The State Department of Public Utilities has recommended that the Boston Elevated Railway take over the lines which the Eastern Massachusetts Street Railway has announced it will abandon.

Short-Term Notes Offered.—Ames, Emerich & Company, New York, N. Y., are offering for subscription at $98\frac{1}{2}$ and interest, yielding 7.80 per cent \$850,000 of two-year 7 per cent secured gold notes of the Richland Public Service Company. The company is a subsidiary of Cities Service Company. It owns or controls and operates the only electric light, power and street railway system in Mansfield, Ohio, the interurban railway between Mansfield and Shelby and one of the two gas distribution systems supplying natural gas, principally for domestic use, in Mansfield, and is also furnishing electric current to the local company at Ashland for distribution by it. The notes are dated March 15, 1920.

Representatives of Bankers in Charge.—Charles Day and John E. Zimmerman, Philadelphia, Pa., will become managers of the Ohio Electric Railway on April 1, according to announcement made by F. A. Healy, secretary and treasurer of the company. Mr. Healy said no change will be made in the personnel of officers and employees of the company. H. Gordon Gilpin will retain his position as general manager and Mr. Healy will remain as secretary and treasurer. Mr. Healy said that the bankers and bondholders' protective committees have agreed with President W. Kesley Schoepf that the company should be turned over to Messrs. Day and Zimmerman, to be managed by them as the bankers' representatives.

Pittsburgh Doing Better.—An investment banking circular reviewing the affairs of the Philadelphia Company, which controls the Pittsburgh Railways, says: "The ownership of the Pittsburgh Railways, heretofore treated by the company as a non-revenue producer, has great possibilities of developing into a source of income, as cash fares have been increased from 5 cents to 10 cents. The company sells tickets also at the rate of four for 30 cents. The gross receipts have thus increased from about \$32,201 a day in 1914 to about \$53,700 a day in 1919. The company now is understood to be earning all of its fixed charges. The valuation placed upon the transit system by appraisers indicates that the time is not far distant when under the caption of 'Other Income' will be listed the revenues from the Pittsburgh Railways."

Two New Directors in Philadelphia.—William J. Montgomery and William Y. Tripplé have been elected directors of the Philadelphia (Pa.) Rapid Transit Company to succeed C. E. Ingersoll

and J. J. Sullivan, Jr. Messrs. Montgomery and Tripplé are Philadelphia Rapid Transit Company stockholders of many years' standing. They were elected as direct representatives of the stockholders, following the dissolution of the voting trust, which was made effective on Feb. 12. Mr. Stotesbury was re-elected chairman of the board and Mr. Mitten chairman of the executive committee and president. The election of W. C. Dunbar as vice-president in charge of accounting and finance and G. A. Richardson as vice-president in charge of operation was made in order that they might with greater authority assist President Mitten in the management of the property.

Bond Extension Arranged.—The Cleveland, Southwestern & Columbus Railway has arranged for the extension until Feb. 1, 1923, of the \$110,000 of twenty-year first mortgage bonds of the Norwalk Gas & Electric Company, due on April 1, which issue it has assumed to pay by agreement of consolidation. The company found it was practically impossible at the present time to refund the bonds in the ordinary way and that the only course available was to provide for a short extension. The bonds will accordingly be extended until Feb. 1, 1923, at the same rate of interest, namely 6 per cent. In consideration of this extension the company proposes to make an immediate cash payment of \$14.17 on each \$500 bond. Thus the bonds during the period of extension will net the holder slightly more than 7 per cent annually. The company hopes that with the continued improvement in its earnings, the most satisfactory in its entire history, and with the termination of the present stringency in the money market it will have no difficulty in paying the bonds promptly at the extended maturity date.

Referendum on Dividend Increase.—Councilman H. C. Gahn, Cleveland, Ohio, stated on March 26 that he and associates will soon file more than 6,000 additional names asking for a referendum vote on the ordinance increasing the rate of dividend on Cleveland Railway stock from 6 per cent to 7 per cent. The Tayler service-at-cost ordinance fixed the rate of return at 6 per cent, but when the trainmen were granted an increase in wages some time ago the company asked for an increase in dividends on the basis that stockholders are entitled to an additional income just as much as are the employees. Two or three weeks ago Judge Dan B. Cull held that the original petitions were not sufficient. The fifteen-day limit claimed by Mr. Gahn for securing additional names expired on March 24. City Clerk Benkoski will be asked to certify the petitions, after which Council will be requested to order the question placed on the ballots at the next election. The decision of the arbitrators permitting the increase in the rate of dividend was reviewed at length in the ELECTRIC RAILWAY JOURNAL of Jan. 3, page 71. The decision of the city to arbitrate was reached last July.

Traffic and Transportation

May Order Zone System

Washington Company's Case Before Commission—Must Have More Revenue

A zone-fare system may be introduced in Washington, D. C., as a solution of the financial difficulties of the Washington Railway & Electric Company. That such a system might be established in the national capital became evident on March 23 when the Public Utilities Commission of the District of Columbia opened hearings on the company's application for relief further than that afforded by the present 7-cent cash fare with a ticket rate of 6½ cents.

The company now asks a flat 7-cent fare with a 2-cent charge for transfers. The application for the increase was filed with the commission early in January. At that time it was stated that the company must secure additional revenue. W. F. Ham, president of the road, informed the commission at the hearing on March 23 that during the past twenty months the company had failed to meet expenses by more than \$1,000,000.

THOROUGH INVESTIGATION PROMISED

The commission announced that it would go thoroughly into the company's condition with a view to working out a satisfactory plan of operation. In this connection Commissioner Kutz stated that the board would make a study of the zone plan in order that, if found advisable, it might order its adoption by the company. He instructed President Ham, for the Washington Railway & Electric Company, and Vice-President Hanna, for the Capital Traction Company, to prepare suggestions of a specific nature regarding the possible results of the installation of a zone system.

The 7-cent cash fare with four tickets for 25 cents, has been in effect since Nov. 1, 1919. The Capital Traction Company is also charging 7-cent cash fares, but is asking no further relief. The latter company is, however, a party to the present proceedings by order of the commission.

COMPANY'S PLIGHT GRAVE

Mr. Ham informed the commission that his company could not long continue to provide the present standard of service unless it were granted further relief. He went over the road's financial condition in detail and presented figures to show that during the past twenty months the company had furnished service at a loss of \$1,147,960. During the fourteen months previous to Nov. 1 the road rendered service at \$936,565 less than cost. Mr. Ham called the commission's attention to the fact

that the company had passed both its common and preferred stock dividends, and that its 6 per cent bonds were now on a 12½ per cent basis. He stated that the company was facing default on the mortgage bonds of the City & Suburban Railway and that the officials had almost reached the limit of their ability to keep the system together.

President Ham then presented figures of the company showing a comparison of earnings for the company immediately prior to and immediately following the last raise in rate, on Nov. 1. He said that following Nov. 1, the average earning was slightly more than \$14,000 per day, whereas during October the average earning of the company was slightly less than \$12,800 per day.

FALLING OFF IN CAR RIDERS

He presented a mass of detailed figures showing the combined averages of the Capital Traction Company and the Washington Railway & Electric Company with regard to pay passengers and transfers, tending to show the falling off of gain in passenger traffic following the raise in rates.

One of the strongest points presented by the company was a table of statistics showing the operations of the Washington Railway & Electric Company for four months ending Feb. 29. The total operating income for the system, including subsidiaries, was placed at \$1,779,404, and the operating expenses, taxes and miscellaneous items were figured at \$1,594,413, leaving a balance of \$184,990 available for the return upon investment, without payment of interest on bonds or dividends upon common or preferred stock.

Commission Hearing on Railroad Crossing Protection

The Railroad Commission of Wisconsin will hold a hearing in Madison, Wis., on April 9, for the purpose of determining whether or not it should issue an order prescribing trolley guards and other protective devices at all grade crossings of steam and electric railroads. The commission has received a number of informal complaints about the absence of trolley guards at such crossings and the question has been emphasized by several accidents occurring during the past year.

The commission's staff has studied the matter and has come to the conclusion that conditions warrant the establishment of a general rule in this connection. It will be the purpose of this hearing to afford an opportunity to the public, electric railways and steam roads to present their views on the subject.

Higher Fare Certain

Federal Court Authorizes Binghamton Receiver to Apply to Commission for Six-Cent Rate

Higher fares for the Binghamton (N. Y.) Railway are assured. Judge George W. Ray of the United States District Court on March 17 issued an order granting W. G. Phelps, receiver for the road, permission to apply to the Public Service Commission for the Second District for authority to raise the rate from 5 cents to 6 cents. The Binghamton City Council had previously passed an ordinance authorizing the increase, following the refusal of the company's carmen to return to work until the municipal government had acted favorably on Mr. Phelps' application for a fare increase.

Since the City Council has already sanctioned the 6-cent fare, the Public Service Commission is expected to give its assent to the increase without further delay. Mr. Phelps has announced that as soon as the commission has issued its formal order, he will begin carrying out the terms of the ordinance passed by the City Council.

WILL RAISE WAGES

These call for the purchase of additional equipment, including fifteen new cars, and for other improvements in service. They also provide for an increase in wages as demanded by the men. It is believed that the additional revenue to be derived from the 6-cent fare will prove adequate to meet the expense to be incurred by the company in making the contemplated changes.

The company has been endeavoring to secure an increase in fare for many months. The City Council refused to pass an ordinance suspending for the duration of the war and for two years thereafter the franchise provision limiting the fare to 5 cents. Receiver Phelps then applied to the Federal District Court, alleging that there was in existence no contract between the company and the city limiting the rate of fare which might be charged by the former. The city objected to the jurisdiction of the court to determine this question. The court sustained the city's contention and refused to intervene.

HARD FIGHT FOR INCREASE

The company then sought the aid of the State Courts in an effort to secure a fare increase from the Public Service Commission. Justice Charles E. Nichols of the New York Supreme Court handed down an order last November restraining the commission from granting the company a higher fare on the ground of lack of jurisdiction growing out of the fare provision of the road's franchise. The company then turned once more to the City Council. Affairs were brought to a crisis by the demands of the men for an advance in wages. Mr. Phelps announced that under the present fare the company could grant no further wage increase. The men struck when the City Council seemed unwilling to help the company.

Ten-Cent Fare Upheld

Pittsburgh Valuation Fixed at \$62,500,000—This Is Less Than Company Asked, but More Than City Would Admit

In an opinion handed down on March 23 the Pennsylvania Public Service Commission upholds as "fair and reasonable" the present "basis" carfare of 10 cents charged by the Pittsburgh Railways. The valuation of the company's properties was fixed at \$62,500,000. This is \$14,500,000 greater than the \$48,000,000 valuation contended for by the city of Pittsburgh and \$7,500,000 less than the \$70,000,000 figure urged by the company. The company is capitalized at a total of \$156,000,000.

FINANCIAL REORGANIZATION NECESSARY

A complete financial reorganization of the company is declared necessary by the commission. Ten million dollars is set as the sum necessary for rehabilitation of the lines and rolling stock.

A physical valuation of the railways company properties, in order to determine a fair valuation, and therefore fix a fair rate of fare, was ordered by the commission, through Chairman Ainey, a little more than two years ago. In charge of an engineering board of five members, headed by Dr. F. Herbert Snow, chief engineer of the commission, as chairman, and including J. A. Emery and Morris Knowles, representing the traction interests, and Robert M. Feustel and George W. Fuller, representing Pittsburgh and surrounding municipalities traversed by the lines of the Pittsburgh Railways, the valuation was completed late last year, and submitted to the commission. The commission said:

The complainants (Pittsburgh and other municipalities) urged a valuation of \$48,000,000, while respondent (the Pittsburgh Railways and Philadelphia companies) contended for \$70,000,000.

The commission is convinced under all the testimony that even if the evidence would warrant it, a valuation of \$48,000,000 would defeat the very purpose which the city and other complainants have in view, to wit, the rehabilitation of respondent's property upon a new and better financial basis, and the improvement and extension of its service to properly care for the present and future needs of the city and surrounding territory.

Upon such a valuation, the receivership would no doubt continue until foreclosures of mortgages disintegrated the unified system and left the city and vicinity with a number of separately operated street railway companies, each charging fares, to care for the public. This is unthinkable, and, by this report, we believe that we have laid the foundation for all that the complainants desire, or the public may require.

TRANSIT IMPROVEMENTS ESSENTIAL

At the risk or redundancy, but with a view of retaining the emphasis of our former statements, the commission again averts to the fact that the most important question now affecting the city of Pittsburgh, with respect to its transit problems, is improvement in street railway service; that improvement cannot be secured except by the expenditure of a large amount of money, a part of which, at least, would represent new capital requirements and a portion to be devoted to replacements of tracks, acquiring new equipment to take the place of some that must be superseded. In reaching its conclusion, the commission has at all times had these matters in mind, and its final determination is made with that end in view. It recognized the difficulties in the way of accomplishment, and that conditions which arose in former years are not easily overcome or set aside.

A program by which the amount required might be so divided that a part would be

chargeable to capital and the balance amortized over a course of years would furnish a solution. Under all the evidence of the case, and taking into consideration all the measures of value set forth in the Public Service Company law, the commission finds that the fair value of respondent's property considered as a going concern is \$62,500,000.

An order will be issued dismissing all complaints in so far as they relate to the rate of fare.

Upholding the 7½-cent fare, the commission's order kills all value in rebates given riders under earlier changes in fare. Also the commission, noting a previous decision upheld in the courts, reiterates its right to ignore municipal franchises with the railways in which the rate of fare, usually 5 cents, was fixed in the franchises, and such franchises, where affecting the railways company, are set aside.

On the fare question, the commission, after reciting increases in fare preceding fixing of the present 7½-cent fare says:

None of the tariff changes, except perhaps the last, gave to the respondent company the gross revenue it anticipated.

The last increase in wages (not the recent one announced for April 1) of respondent's employees, made under the direction of the War Labor Board, increased the gross operating expenses of respondent by approximately \$1,000,000 a year. Neither in the testimony, nor by argument, was it seriously contended by complainant that the gross revenue obtained under the last tariff, which was filed by the receivers, was more than the respondent was entitled to receive.

The engineering conference unanimously determined upon careful estimates that the operating costs, including taxes for 1920, would be \$14,086,000. This estimate did not take into consideration the item for increased wages above referred to, calling for an additional expenditure of approximately \$1,000,000. This amount must be added to the estimate of the valuation board.

The lowest valuation for rate making purposes advocated by any of the experts called by the complainant was \$48,000,000 (the city's proposed valuation), and we fairly assume therefrom, and from all the testimony in the case, that a valuation less than that amount would be, in result, a confiscation of the respondent's property. If a 7 per cent return were allowed on that amount it would entitle the respondent to \$3,360,000.

Adding this to the estimated operating expenses would make \$18,446,000 as the practically conceded annual revenue requirements of the respondent. Measure against this amount is the uncontradicted testimony of witnesses as to the probable gross income of respondent from all sources during the year 1920. This amount is estimated at \$17,642,601, showing a deficit in operating account on the assumed basis.

It was argued with some force that high rates of fare did not tend to increase the number of passengers carried, and that, therefore, the respondent company might make up a portion of its required revenue by stimulating the riding habit in the territory served if lower rates were charged.

While the respondent has put into effect a basic rate of 10 cents, a very large part of its patrons buy tickets (metal tokens) entitling them to ride for 7½ cents, which, therefore, is the controlling rate in the present instance.

The commission cannot say that such rate is prohibitive per se.

It would not, therefore, be justified under all the circumstances disclosed by the evidence in interfering with the discretion of the receivers appointed by the Federal Court to operate this property, as long as these rates will not provide a gross revenue larger than the respondent is entitled to receive.

The sequence of events in order to bring respondent's service to the standard of efficiency necessary to meet the public needs in the city of Pittsburgh and adjoining territory, must be (a) the rehabilitation and readjustment of the company's financial relationship both with the holding company and with the underlying companies upon a basis of fair value; (b) the secur-

ing of additional moneys with which to make these improvements to care for deferred maintenance and provide additional equipment; (c) a readjustment of some of the franchise obligations whereby the operating company may be relieved from unnecessary burdens of maintaining tracks which are not now used or which might, with propriety, be abandoned; (d) the granting by ordinance of certain privileges which would permit a better routing of cars, more expeditious and less crowded service, and all leading to economics in operation which would be reflected in reduced operating expenses and no doubt in an increase in the number of passengers carried.

To accomplish these improvements will require thoughtful and broad-minded co-operation between the municipalities and the railways company.

It was unanimously agreed in the engineering valuation board that the rate of return on its investment to be allowed the railways company would be 7 per cent.

The city of Pittsburgh will ask an immediate rehearing before the Public Service Commission of its decision fixing the valuation of the Pittsburgh railways at \$62,500,000. It was announced by Mayor E. V. Babcock that if necessary the valuation will be appealed from the commission to the highest courts in the state. It is predicted that a flat 10-cent car fare will succeed the present 7½ cent fare.

Anti-Jitney Publicity

The Danbury & Bethel Street Railway, Danbury, Conn., has been publishing some excellent talks on jitney operation and competition. The following statements are from a recent advertisement in one of the Danbury newspapers:

We hear a great deal nowadays about the "trackless trolley" and how it will soon supersede the street car which runs on a track. Much of this talk is being fostered by motor bus and tire manufacturers in order to induce people to go into the jitney bus business and buy their wares. This is not the opinion of trained and experienced men who have given a life study to problems of urban transportation. It is now generally conceded by men who know what they are talking about and are not interested merely in advancing the sale of their products but in solving in a very real way the problem of transporting people through the streets of our cities by the cheapest and best method possible, that the only practicable and satisfactory method is the use of tracks.

Even Henry Ford, who a few months ago preached a funeral sermon over the trolley, has changed his mind and has become convinced that the street car on a track is an absolute necessity. His latest invention, the "gasolene street car," runs on a track.

Not one of the 114 experts, publicists, public officials or traction men who testified before the Federal Commission, seriously proposed a return to the independently operated stages or buses of pre-horse-car days, moving at will over the entire surface of the streets, taking their chances among other vehicles and making hopelessly unmanageable addition to the already over-congested traffic.

Do not be deceived by the half-baked and ill-considered opinions of men who tell you that in a few years there will be no street railway tracks in any of our cities. If the tracks are taken up in Danbury and Bethel it will not be because they have become obsolete as a method of transportation and supplanted by a better method, but because the people have given their support to the jitneys instead of to the trolley for the time being and compelled the receiver to discontinue service, dismantle this valuable property and sell it for junk. If the people of Danbury and Bethel are short-sighted enough to refuse to support the trolley and save it for the future, in a very short time they will regret the course they took when they realize that in other towns and cities the trolley has survived the jitney and that the people of these other communities are enjoying facilities which are denied to the people of Danbury and Bethel. Think this over.

Kalamazoo Will Vote on Seven-Cent Fare

The local railway problem in Kalamazoo, Mich., appears to be in a fair way toward settlement. An agreement has been entered into between the City Commission and the Michigan Railway which provides briefly for the suspension of the rate of fare fixed in the company's franchise and for the making of certain improvements by the railway.

To give the contract effect the matter will be submitted to the citizens on April 5 for a vote. It is proposed to permit the railway to charge a 7-cent fare, the company agreeing in consideration of this rate to create an improvement fund to be made up of 1 cent from every fare collected. Improvements amounting to \$200,000 will be made. The improvement work will not, however, await the accumulation of the fund. The company will arrange to start the work immediately, financing it by obtaining a loan if necessary. The City Commission agrees to act substantially as follows:

Submit to the electors next April a proposition empowering the City Commission to suspend clauses in existing agreements with the Michigan Railway having to do with the rate of fare to be charged and to permit the company to charge a straight 7-cent fare entitling passengers to transfer privileges.

Designate two members of the City Commission to act on board of trustees, whose business shall be the establishment of trust fund to be made up of 1 cent from every fare for the making of improvements in the railway service.

Pass on construction program of company excepting so far as the Portage Street improvements are concerned, the latter being specified in the agreement.

Exercise the privilege of purchasing the company's lines, if the Commissioners see fit so to do, within a five-year period.

Terminate the agreement with the passing out of the original franchise in 1923.

The company agrees substantially as follows:

Devote 1 cent of every fare collected toward the establishment of a fund to be kept in the bank designated by the city for making of stipulated improvements.

Borrow money on the strength of the new agreement so that the improvements may be made and thirty-six new cars obtained at once, and liquidate the debt incurred out of the foregoing fund, bearing interest charges out of its own revenue.

Appoint one trustee to manage the trust fund with the two trustees designated by the city.

Proceed with construction work in Oakland Drive to the extent of \$36,000, and or Portage Street to the extent of \$96,000, and buy thirty-six new cars, the total program calling for an expenditure of \$192,000.

Agree to sell, should the city decide to buy the lines, within five years.

The city retained Delos F. Wilcox, New York, as its consultant to advise on the railway matter.

New York Bus Rights Before Court

Federal Judge Julius M. Mayer on March 19 ordered Job E. Hedges, receiver for the New York (N. Y.) Railways, to institute legal proceedings to prohibit the operation of privately owned buses in competition with the company's lines. The company will ask that the buses be barred on the ground that they have no franchises and have failed to obtain certificates of convenience and necessity from the

Public Service Commission for the First District. It is estimated that the competition of buses is costing the company approximately \$34,000 monthly. E. L. Winthrop, of counsel for Mr. Hedges, told Judge Mayer that the company's cash balance amounted to \$680,602, or \$198,305 less than the predictions made a month ago forecast.

Acting on behalf of Manhattan taxpayers, E. L. Schafer has obtained from Justice Newburger a temporary injunction restraining the city from using an appropriation of \$1,140,000 made by the Board of Estimate for the installation of additional municipal bus lines. The order was obtained on the grounds that the bus project would incur indebtedness other than for city or county purposes in violation of the State constitution; that the city has not received from the Legislature any power to use the credit, or the funds, of the city for such a purpose and that the city, as a municipal corporation, possesses no franchise to operate bus lines.

Accepts Columbus Grant

The Columbus Railway, Power & Light Company, Columbus, Ohio, on March 9 filed with the City Clerk its acceptance of the 6-cent fare ordinance recently passed by the City Council. The ordinance provides for a 6-cent cash fare for a six-year period. During the first two years the company is to sell five tickets for 25 cents and during the remaining four years six for 25 cents. Opponents of the measure have circulated petitions for a referendum on the question. The company on March 12 asked the Common Pleas Court to restrain the Columbus City Clerk from certifying the referendum petitions on the ground that they did not comply with the provisions of the law.



Six-Cent Fare Continued.—By order of the Illinois Public Utilities Commission the 6-cent fare now charged by the Springfield Consolidated Railway will continue in effect until May 1.

Jitney Bonds in New Albany.—The City Council of New Albany, Ind., has passed an ordinance requiring jitney operators to deposit with the municipal authorities bonds of \$1,000. The fare is limited to 5 cents on improved streets.

Wants City to Operate Lines.—Municipal ownership of the Phoenix (Ariz.) Railway is asked in petitions which are being circulated in Phoenix by M. J. Morley. Several thousand signatures have already been signed to the petitions.

Eight Cents in Alton.—The Illinois Public Utilities Commission has authorized the Alton, Granite & St. Louis Traction Company, Alton, to charge 8-cent cash fares and to sell two tickets for 15 cents. The present fare is 7 cents.

Six Cents in Centralia.—The Centralia & Central City Traction Company and the Centralia Traction Company, which operate in Centralia, Ill., have received permission from the State Public Utilities Commission to raise their fare from 5 cents to 6 cents.

Seven Cents in Pleasantville.—The Atlantic & Suburban Railway, Pleasantville, N. J., has received permission from the State Board of Public Utility Commissioners to raise the fare in each of its zones from 6 cents to 7 cents, beginning April 1. The company will sell tickets in strips of ten for 65 cents.

Traffic Probe in New Orleans.—The Association of Commerce of New Orleans, La., has appointed a committee to conduct an investigation of traffic conditions in that city. The committee will study the service furnished by the New Orleans Railway & Light Company and will make suggestions for its improvement.

Asks More in Shreveport.—The Shreveport (La.) Traction Company has petitioned the Shreveport City Commission for an increase in fare from 5 cents to 7 cents. The company asks that the question of amending its franchise to permit the fare to be raised be submitted to the voters at a referendum election.

Ten Cents Asked in Nashua.—The Nashua (N. H.) Street Railway has petitioned the State Public Service Commission for permission to increase its cash fare from 8 cents to 10 cents. The company hopes by raising the cash fare to increase the use of metal tokens, which it plans to sell at the present rate of five for 35 cents.

Increase on Connecticut Line.—Judge L. F. Burpee of the Superior Court has authorized an increase in the fare charged by the Hartford & Springfield Street Railway, Warehouse Point, Conn., to 10 cents in each zone. The new rate is approximately 3 cents a mile. The fare between Springfield and Hartford is increased by 5 cents.

Five Cents to Coney Island.—Fares between points in Manhattan and Brooklyn and Coney Island on the lines of the Brooklyn (N. Y.) Rapid Transit Company will be reduced to 5 cents on May 1, when the company's through rapid transit lines to the island will be ready for operation. Under the dual contracts it was provided that no more than a nickel should be charged for a continuous ride from any point in the city to the island, but the company has been charging 10 cents because it has been necessary to break the continuous ride provision by a transfer.

Oppose Fort Wayne Increase.—The City Council of Fort Wayne, Ind., has passed a resolution directing the Mayor

to take steps to prevent the Public Utilities Company, which operates the Fort Wayne city lines, from raising its fare. The company has applied to the State Public Service Commission for permission to increase the fare from 5 cents to 7 cents.

One-Man Cars in Franklin.—The Citizens' Traction Company, Oil City, Pa., has placed a number of Birney one-man safety cars in operation on its lines in Franklin, Pa. B. C. Everingham, executive secretary of the Franklin Board of Trade, has written a letter to J. H. McClure, general manager of the company, expressing approval of the use of the cars in Franklin.

\$1,500,000 Improvement Plan for Cincinnati.—Several important changes in car routing will be made by the Cincinnati (Ohio) Traction Company during the next few months. Walter F. Draper, vice-president of the company, has informed Street Railway Director W. C. Culkins that the carrying out of the company's improvement program will involve an expenditure of \$1,500,000.

New Safety Campaign in Youngstown.—The Pennsylvania-Ohio Electric Company, the successor to the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, is about to engage in an intensive safety campaign. It has retained the Bureau of Safety, Chicago, to direct the work. Safety committees have been organized for the different departments, also a general safety committee.

Three Cents a Mile on Kansas Lines.—The Kansas Court of Industrial Relations, which has taken over the work of the State Public Utilities Commission, has granted the Kansas City, Kaw Valley & Western Railway, Bonner Springs, Kan., and the Joplin & Pittsburg Railway, Pittsburg, Kan., an increase in fare to 3 cents a mile. Commutation tickets are to be sold at the rate of 2½ cents a mile.

Chicago Traffic Survey Starts.—John A. Beeler, traffic expert, who has been retained by the Chicago (Ill.) Surface Lines to make a survey of traffic conditions in Chicago, has announced that he will begin his investigation of transit conditions in that city at once. Mr. Beeler will go thoroughly into the matter of car routing with a view to evolving a plan of relief in the congested sections of the city.

Paving Neglect a Misdemeanor.—The City Commission of Phoenix, Ariz., has passed an ordinance under the terms of which it will be a misdemeanor for any electric railway operating within the city limits to neglect improvements ordered by the commission. Under the ordinance failure on the part of the Phoenix Railway to comply with an order of the commission is punishable by a fine of \$200 for each day the company fails to obey the order.

May Raise Dallas Fares.—An increase in revenue is necessary if the Dallas (Tex.) Railway is to take any

steps to improve its service. Announcement to this effect was made recently by J. M. Everman, who has been appointed supervisor of public utilities for Dallas. Mr. Everman is understood to favor an increase in the company's fare. It is reported that he will shortly request the City Commission to grant a higher rate and at the same time to order improvements in the service furnished by the company.

Decision Against Commission.—The Court of Appeals of New York has denied the appeal by the Public Service Commission from the decision of the Supreme Court, which granted an alternative writ of prohibition preventing the commission from hearing an application of the receivers of the Manhattan & Queens Traction Corporation for an increased fare. The court stated that the order of the lower court was not appealable as a right and that the permission granted by the Appellate Division to appeal had been revoked.

Demand Utility Board's Removal.—Charges of neglect of duty and misconduct in office have been made against the New Jersey Board of Public Utility Commissioners by the Mayor and Aldermen of Jersey City. The Jersey City officials have asked Governor Edwards of New Jersey to remove the commissioners from office. The board is arraigned on eighteen counts, which seek to show that the board has failed to serve the public, has been unduly dilatory and formal, and has favored the Public Service Railway.

Wants Philadelphia Service Improved.—William S. Twining, director of city transit of Philadelphia, Pa., in a recent statement declared that the Philadelphia Rapid Transit Company would require 600 additional cars to provide service equal to that of 1914. Mr. Twining announced that he was prepared to demand the placing of many additional cars in operation, the taking over of the Frankford "L" by the company, and the utilization of streets at present unused, to relieve the congestion in the central part of the city.

Bus Lines Planned for Detroit.—The Detroit Motor Bus Company, formed in Detroit, Mich., for the operation of bus lines in that city, has now organized permanently with the following officers: President and general manager, R. W. Meade; vice-president, S. D. Waldron; secretary, Sherman D. Callender. The board of directors besides the foregoing officers, includes H. W. Alden, W. F. Evans, Edwin Denby, W. J. Kennedy and others. The company plans to establish service on one route in the near future and later to extend it to include others.

Zones for Philadelphia?—Joseph A. Lewis, president of the Cliveden Improvement Association, Philadelphia, Pa., testifying before the State Public Service Commission on March 19, declared that the Philadelphia Rapid Transit Company planned to introduce

a zone-fare system in Philadelphia. Mr. Lewis asserted that the location of the conductor in the company's side-door cars indicated that the company intended to install such a system. The conductor in this type of car is stationed at the rear of the side exit. Mr. Lewis argued for a 5-cent fare with universal free transfers.

Setback for Hylan's Staten Island Plan.—Mayor Hylan's plan to operate city-owned cars over the tracks of the Staten Island Midland Railroad, Richmond Borough, New York City, has encountered an obstacle. The Mayor proposes to seize the tracks of the company, which suspended operation early in January, and to purchase twenty cars from the Emergency Fleet Corporation. Corporation Counsel Burr now informs his Honor that for him to operate cars over the Midland's tracks would violate the city's agreement with the company. The latter holds some twenty-five franchises, of which 50 per cent. provide from sixty to ninety days' grace which the company is allowed in warning before the termination of the franchises.

Urges Reduction for Regular Riders.—Lower fares for short-haul rides, retention of the present 5-cent fare for regular riders, and an increase to 6 or 7 cents in the rate paid by casual riders, are advocated as a partial solution of New York City's transit difficulties in a brief recently submitted to the Public Service Commission for the First District and to Judge Mayer of the United States District Court. The brief was prepared by William M. Speer for Elon S. Hobbs, who represents the minority bondholders of the Interborough Consolidated Corporation. Mr. Speer advocates a 3-cent fare for short rides on the surface lines. He would retain the present 5-cent fare in the shape of commutation tickets and would raise the cash fare to 6 or 7 cents.

City Loses Fare Fight.—The city of San Antonio, Tex., lost its fight before the United States Supreme Court for an early hearing of appeals brought by the city from Federal Court decrees restraining the city from interfering with the San Antonio Public Service Company in putting into effect higher fares as authorized by Judge Duval West of the United States District Court. Judge West, after a hearing before a master who made a report on the earnings of the company, held that the 5-cent fare authorized by the city of San Antonio was confiscatory, and declared that the company had the right to charge such fares as would assure an adequate return on invested capital. Acting on this decision, the company announced an increase in fares through the inauguration of the zone system. The city then sought an injunction in the Federal Courts, and being denied the relief sought, it appealed to the Supreme Court. Motions to expedite the hearing were denied by that body during the week ended March 13.

Personal Mention

Nominations for A. I. E. E. Officers

At the meeting of the board of directors of the American Institute of Electrical Engineers held in Pittsburgh, Pa., on March 12, the report of the committee of tellers on its canvass of the nomination ballots cast for candidates for the Institute offices falling vacant July 31 next was presented. As required by the constitution of the Institute, the board then selected by ballot its list of "directors' nominees," with the following result:

For president—A. W. Berresford, Milwaukee.

For vice-presidents—C. S. Ruffner, New York; E. H. Martindale, Cleveland; Charles Robbins, Pittsburgh; C. E. Magnusson, Seattle; C. S. McDowell, U. S. N.; L. T. Robinson, Schenectady.

For managers—E. B. Craft, New York; Harold B. Smith, Worcester, Mass.; James F. Lincoln, Cleveland.

For treasurer—George A. Hamilton, Elizabeth, N. J.

Bond Anderson has been appointed auditor of the Piedmont & Northern Railway, Charlotte, N. C.

Lucius S. Storrs, president of the Connecticut Company, New Haven, Conn., has been elected chairman of the public utilities section of the Connecticut Chamber of Commerce for the coming year.

Alfred S. March, a member of the New Jersey Board of Public Utility Commissioners, has tendered his resignation to Governor Edwards. Mr. March was appointed to the board by Governor Edge in 1917. He will resume the practice of law.

F. H. Hensel will on May 1 assume the duties of superintendent of the light and power department of the Wilmington & Philadelphia Traction Company, Wilmington, Del. Mr. Hensel will succeed Augustus T. Throop, who has tendered his resignation to take effect on that date.

C. W. Hardesty, traveling passenger and freight agent of the Monongahela Valley Traction Company, Fairmont, W. Va., has been promoted to the position of division superintendent with headquarters at Clarksburg, W. Va. Mr. Hardesty succeeds W. V. Neal.

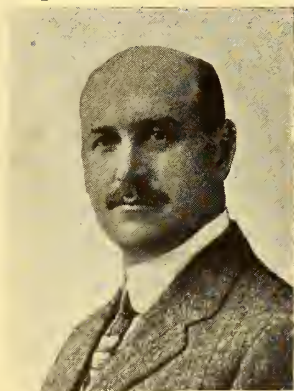
W. V. Hill, formerly manager of the Washington (D. C.) office of the American Electric Railway Association, has reopened his office in the Holbrook Building, San Francisco, Cal., as manager of the California Electric Railway Association. In resuming his work in California Mr. Hill will turn his attention to the many new prob-

lems confronting the electric railways of the State. Charles L. Henry, president of the Indianapolis & Cincinnati Traction Company, has taken over Mr. Hill's duties at Washington, as announced in the *ELECTRIC RAILWAY JOURNAL* for March 6.

Mr. May, Club President

Comptroller of Connecticut Company
Heads New England Body—
Active Association Worker

The New England Street Railway Club has chosen for its president during the coming year I. A. May, comptroller of the Connecticut Company, New Haven, Conn. Mr. May's election as head of the club took place at the



I. A. MAY

meeting of that body at Boston, Mass., on March 25 and 26. The nominations for president and the other officers were made on March 25 and were confirmed by the club at the banquet that evening.

In choosing Mr. May to direct its activities the club has selected a man well fitted both by natural ability and by training to carry on its work successfully. Mr. May is one of the best-known railway men of the New England section. He has for many years been identified with the club's activities, and has also taken much interest in the affairs of the American Electric Railway Association. He is president of the Accountants' Association of the national organization.

An accountant by profession, Mr. May has had a varied and interesting experience during his eighteen years' connection with street railway work. He entered the electric railway business in 1902 with the building of the Berkshire Street Railway in Massachusetts, as clerk and paymaster of the company. Two years later he joined the staff of the Consolidated Railway

in New Haven. Here he handled the railway, electric light, gas and water accounts as head bookkeeper and chief clerk to the auditor. When the Connecticut Company was formed in February, 1910, the Consolidated Railway became a part of that system. Mr. May continued with the Connecticut Company. He was promoted to auditor in 1912 and in the following year was again advanced, this time to the office of comptroller, which he has since filled.

Mr. May passed the certified public accountancy examination in 1915. He is the author of "Street Railway Accounting," recognized as a standard work on accounts in the electric railway field. He is vice-president of the Connecticut Society of Certified Public Accountants. He has served as vice-president for Connecticut of the New England Street Railway Club for the past year.

George C. Towle, formerly general manager of the People's Railway, Dayton, Ohio, resigned on March 1 as manager of the Logansport (Ind.) Utilities Company. Mr. Towle entered the transportation field in 1890 in Ohio. In 1891 he was appointed master mechanic of the Allentown & Bethlehem Rapid Transit Company, Allentown, Pa. He resigned the next year to become superintendent of the Biddeford & Saco Railroad, Biddeford, Me., remaining with the company for three years. In 1895 he left railway work for manufacturing, but returned to it in 1900, when he was placed in charge of the Houghton County Traction Company, Houghton, Mich., by Stone & Webster. Two years later he was transferred by Stone & Webster to Ponce, Porto Rico, where for two years he had charge of the organization and construction of the Ponce Railway & Light Company. He then took charge of the Mattoon and Charleston properties of the Central Illinois Traction Company, Mattoon, Ill., and later of the Syracuse & South Bay Electric Railroad, Syracuse, N. Y. In 1906 he was appointed general manager of the People's Railway, subsequently receiving a similar appointment with the Springfield (Ohio) Railway. In October, 1919, he severed his connection with the latter company and in February of the present year he withdrew from the management of the People's Railway to take charge of the rehabilitation of the Logansport Utilities Company.

Obituary

Douglas M. Easton, at one time identified with the street railway industry in Massachusetts, died at his home in East Weymouth, Mass., on March 11. Mr. Easton was eighty-three years of age.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

Labor Shortage Cuts Malleable Production

Brass and Bronze Castings Will Be Used in the Railway Field to Replace Malleables Wherever Possible

With the exception of light malleable castings such as are used in trolley construction and on which one prominent railway manufacturer is quoting delivery of from two to four weeks, the malleable market situation is serious. Production in this industry, which includes from sixty to seventy malleable iron foundries, is estimated to be 70 per cent of normal. Railways, unable to place requirements for malleables within a reasonable time, already have ordered certain fittings, castings, etc., to be made up of bronze or brass.

Manufacturers who are making brass and bronze castings in place of malleables are getting 25 to 30 cents per pound, which is cheaper on the average than malleable castings, which range from 18 to 48 cents per pound.

Deliveries on light malleable castings range from two to ten weeks and on heavy castings from three to eight months.

According to the American Malleable Castings Association, there is ample foundry capacity to provide for all known demands, provided labor can be obtained to operate the plants. As the labor shortage appears to be increasing rather than decreasing, no relief from present conditions can be foreseen within the next few months.

Wage Boost for Miners

Increase Amounts to 27 Per Cent to Become Effective April 1—Seasonal Buying Recommended

President Wilson has removed the regulation of bituminous coal prices to become effective April 1 and has transmitted the report of the majority of the Bituminous Coal Commission notifying the mine workers and operators that this must be the basis on which the wage settlement must be made.

The commission awarded the miners a wage increase which is on a 27 per cent basis, the 14 per cent increase of last October to come to an end March 31. The new wage is to continue for two years. In this way the wage contract is terminated in the spring rather than the fall.

In addition to the award, the majority report made recommendation looking to the storage of a minimum of three months' winter supply of bituminous coal by July 1 of each year by federal government departments, public utilities, railroads and domestic

consumers; the study of the Interstate Commerce Commission of the advisability of instituting freight rates on coal lower in the spring than in the fall and winter months, and that steps be taken to minimize as far as possible car shortages in the transportation of coal.

Freight Delays Hold Up Work Schedules

Railways, Waiting for Material and Supplies, Unable to Commence Bonding and Repairing Overhead

Several railways within the past week report having received railbonds and other supplies by parcels post on account of the seriousness of the car shortage. Very heavy weather conditions have held up freight cars throughout the whole winter season, but particularly from the first of the year on. It is only now that some of them are finding their way to their destinations and helping to relieve the critical situation that exists. One manufacturer reports that of one hundred cars ordered from the railway to remove finished products from his factory, only nineteen were sent, and of this number nine were unfit for use because they leaked so badly it would have been unsafe to trust the materials to them. One company reports the receipt of rusted heating devices in a recent shipment made during a storm. It has been virtually impossible to withdraw freight cars from service for repairs because they were so badly needed. Recent orders placed with the steam road car builders promise to give some relief to this situation in the near future. With the condition of steel deliveries this relief is even more likely, because it is understood that steel for railway purposes is getting the preference over that for other industries.

Many manufacturers have resorted to express shipments, and although units have been limited to 200 lb. each, a great amount of material has been delivered in this way.

Certain railroad companies are demanding that their cars be sent back to their own lines immediately—cars which had been allotted to other lines while the roads were under government control. In cases this insistence has been so great that freight cars have gone back empty where with a little manipulation they could have picked up a load, although at a cost of a few days' further delay. This recall of cars to their home lines is undoubtedly going to cause a still greater car shortage than now exists on certain lines and divisions, but it will benefit the home lines.

Demand for Fiber Conduit Shows Increase

Mills Booked Up to Good Capacity with Prospects of an Advance in Prices

Fiber conduit has been purchased in large quantities this spring and mill capacities have been booked for many months ahead. The supply of pulp from Canada is in satisfactory condition for all requirements anticipated for the year. Conduit mills are running in a comfortable capacity, but if they are required to resort to extra shifts to supply a sudden demand during the summer it is expected that a price advance will result, possibly to the extent of 20 per cent.

Sufficient material is on hand to satisfy the orders now booked at the prevailing rate, which has held for some time. Additional business for quick delivery would require overtime labor and fresh ordering of raw materials at a rate higher than on those already laid in. Consequently it is of advantage to companies contemplating extensions wherein fiber conduit would be used to place their orders as soon as possible for shipment as far ahead as can be done, in order to get in on present prices.

It is known that some large contracts have not yet been placed which undoubtedly will have to be placed before the summer is out. At this time there is a certain amount of capacity which can be turned to shipment in five to six weeks. While the popular demand is for 3-in. conduit, there also has been good ordering of other sizes as well.

Trolley Cord Scarce

Heavy Demand for Sash Cord Cuts Down Available Supply for Railways

Bell cord and trolley cord deliveries are now four to six weeks on a fair sized order. Present stocks are practically nil, with but slight chances of obtaining anywhere near enough to fill orders now on hand.

Demands by the building trades for sash cord are partly responsible for the present shortage, as both sash cord and trolley cord are made on the same machine. Also, failure of the railroads to deliver raw materials, yarn, etc., to the manufacturers is a direct cause of lengthened deliveries.

Inquiries and orders from the railroads on bell and trolley cord have assumed considerable volume of late and the manufacturers of cord are hoping to have sufficient quantities to equip

the large number of new cars which are now in process of construction in the plants of the different car builders. For maintenance needs railways must worry along with present supplies until the spring building rush is over, after which deliveries are expected to be improved.

Prices since the first of the year have advanced approximately 5 to 10 per cent on all grades. Quotations on one well-known brand are as follows: No. 8 white, 97 cents per lb., drab, \$1.04 per lb., and mahogany, \$1.09 per lb.

Magnet Wire Scarce

Unprecedented Condition Results in Long Time Deliveries, With No Signs of Immediate Relief

Manufacturers of magnet wire are unable to satisfy the present demand. As far as can be learned there is no mill capacity available under three months, and from that length of time it runs up to nine months in one case. Producers have been carried away by this unprecedented condition, and there is apparent no immediate relief from the situation.

In the case of the cotton-covered magnet wire the greatest factor in the shortage is the dearth of long-fiber cotton. When this supply would increase no one was prepared to say. For enamel wire there was found no particular shortage of enamel, although its price has been constantly increased by the manufacturers. The inability to turn out any more product under present capacity seems to be the main cause, with the result that the manufacturer must scan his list of orders and pro-rate the amount to be shipped to each company.

Better Packing of Supplies

Trolley Catchers and Retrievers Now Packed in Corrugated Board Cartons

Recently a manufacturer of railway supplies and accessories discovered that its trolley catchers and retrievers were not always reaching the purchaser in the best of condition. Rough handling in transit sometimes destroyed the enamel finish and the excelsior used in packing would work up inside and clog the mechanism.

Now each catcher and retriever is packed in a corrugated board carton after final inspection so that as a result the device is protected until it is placed on the cars. A label on the outside identifies the contents and it is therefore unnecessary to open the package until ready to put the retriever in service.

This package service which has been used to a great extent in other lines of business is proving very satisfactory according to reports received from electric railway men.

Rolling Stock

Danbury & Bethel Street Railway, Danbury, Conn., is reported to have placed an order for six safety cars.

Boston (Mass.) Elevated Railway is in the market for six cars for snow removal, some of which will be snow-plows and the remainder snow-sweepers. Four large steel dump cars also will be ordered.

Washington Railway & Electric Company, Washington, D. C., is remodeling and will put in operation fifty summer cars. The cost per car will approximate \$6,000, according to figures filed with the Public Utilities Commission, which has authorized the work.

Michigan Railway, Kalamazoo, Mich., will purchase thirty-six new cars for its lines in Kalamazoo if the voters on April 5 approve the tentative agreement between the railway and the City Commission under which 1 cent of every 7-cent fare which it is proposed to allow will be impounded to create a fund to pay for improvements to be carried out at once.

Northwestern Elevated Railroad, Chicago, Ill., has purchased two new 50-ton electric locomotives. These will be equipped with Westinghouse 567 motors which are of the same type as were specified for part of the last all-steel cars bought by the elevated line. The two electric locomotives will be used in connection with the interchange of freight between Chicago, North Shore & Milwaukee Railroad and the Chicago, Milwaukee & St. Paul Railroad.

Power Houses, Shops and Buildings

Fort William (Ont.) Electric Railway.—Plans have been prepared for an addition to and reconstruction of this company's carhouse. The improvements will cost \$50,000.

Port Arthur (Ont.) Civic Railway.—A portion of the carhouse and four cars belonging to the Port Arthur Civic Railway were recently destroyed by fire. The loss is estimated at \$100,000.

Montreal (Que.) Tramways.—This company will erect a sub-station at a cost of \$75,000.

Cape Breton Electric Company, Sydney, S. C.—Fire recently destroyed the carhouse and two cars of the Cape Breton Electric Company with a loss of \$50,000.

Track and Roadway

British Columbia Electric Railway, Vancouver, B. C.—This company plans to build an interurban line 10 miles long between Cloverdale and Blaine, B. C. A portion of the right-of-way has already been cleared and graded.

British Columbia Electric Railway, Vancouver, B. C.—The British Colum-

bia Electric Railway will shortly double track its extension in Hastings Street East from Renfrew Street to Boundary Road, Vancouver, at a cost of \$17,000.

Pacific Electric Railway, Los Angeles, Cal.—The Pacific Electric Railway has presented to the Chamber of Commerce of Wilmington, Cal., tentative plans for the installation of electric railway service in that city. The plans call for the building of a line by bonds to be voted by the municipality, and for the operation of the same by the Pacific Electric Railway.

Pekin (Ill.) Municipal Railway.—The Pekin Association of Commerce has petitioned the City Council to order extensions to the lines of the Pekin Municipal Railway.

Boston (Mass.) Elevated Railway.—This company is preparing to carry out an extensive improvement program involving a new power installation in its main power house and the reconstruction of its carhouse and yard layout. The proposed track work calls for a thorough rehabilitation and reconstruction. The plan will require about four years for its completion.

Eastern Massachusetts Street Railway, Boston, Mass.—The city of Revere, Mass., has petitioned the Legislature to give the State Department of Public Utilities authority to consider a plan whereby the Eastern Massachusetts Street Railway would secure a lease of the East Boston Tunnel and the track rights of the Boston Elevated Railway in East Boston, and would build two miles of track, in order to shorten the present route between Boston and Revere. Under the plan the company would build a freight station at the western terminus of the East Boston Tunnel.

Public Service Railway, Newark, N. J.—The City Council of Camden, N. J., has requested the Public Service Railway to double track its line in State Street, Camden, for a distance of five blocks.

Cincinnati (Ohio) Traction Company.—The Cincinnati Traction Company plans to reroute several of its lines and to extend its Warsaw Avenue line. The cost of the improvements will approximate \$1,500,000.

Toronto (Ont.) Civic Railway.—The Board of Control has approved the estimates of Works Commissioner Harris for \$168,378 for the construction by the Toronto Civic Railway of a line on the Prince Edward Avenue viaduct.

Montreal (Que.) Tramways.—The Montreal Tramways will shortly begin work on an extension to its Park Avenue line.

Dallas (Tex.) Railway.—The Dallas Railway will shortly begin work on its Masten Street extension.

Virginia Railway & Power Company, Richmond, Va.—The Virginia Railway & Power Company has been authorized by its board of directors to spend \$123,329 in track renewals and exten-

sions. The appropriation will cover the reconstruction of 8,395 ft. of track on Hull Street, four blocks on Main Turnpike, and 700 ft. on Eighth Street, Street, 1,900 ft. on the Petersburg and the extension of the double track at the end of the First Street line for 2,902 ft. Work will begin as soon as materials and competent labor can be procured.

Seattle (Wash.) Municipal Street Railway.—Work has been begun on the East Marginal Way extension of the Seattle Municipal Street Railway. The construction involves the installation of a 3-ft. fill, 1,400 ft. long. The project will cost \$170,000.

Trade Notes

Safety Car Devices Company, St. Louis, Mo., has established a district office in the Munsey Building, Washington, D. C.

American Armature Engineering Company, Bluefield, W. Va., has let contracts for a plant, 40 x 100 ft., at Mullins, W. Va.

The Black & Decker Manufacturing Company, Baltimore, Md., has established a permanent office and showroom at 1436 South Michigan Avenue, Chicago, in charge of R. G. Ames, whose territory has been extended to cover the entire Mid-West. F. E. Marston and J. N. LaBelle will assist Mr. Ames.

Poole Engineering & Machine Company, Baltimore, Md., on Feb. 1 moved its general office from 50 Church St., New York City, to its works at Baltimore. The company will still maintain a district office at 50 Church Street. All general correspondence should be addressed to Baltimore, Md.

The Continuous Rail Joint Company of America has received orders for approximately 2,500,000 continuous and Weber rail joints so far this year. The bulk of this is, of course, in the steam road field. Deliveries are now being made only in time to meet rail deliveries.

Buda Company, Harvey, Ill., announces that Frank W. Marvel, formerly Middle West representative and later in the eastern territory, has again been transferred to Chicago as the Middle-West representative of the company in the electric railway field. Peyton W. Wood, who has been handling the territory in the Middle West will represent the company in Southern territory with headquarters at New Orleans.

Oxweld Acetylene Company, Newark, N. J., and Chicago, Ill., has recently extended its manufacture of oxy-acetylene apparatus and equipment to include "Eveready" welding and cutting outfits. This is a new name but the apparatus is not new, excepting for certain refinements of design, having been used extensively in the metal-working trades for sev-

eral years under the name of "Prest-O-Lite" apparatus.

Standard Underground Cable Company, New York, N. Y., announces that its Detroit sales office, which for several years has been a sub-office of the Chicago office, has been made a full branch office with R. E. Green in charge. Mr. Green has been in charge of the Detroit office since it was first opened. He has been connected with the Standard Underground Cable Company since 1909 as salesman and is well known in his territory.

Western Electric Company, New York, N. Y., has appointed A. Buehler, sales manager at its Minneapolis office. Mr. Buehler joined the company in the early part of 1915, and became sales manager at Omaha during the fall of 1917. Eliot Lum has been promoted to be sales manager at the Omaha office, to succeed Mr. Buehler. Mr. Lum joined the company in 1905, and in 1907, became a member of the telephone engineering department at Chicago. In 1909 he was transferred to the sales department of the Minneapolis house, joining the Omaha organization in a similar capacity in the winter of 1912.

American Steam Conveyor Corporation, Chicago, Ill., has appointed the Kon-Wald Engineering Company, Mutual Life Building, Buffalo, New York, of which F. A. Konzelman is manager, as its representative in Buffalo and Western New York. The Brooks-Fisher Company, Candler Building, Atlanta, Georgia, are now southeastern representatives. J. M. Fisher of this company was for fifteen years in the erection department of the Babcock & Wilcox Company, the last six of which he was district superintendent of the Atlanta territory. E. A. Brooks, was assistant sales manager of the Atlanta office of the Babcock & Wilcox Company.

Ohio Brass Company, Mansfield, Ohio, is introducing its gas-welded type of rail bond into the signal field. It has been the practice in connection with steam-road track signal installations to utilize a long solid wire bond fastened to the web of the rail and with the terminals spanning the splice bars. By contrast, the Ohio Brass bond terminals are fastened to the rail head and only about 3 in. apart. It developed that this short span is a particular advantage, since some 60 per cent or more of the breakages in rails occur through the bolt holes underneath the splice bars. With the long type of bond now used for the signals a rail break of this character does not open the signal circuit, and the signals do not therefore protect against this kind of break. The new Ohio Brass bond, however, would cause the signal to assume the danger position if a break in the rail occurred anywhere. This bond was exhibited at the National Railway Appliance exhibit in Chicago, March 13 to 18, and attracted a great deal of interest among railway signal engineers.

New Advertising Literature

Pelton Water Wheel Company, San Francisco, Cal.: Bulletin No. 10 describing its lines of centrifugal pumps.

W. S. Godwin Company, Baltimore, Md.: Booklet B descriptive of steel paving guard for use with groove girder rail and street railway paving.

Russell Manufacturing Company, Niagara Falls, N. Y.—A catalog on the "Triggerlock Reversible Controller Finger," showing economies possible by use of this product.

American Steam Conveyor Corporation, Chicago, Ill. Folder containing fifty to sixty trade marks and trade names of nationally advertised concerns using American steam jet ash conveyors.

Locomotive Superheater Company, New York, N. Y.—Bulletin: T-5 on the "Advantages of Superheated Steam," setting forth in concise language statements of interest to all power plant owners.

Mitchell-Rand Manufacturing Company, New York, N. Y., has sent out cards of samples of armature twines. The company has adopted a new system of gaging these twines, which greatly simplifies the method of determining sizes.

General Electric Company, Schenectady, N. Y.: Bulletin No. 47,419-A, superseding bulletin No. 47,419, descriptive of its small-capacity industrial oil circuit breakers, type FP-10, 50-amp., 300-volt, for three-phase and quarter-phase induction motors of 25 hp. or less.

Esterline Company, Indianapolis, Ind., Bulletin No. 395 covering power factor recording instruments which points out the evils of low power factor to the central station, to the isolated plant and to the power customer, as well as how to locate and eliminate the causes of low power factor.

The English Electric Company, Ltd., Queens House, Kingsway, London, England: The first number of the English *Electric Journal* dated January, 1920, being Vol. 1, No. 1, of this publication. This company represents under a new name a consolidation of the number of old companies which it controls and operates under one management. It includes the Dick, Kerr Works, Preston; the Ordnance Works, Coventry and Scotstoun; the Phoenix Works, Bradford; the Siemens Works, Stamford; and the Williams Works, Rugby, which with the exception of the Ordnance Works, are all well known as pioneers of the electrical industry in its various branches in England. Many illustrations and descriptions of large turbines, railway motors, control equipment, rolling stock showing multiple unit control equipment as used on the Continent, trucks and third rail equipment, track and roadway construction as well as a number of technical articles are included.