Electric Railway Journal

McGRAW-HILL COMPANY, INC.

JAMES H. McGRAW
President

Consolidation of STREET RAILWAY JOURNAL and ELECTRIC RAILWAY REVIEW

H. W. BLAKE
Editor

H. H. Norris, R. R. Bruster, H. L. Brown, G. J. McMurray, L. E. Stibbe, L. C. Paul, H. S. Knowlton, N. A. Bowers, S. B. Williams

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Some Changes in the Make-Up of the "Journal"

READERS of this paper will notice a number of changes in typographical appearance in this issue, notably in the type used in the captions of articles and in the three-column arrangement in the news department. The fundamental purpose of the former is to utilize the best in the printer's art to "play up" the important facts so that they will appeal to the readers with a force proportionate to their import. Another purpose is to bring in the element of novelty. Just as it is refreshing to shift the furniture and pictures in a room, so in a periodical an occasional change in type face or headings makes a pleasing impression. Three columns have been adopted as standard in the news pages, instead of two, partly because we believe the narrower column will be more easily read, with the size of type used, and partly because of the greater variety of caption sizes thereby made possible. Another change is in the title of the "Equipment and Maintenance" department, to be known hereafter as "Construction, Maintenance and Equipment." This department begins its fifth year with this volume. Since the war began it has proved useful in segregating short articles of a practical character. The new name suggests what has actually come to be the scope of the department. The plan is gradually to enlarge it under the new name to provide full opportunity for the discussion of all live topics of the shop, the track, the line, the power house, etc. Such an opportunity is especially needed now that the war has caused a temporary cessation of the Engineering Association committee work and meetings.

A Review and a Prophecy

WITH the turn of the year comes the time for self-analysis. Our successes will take care of themselves. Our mistakes will persist in calling for correction.

Our industry—and by that we include the financiers, the managements, the Association and the "Electric Railway Journal"—has made mistakes. And the greatest of these mistakes has been the failure to carry out as an industry that policy of full, free and frank publicity which the Association, on the recommendation of its committee on public relations, formally adopted in 1914. Had that policy been put in operation, the railways of this second generation would not be suffering so alarmingly because of the sins of the fathers.

The electric railways have done a great work for this country; and there is still great work for them to do. No greater catastrophe, short of food, fuel and water shortage, can come to the modern community than to have its electric railway facilities crippled or wiped out. What have we done as an industry to bring this fact home to the people?

Like Elijah of old we have been living too long in the cave of pessimism, of fear, of inertia. We have failed to accept the mandate of the Lord to "Go forth and stand upon the mount" to see the world.

And now the time has come when this pessimism, this fear, this inertia must go. We must leave the cave and go out on the mountain in the light and before the people.

Let us first look into ourselves to see what we can do to give good service. Then come frankly forward and tell the people and their regulatory officials what they should do to help, and if the giving of good service really is accompanied by full, free and frank telling of our problems and burdens, the great fair-minded people of this country will give the electric railways the right to charge whatever fare is necessary to keep the railways going, growing, prosperous concerns.

Will the Government Be Able to Give Us More Coal?

NO radical and immediate change in the coal-supply situation is to be expected under the new management of the steam railroads of the country for reasons entirely beyond the control of government, however efficient. Efforts in the line of economy should not, therefore, be relaxed; in fact, they should be pushed to the limit. An excellent start has been made in enlisting the cooperation of employees, which will be urgently needed even if the federal authorities are as successful in improving distribution as we all hope they may be. The stubborn fact is that there is not enough coal to go around. From the reports of the Bureau of Mines and the Geological Survey it is clear that while the coal-mine output has been greatly augmented, the demands are more than proportionately increased, while the quality is quite inferior. The Railroads' War Board, now defunct, which formed a voluntary committee to accomplish the same purpose as that underlying the government's move, claimed that the coal shortage is largely due to poor distribution. That is, coal is purchased at unnecessarily remote points, involving more ton-mileage than is justified by present conditions. This situation can be remedied, at least in part, under the new management. Nevertheless, it must be remembered that the government possesses no magic wand by which coal can be mined without labor, transported without cars, or moved long distances in infinitesimal time. Hence while some hope for relief may be justified the surest relief is that to be secured through economy. If 25,000 tons of coal annually can be saved by the electric rail-

ways in Washington, D. C., as the Electric Railway War Board's conservation committee says can be done, then the possible total for the country is something worth while.

Help, Don't Hinder, the Electric Railways

IF THERE ever was a time when all of us—railways, public and regulators—should pull together, it is now. We are in a period of high prices and scarcity of labor brought on by the war, and electric railway operating expenses have been mounting by leaps and bounds. At the same time the needs of the country for good transportation are greater than ever before. At a period when every productive agency in the country is working at full pressure, it is most important that the urban and interurban transportation systems of the nation, which are an integral part of its industrial life, should maintain their efficiency at its maximum point. No community has the right at this time to oppose any plan which will allow the railways to give better service to the public or will make the demands of the railways upon fuel and labor less.

The nation has awakened to the necessity of obtaining maximum efficiency from the steam railroads. It must be equally ready to remove the hindrances to good service by the electric railways. Of what good is it to transport raw materials to a city factory if thousands of workers cannot enjoy the best possible facilities in going to and from their work that the local railway can give them? A higher fare is necessary to meet the increased expenses of operation, but there are other obstacles which exist as well to efficient electric railway operation. Some of them arise from antique municipal ordinances or popular prejudices, such as objections to the skip stop and to changes in routing, others from the opposition of the labor element to improvements which might tend to reduce the man-power required per car, and still others from financial inability to purchase modern equipment. Now is the time to get these hindrances removed. There are several reasons why this is so.

Two years ago the jitney was looming up as a serious competitor of the electric railway. The jitney was largely the production of unemployment and flourished for a while, but with the present period of high wages, labor scarcity and work for all who wish it, the jitney has largely disappeared. But it may come back to the injury of both the railways and the communities which they serve unless the companies improve this interval to make their properties capable of giving such good service that no one will want to patronize the jitney, if it is here.

A second reason why the present is a most appropriate time for analytically studying scientific operation is that municipal bodies and the public as a whole are taking a fairer and more considerate view of railway matters than formerly. This may be because they are coming to realize the present arduous conditions under which electric railways operate. The discontinuance of several electric railways and the sale of their equipment as scrap have shown that electric roads cannot continue operation indefinitely at a loss. Greater publicity also has helped the people at large to understand somewhat better the problems of the railways and the dependence of the public on good transportation.

Finally, the recent action of several commissions indicates a growing willingness on their part to grant a rate of fare which will enable the companies to earn a fair return on the money invested in the property in public use. If the railways in general have this return, they will be able to do some rehabilitation on a scientific basis. At present and for the past few years about all that most companies could hope to do was to escape the call of the sheriff and the junk man. To earn interest on the investment in the property was beyond them and old equipment had to be used because no other could be bought.

All these improvements could not be made at once, even if the railways had the funds to spend on the new equipment, trackage, etc., necessary. The state of the industrial market would prevent that. But at least each company should know its objective. It is to help the railways to do this that Mr. Layng has written the article on economical operation which constitutes the feature of our reading pages this week. This article is based on a study extending over years of electric railway properties in all parts of the country. Many, if not most of the principles mentioned are not new, but they are mentioned in a new way and data are given to substantiate them. With an awakened sense of responsibility in this country to the necessity of good transportation, we hope that this coming year will bring better times to the electric railways of the country and a broader understanding of their burdens.

Should the article by Mr. Layng on the fundamental principles of electric railway operation help in this direction, the aims of the author and the publisher will be attained.

Making Both Ends Meet Has Been a Real Job

THE high-cost-of-living problem during the past year has been a tough one for electric railway managers to handle. The financial stability of the industry—that characteristic upon which investors have placed so much confidence—has decreased to such an extent that many a company has had marked difficulty in making its net meet its fixed charges. Many railways have found the burden unbearable, and their end has been bankruptcy and foreclosure, as shown in the extended lists published on another page. Still others have been forced farther into suspension of service or actual dismantlement.

Why have utilities offering so essential a service fallen into such a sorry plight that even the hope of successful operation under readjusted conditions after foreclosure has in some cases failed? To look at the industry from a financial point of view, the revenue-producing power, which stood up so well in the face of the jitney onslaught, is in the main unimpaired, and the revenues during 1917 have shown a fair rate of growth. But the cost of operation has increased faster. The rising costs of materials and supplies, together with heavy increases in wages and taxes, have caused a dangerous stringency in income available for a return on the investment.

Complete data are not yet available for the whole calendar year, but those already collated bear out this point. For the first half of 1917, as compared to a similar period in the year previous, electric railways with 8388 miles of line gained 3.14 per cent in operating revenues but suffered an increase of 7.67 per cent in operating expenses and a loss of 4.70 in net revenues.

The operating ratio rose from 63.40 in 1916 to 66.18 in 1917. The showing was perhaps a little better for the first nine months of 1917, when the increase of 5.87 per cent in operating revenues for only 7450 miles of line was so far offset by the 11.02 per cent rise in operating expenses that the net fell off 2.17 per cent, the operating ratio rising from 60.96 per cent to 63.93 per cent. Perhaps, with the increasingly ameliorating influence of fare increases, cantonment and other war travel and the wider development of freight and express facilities, the operating gross during the last quarter will show an even more substantial advance. It is very unlikely, however, that the net for the year will fail to reflect to a marked degree the burdensome influence of increasing costs of operation.

The railways have endeavored to meet the situation in 1917 by the institution of more economical methods, to cut down costs, and by applications for higher fares to increase revenues. In both cases traditions have been handicaps, but, on the one hand, the opposition of unprogressive managers and, on the other, the distrust of rate-making bodies, have become appreciably lessened. In regard to fare increases (we speak of the other matter in detail elsewhere), the year has been encouraging. Recent years had been so full of attempts to cut rate schedules in every conceivable way that the work of seeking general relief seemed to many almost a herculean task, but it has not been so difficult. About fifty fare increases have already been granted, and the full returns for the year's campaign have not yet been received. The commissions have as a rule met the situation with painstaking fairness, with a clear-cut recognition of their paramount rate-making powers under legislative sanction and with a frank acceptance of their share of the responsibility for preserving electric railway service. And the public, when it has been greeted with the best possible service and honest publicity, has not fought legitimate rate increases. We wonder whether the industry ought really to be proud of the fact that only its diminishing coffers finally drove it to an active public-relations campaign! To some men nothing succeeds like success; at any rate, we hope the value of intelligent public-relations work will now be denied by none.

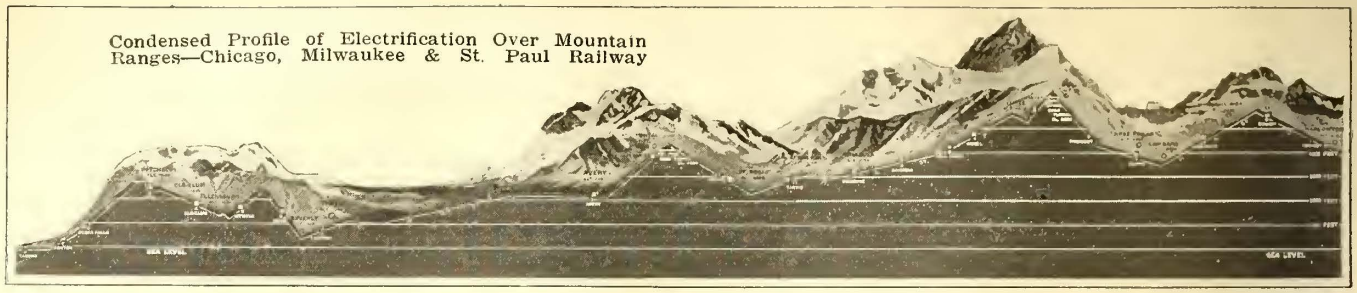
Many more fare increases are needed, of course, but even when these are obtained it is not certain that the electric railway industry will have all the financial relief needed. It must have some direct relief from inflated costs, but this will probably come to some extent through government price control. Moreover, with more than $126,817,000 of securities maturing in 1918 (and issues below $200,000 are not included), and with improved service being demanded for car patrons, the industry needs new capital. It can hardly afford to compete with the government, however, either in borrowing money or in buying new facilities. The war, in short, dominates the whole situation, and the course for the next few months or perhaps years must be planned with this in mind. What does the industry need for its preservation and for the successful prosecution of the war? and how are these requirements to be most economically met?—these are the vital questions of the new year. They can be satisfactorily answered. The past year has shown how constructive co-operation and foresight on the part of railways, commissions and the public bring beneficial results in such work.

The War Should Stimulate Steam Railroad Electrification

WHEN a few days ago the government took over the steam railroads with the stroke of a pen, things that before were remote possibilities came immediately within the range of almost immediate practicability. It requires neither a prophet nor the son of a prophet to predict that if the government continues to control the railroads for a few years extensive electrification must form part of the program. This follows because, if electrified, many roads could be operated with far less coal, and sections near water power would require no coal at all. The experience through which we are now going, with manufactories and utilities handicapped and with a large part of the population suffering or fearful of approaching suffering, has made the words "save coal" an expression to conjure with. And of equal significance is the phrase "save labor." This experience will have great weight with Congress and with individuals and committees controlling public expenditure. Feasible electrification plans will command a ready hearing, even if they involve large capital expenditure, if only ability to save fuel and labor be demonstrated. Under government operation these plans could be carried out promptly, as war measures, leaving the affected roads in much better condition when returned to their owners after the war.

While railroad conditions abroad are not altogether comparable with those in this country it is true that the Swedish, Italian, Swiss and French governments have gone into electrification of the federal railways on a comprehensive scale. The Savona-Ceva electrification, described in last week's issue of this paper, is an example of what was going on in Europe until the war called a halt. Even little Belgium is considering extensive electrification when the Huns have been forced to evacuate her territory and pay her at least in part for the ruin wrought. A London dispatch, dated Dec. 27, states that the Coal Economy Committee of Great Britain has proposed, and the Minister of Reconstruction has announced, a plan for an extensive electrification, including, of course, the railroads. An annual coal saving of a half billion dollars is expected.

The case for electrification is stated clearly by Frank H. Shepard in the first article in the body of the Journal this week. Everything that he says can be demonstrated in railroad practice in this country today. If the Government wants to go ahead the manufacturers can, with Government backing, "deliver the goods." What they can do is being demonstrated in the Milwaukee electrification extension to be practically completed this year. The places to begin are those where heavy freight traffic must be carried over mountain ranges, at which points in general water power is available. Next or simultaneously come congested sections of line which throttle traffic. This will probably be enough for wartime. Fortunately we have enough successfully electrified railroad mileage to prevent any fear of operating failure from entering into consideration. Of course, electric locomotive design is not yet standardized but for that matter neither is that of steam locomotives. With competition eliminated for the time railroad men and electrical engineers might well combine forces at this juncture to show the Government what could and should be done to increase the over all efficiency of our railroads by judicious electrification.



Condensed Profile of Electrification Over Mountain Ranges—Chicago, Milwaukee & St. Paul Railway

Further Railroad Electrification Important

Electrical Equipment Presents a Most Effective Way of Increasing Transportation Capacity—Considerations Why This Is Now a Timely Subject

By F. H. SHEPARD

Director of Heavy Traction, Westinghouse Electric & Manufacturing Company

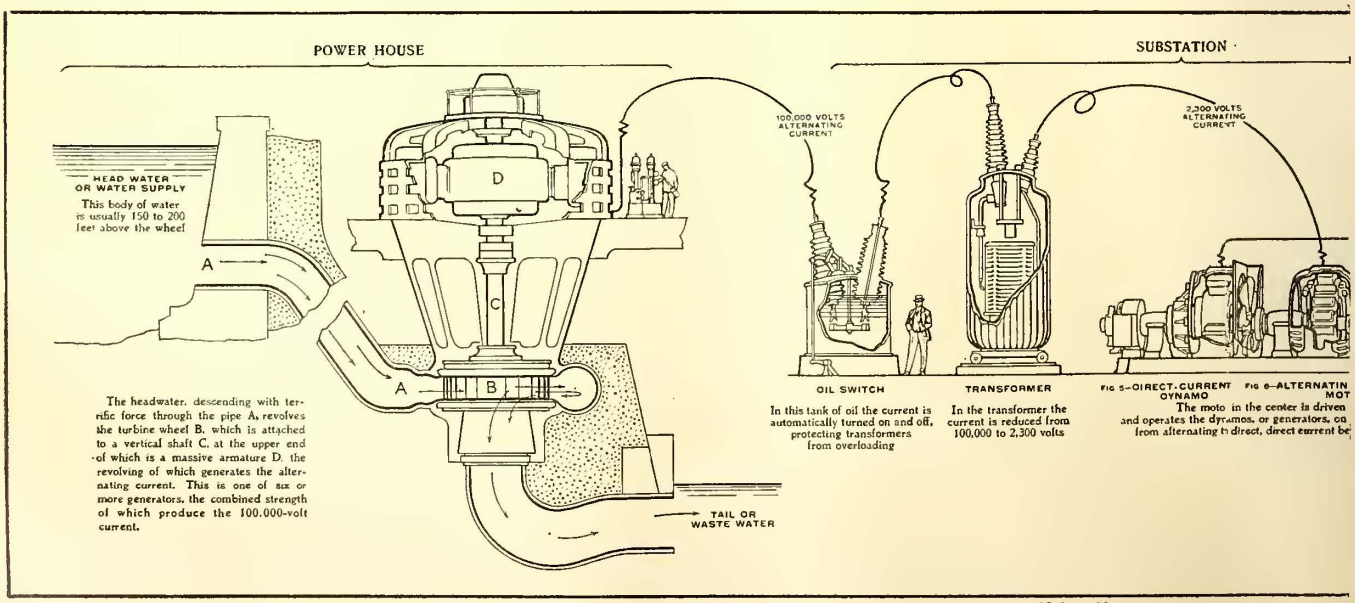
IN NO other period of our history has the necessity of adequate means of transportation been more evident. We are now at war, and one of our most important duties is to transport a vast amount of goods over long distances. Even under ideal conditions this would be a herculean task, but unfortunately for the last five years or more the railroads have been obliged, mainly because of adverse legislation, to follow a halting program of development and this condition is proving a most serious handicap to the prosecution of the war. Had there been in Public Opinion, which after all governs our legislation, a better comprehension of the requirements of our steam railroads, the present burden on the nation and on each individual would be materially less. But at least we are now fully alive to our lack of foresight, and we should be prompt to correct this ominous situation.

The need for increased transportation facilities has long been apparent to those well informed in such matters. Experience has shown that the traffic on our railroads about doubles every twelve years and that an annual capital expenditure of $1,000,000,000, at normal price levels, is needed to keep pace with this expansion. Since, for the last few years so much less than this has been invested, the sum now necessary to bring our railroads up to the point where they will be adequate to the needs of the nation is literally enormous. No such capital being now available, normal methods can no longer be followed, and therefore in the present emergency any and every means to utilize our existing railroad plant to its fullest efficiency should be carefully considered.

The Railroad War Board, despite legislative handicap, has already made phenomenal progress toward unifying the railroads' facilities, and if these handicaps were removed, it could practically eliminate all duplication of service by the common use of terminals, tracks, and equipment and by a thorough revision of traffic routing.

When all this is accomplished, however, a further improvement in the transportation situation can be secured by means of electrification.

Electrification can help the railroads and the nation in three ways:



PICTORIAL REPRESENTATION OF USE OF HYDROELECTRIC POWER FOR RAILROAD

1—By increasing the capacity of existing track and terminal facilities.

2—By decreasing the consumption of fuel, and

3—By conserving the labor necessary for operation and maintenance.

Increasing Track Capacity

Any method by which the capacity of our steam railroads can be increased would be of paramount importance at this time. Electricity can accomplish this by permitting the use of locomotives of larger power, higher speed and greater mobility than is possible with steam operation. The largest type of electric freight locomotive built by the Pennsylvania Railroad is capable of developing 7000 hp. for brief intervals and 4000 hp. continuously, regardless of weather and other conditions that reduce the capacity of a steam locomotive. This is nearly the limit in power for a single road locomotive with the drawbar strength of the freight equipment now in general use. With all-steel equipment, heavier trains can be run, and under special conditions it is entirely practicable to operate trains requiring an input of 20,000 hp., including both road locomotive and helper. Such a concentration of power as this will obviously expand enormously the traffic possibilities of existing track facilities and will make additional tracks unnecessary.

The efficiency of electric operation in the most exacting service has already been demonstrated. On the Norfolk & Western Railroad, electric locomotives have replaced high-powered steam locomotives of the most efficient type, and have eliminated all congestion on the grades and, it is estimated, have doubled the capacity of this system at an expense that is considerably less than the cost of a corresponding increase in the number of tracks. In this instance, the power input for single trains is about 11,000 hp. for starting and 8000 hp. for continuous operation.

Furthermore, the electric locomotive is ready to start at any time, needs no fuel or water supply, can run in either direction, accelerates very rapidly, and has great overload capacity. All of these features simplify and expedite yard movements and train dispatching and thus increase the capacity of existing terminals for traffic movement.

The Conservation of Fuel

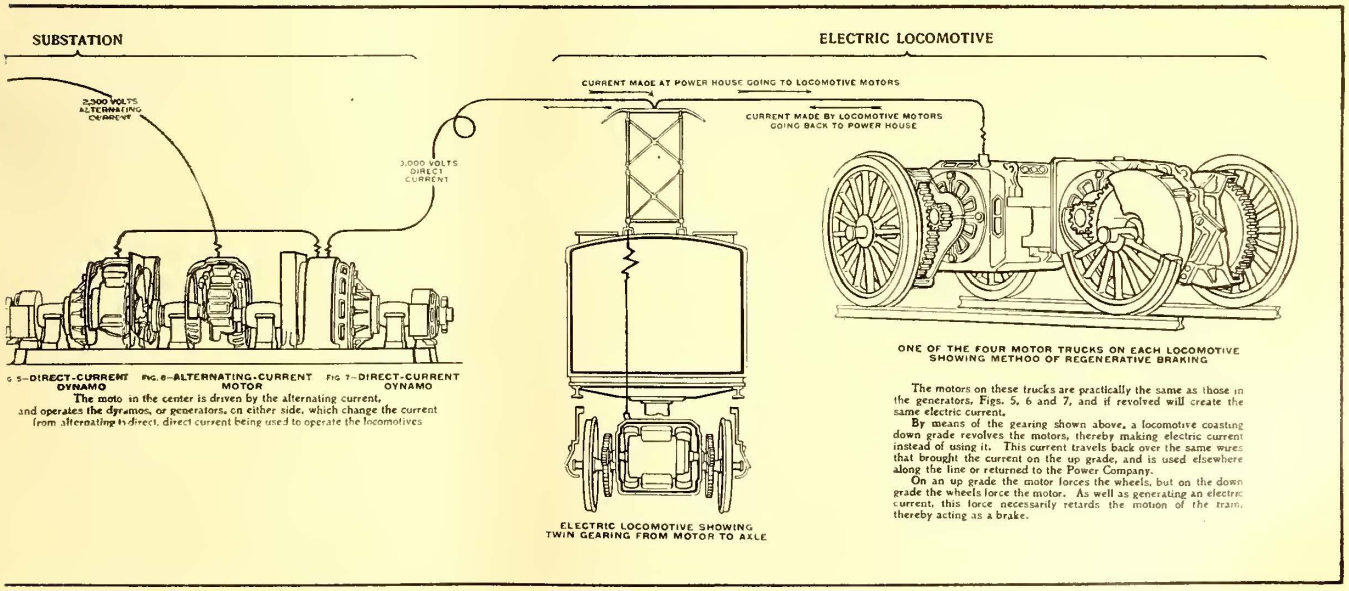
The aggregate power generated in our steam locomotive boilers is about 50,000,000 hp., and to produce this one-quarter of all the coal mined in the United States is consumed. By a somewhat curious coincidence this total horsepower is just about equal to the amount of water power that is going to waste in this country. Hence, it is apparent that if our hydroelectric power was used for railroad operation, 150,000,000 tons of coal would be saved annually, and the cars and crews needed to haul this coal would be released for other purposes. Actually the case is far stronger than this, for owing to the fact that the load factor of the individual locomotive is less than 25 per cent, power stations having a combined capacity of 12,000,000 hp. would suffice to operate our entire system of railroads, thus still leaving 35,000,000 hp. of water power available for other purposes.

For geographical reasons it is of course impossible to generate all railroad power hydraulically, and steam stations must in any event be relied upon to supply part of it. But 1 lb. of coal will produce as much power at the locomotive in a modern electric power plant and transmission system as 2 lb. or more under a locomotive boiler. Hence when this economy is combined with the reduction in the total capacity required, due to the low load factor of the locomotive, it is evident that enormous savings in fuel are possible even when steam stations are used. Irrespective of considerations of economy, our right to deplete our fuel resources in the face of this vast waste of water power is decidedly questionable.

How Electricity Saves Man Power

The third important result secured through the electrification of the railroads is the conservation of labor. This is accomplished in several ways.

In the first place, by effecting a great saving in coal consumption, electrification releases an army of mine and railroad workers for other purposes. Re-



ELECTRIFICATION (COURTESY OF CHICAGO, MILWAUKEE & ST. PAUL RAILWAY)

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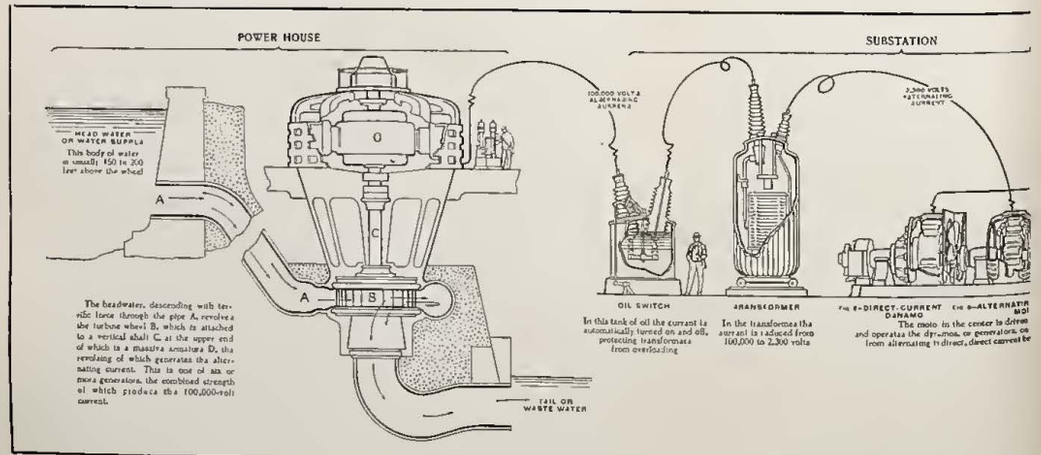

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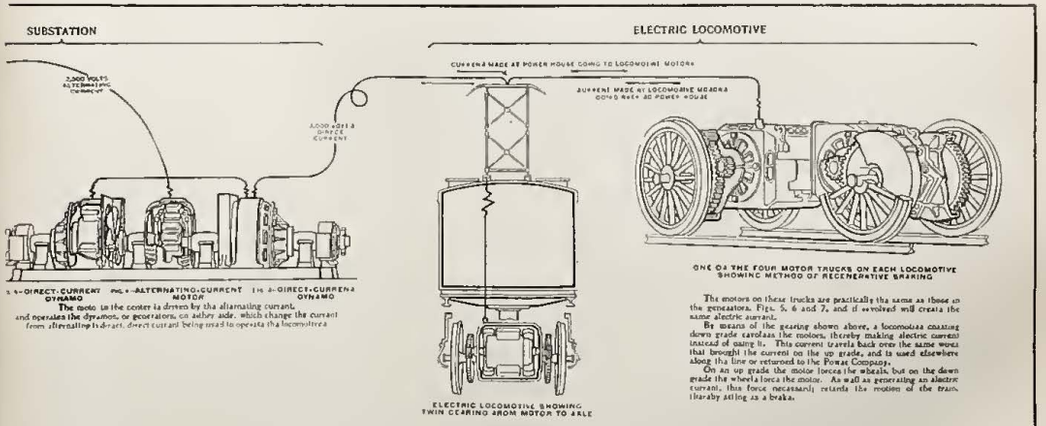


lief of this kind would be especially beneficial at this time, as well as of great economic importance after the war.

Secondly, since the use of electricity increases the amount of power that can be concentrated in a single locomotive and permits the operation of longer trains at higher speeds, a given number of men can handle a much greater volume of traffic on an electrified road than they can on a steam road.

Again, electric locomotives require much less labor for maintenance than steam locomotives. On the Chicago, Milwaukee & St. Paul Railroad the electric locomotives run 500 miles before receiving terminal attention, whereas steam locomotives are ordinarily taken to the roundhouse after runs of 100 miles. On the Norfolk & Western, twelve electric locomotives have replaced thirty-four Mallet steam locomotives, so that between the greater capacity of the electrics and their greater time in service, the reduction in the amount of labor necessary to operate and maintain them is most marked. Moreover, because of the simple construction of electric locomotives, even major repairs, such as the replacement of a motor, can be accomplished in a few hours, in striking contrast to the length of time required for important repairs to steam locomotives.

Finally, because electric locomotives are independent of fires, steam pressure, fuel and water, electric operation secures an economy of yard and terminal labor.

A number of factors are directing constructive thinking in many quarters toward electrification at the present time, and of these the following are most important:

1. The present scarcity of labor, which will undoubtedly continue after the war.

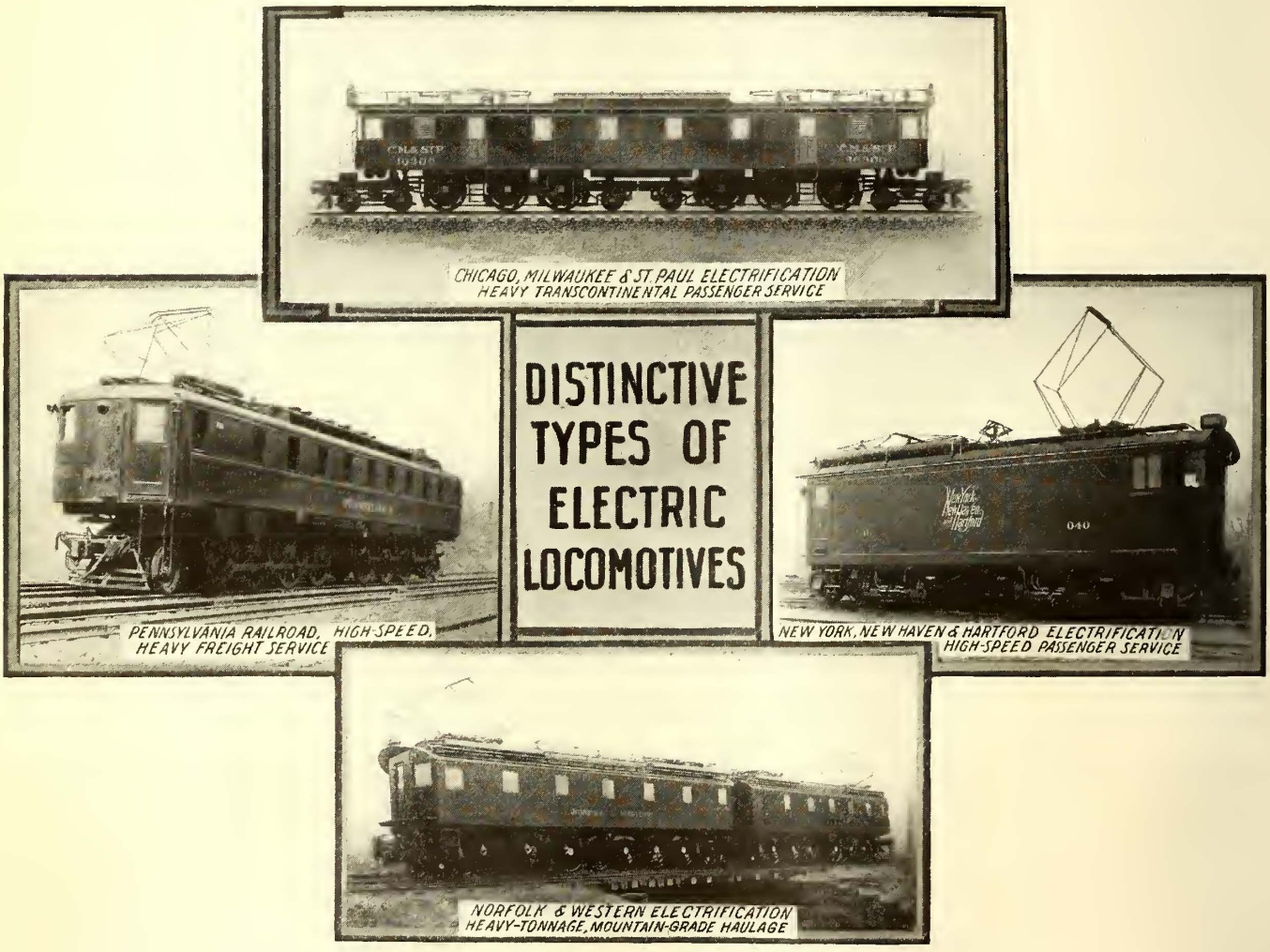
2. The scarcity and high cost of fuel. While present prices are not likely to obtain in the future, it is the general belief that they will never drop to their former level.

3. The inevitable growth of traffic in the United States which will necessitate increased traffic capacity. Electrification in many cases provides the cheapest means of increasing capacity, especially in settled communities and in mountain sections where increasing the width of the right-of-way for additional tracks would be either enormously expensive or practically impossible.

4. The increasing capacity and efficiency of hydroelectric and steam generating plants, which are constantly tending to augment the relative economy of the electric locomotive as compared with the steam locomotive.

5. The increase in the size of transmission systems throughout the country not only makes electric power more readily available to the railroads but increases the facility and ease with which the fluctuating railroad loads can be carried.

6. The improvements in trolley design and construction, which are constantly reducing costs per track-



ELECTRIFICATION HAS PROVED THE MOST ECONOMICAL MEANS FOR CARING FOR TRAFFIC AT TERMINALS LIKE THESE

mile. Because of the number of track-miles involved, this reduction of the cost of overhead construction will have an important influence on railroad electrification.

7. Improvements in the standards for freight car equipment which will permit trains of greater tonnage to be hauled in the future. The power capacity of electric locomotives being practically unlimited, these heavier trains can be hauled electrically over existing grades, but to handle them with steam would require most extensive grade revisions.

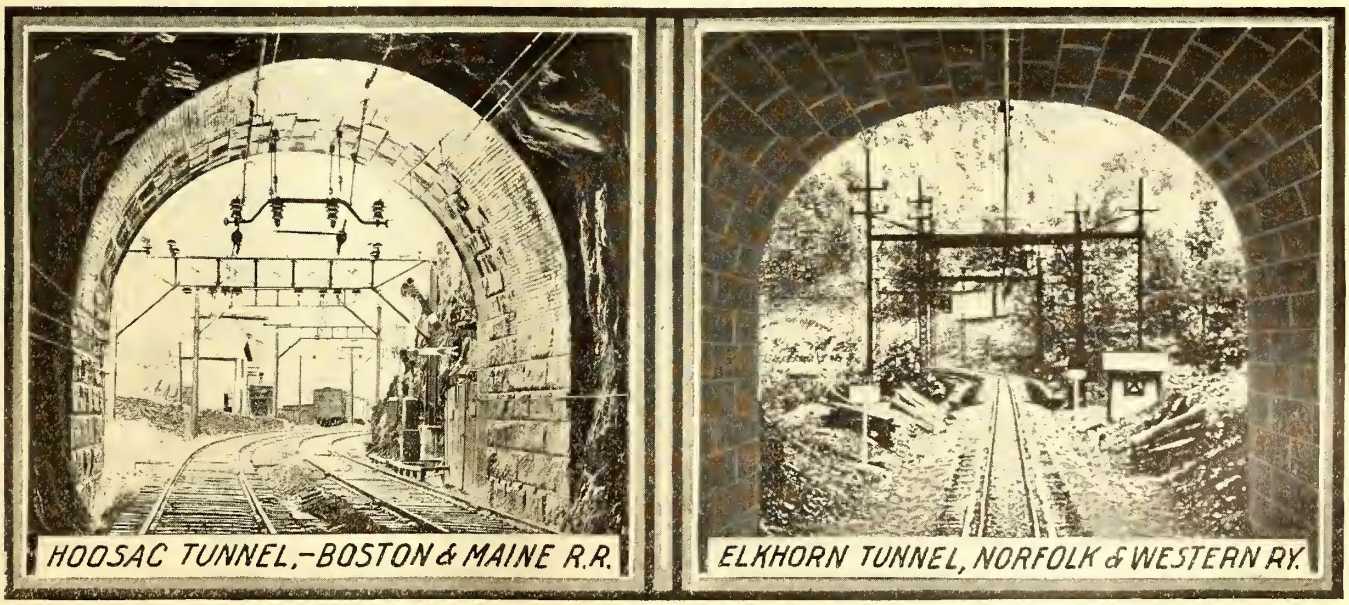
8. Greater regularity and reliability of operation. One of the important results of every electrification has been improvement in service. The New York Terminal locomotives of the Pennsylvania Railroad have, for example, a record over a term of years of 100,000 locomotive-miles for each case of detention. Such accomplishment in maintenance of schedules directly increases capacity.

The Immediate Outlook

With the unification of the direction of the railroads by the action of the President it is expected that capital expenditures during the war will be governed by broad consideration of traffic necessities, conservation of fuel and conservation of man power. In those situations where traffic congestion is most acute relief will be available in some cases through the utilization of existing electric generating stations, so that the construction involved would be limited to that of locomotives, substations and trolley installation, and would therefore involve a minimum diversion of effort.

The means by which this can be accomplished remains to be developed. If the improvements are for the benefit of the nation and the property concerned, the financial means will be forthcoming.

A hopeful view of the situation is that full opportunity for the continuance of individual incentive and ability will prevail, so that the splendid achievement, so characteristic of past American railroad history, will obtain in the future. The further upbuilding and improvement of the transportation facilities for the country should unquestionably be the dominating part of our activity after the war, so that certain electrification, desirable but deferred, should now be planned for, to form part of the nation's immediate constructive program as soon as opportunity affords.



ELECTRIC LOCOMOTIVES ALSO SAVE THE COST OF ADDITIONAL TRACKS IN CONGESTED SERVICE ON MOUNTAIN DIVISIONS

Applying Engineering and Selling Principles to Electric Railway Transportation

By J. F. LAYNG

Railway and Traction Engineering Department
General Electric Company

A Discussion of the Present Situation and Its Connection with the Conservation of the Nation's Resources; of the Electric Railway's Need for Statistical and Analytical Data; of the Economies Possible with Better Equipment and Scientific Running in Co-operation with Regulatory Bodies, and of Improved Relations with the Men

The Situation To-Day

The Need for Conservation of the National Resources in Fuel and Labor Intimately Connected with the Electric Railway's Problem of Meeting Automobile Competition and Higher Costs of Operation

THE electric railways are faced by something actually worse than the question of the price of their necessities—they are likely soon to to be told by the government that they must give an accounting for the efficient employment of every kilowatt hour of energy, of every ounce of material, and of every hour of labor that they use, no matter what prices they pay for them. The question of fuel is in the foreground now, but as the war advances this "show me" attitude may be carried over to many other items.

Many of the betterments possible on electric railways, like longer spacing between stops, the rerouting of cars, the application of anti-blockading ordinances are not up to the railways but are dependent upon the good will and intelligence of the public and its representatives. Such relief would not only go far along the road of patriotism, but prove a permanent benefit to electric railways and to the communities which they serve. Other betterments, such as improved cars, in many cases, have been beyond the means of the properties which have been forced to use the cars they had because they could not afford to purchase the latest models. The suggestions made in this article should therefore be understood as applying only to those conditions in which their introduction is practicable.

10,000 000 Possible Competitors

At the very beginning of any campaign to improve electric railway conditions we must take into account the highly wasteful competition of the automobile. It is possible that the need for conserving gasoline may lead to the prohibition of the automobile for pleasure riding. This, however, would be only a war-time measure. Then the automobile would resume its present attacks on the stability of the electric railway industry unless it could be met by thoroughgoing changes in present methods of operation.

That this competition is serious is known to most managers through individual experience. Yet how many of us realize its scope throughout the nation at large? Perhaps the following figures, furnished on Nov. 28, 1917, by the Automobile Chamber of Commerce, may prove not only enlightening, but startling.

Of 4,243,139 self-propelled vehicles in the United States in use up to July, 1917, 3,843,139 were pleasure cars and 400,000 are auto-trucks.

During 1916 the United States produced 1,617,708 passenger automobiles and 90,000 trucks; and during the fiscal year ending June 30, 1917, 1,693,994 passenger cars and 112,200 trucks. In addition to these figures, the Automobile Chamber of Commerce in New York offers such staggering data as the following:

Wholesale value of motor-driven vehicles produced last fiscal year	$917,470,938
Capital invested in automobile and motor truck plants	$736,000,000
Body parts and accessories, capital	$1,000,000,000
Capital invested by automobile and truck dealers, garages and supply houses	$920,000,000
Employees of automobile and truck companies	280,000
Employees of manufacturers of accessories and body parts	650,000
Employees of dealers, garages and supply houses	368,000

The pleasure cars alone call for an expenditure of $200 a year each, making the stupendous total of $768,627,800, which actually exceeds the present annual receipts of electric railways by more than $150,000,000! But the end is not yet, for even if 500,000 automobiles were scrapped during 1917, the net addition to the ranks would be 1,500,000. Since automobile manufacturers place the saturation limit of the United States at 10,000,000 machines, continuation of present electric railway practices would make automobile competition three times as severe as to-day!

It would be folly to hope that this development will be seriously checked either by temporary war conditions or by the exhaustion of gasoline.

In offering the following ideas for the betterment of existing electric railway practices, for the two-fold purpose of conservation of our national resources and the maintenance of electric railway service for the public, we would not have the reader infer that even if all of these ideas were to prove as good in performance as in prophecy, the need for more revenue from transportation would vanish. There are roads to-day, for example, which would still require more revenue if they got their energy for nothing.

Of all the departments, that of conducting transportation offers the greatest possibilities in the way

of economies and larger receipts, largely because in the past electric railway companies have had less of a free hand in this department than in any other. Should new apparatus promise a saving of a considerable percentage in the power station, the cost of the new equipment is balanced against this proposed saving, and if a definite advantage is to be gained, the company will order the equipment. In the transportation department, however, where a new system of routing, longer spacing between stops or other improvements promise an equal saving, quick action is not so possible. The authorities, represented by the commissions or municipal authorities, have to be consulted. Moreover, the public is usually very conservative as regards changes in transportation methods, and the labor element is also very jealous of what it considers its prerogatives.

Possibilities in Transportation

Nevertheless, in the study for economy, the transportation department deserves vastly more attention than the engineering department, partly because its expenses represent such a large part of the total expenditures for operation and partly because its methods being less susceptible to mathematical laws than engineering practice, there has been less uniformity in them. In spite of this fact, railway companies are standardizing more and more on transportation methods in their effort toward economical operation in order to make the present campaign for higher fares 100 per cent perfect.

* * *

The Railway Manager Has the Biggest Job in Town

Therefore His Problem Is to Secure the Principal Community Statistics. Some Sample Graphs Are Presented, Chiefly from Chamber of Commerce Records

IN NOVEMBER, 1917, during the coal stringency the railways of Kansas City received preference to private consumers in fuel allocations while, in December, the Cleveland Railway received preference over lighting—an eloquent tribute to the primacy of the electric railway.

Knowledge Is Power

But now let us go to a more specific matter in illustrating the old saying "Knowledge is Power," namely:

Since the railway manager has the biggest job in community development, he ought to know more about the past, present and future of the town than anyone else. Otherwise how can he shape the policy of his company to conform to changed conditions or prove to the investor that his town is coming instead of going?

In a growing community a railway manager can get a great deal of helpful information from the following:

First—Graphs of the increase in population according to the shortest intervals available. Figs. 1 and 2 present such graphs for two American cities, both being reproduced to show how the ratios of increase may differ. Nor should we stop here. If at all possible, similar graphs should be made by districts, to determine where track should be put down and where track should be pulled up.

Second—Graphs of growth of employment establishments and wage earners. Fig. 3 shows that these two elements in city growth are by no means parallel. A slight increase in shops against a big increase in men discloses a greater likelihood of congestion than if the shops also had increased in the same ratio. Factory capacity is usually increased vertically or by annexes; but factory number is usually increased by new construction in another district. Some railways, in the absence of these graphs, have overlooked developments like these; or, contrariwise, have continued excess service to a rundown factory district.

Third—Graphs which indicate the financial progress of the community, such as value of products, capitalization, cost of material and wages (Fig. 4) and the bank clearings (Fig. 5). Bank deposits should also be plotted. Such graphs as these will speak in mighty convincing tones alike to the banker, the board of directors, the management and the community.

* * *

Keep Graphic Records of Railway Statistics

How the Expenditures of Each Department Can Be Checked Against Preceding Years and Their Corresponding Gross Earnings

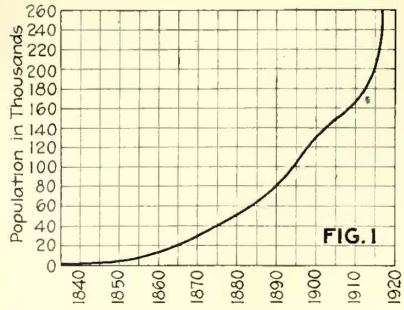
IF IT IS important to chart community statistics, it is vital to chart company statistics. Some men are mathematical wizards who can see a picture in the mind's eye; but most of us, including the board of directors, need direct, concrete charts.

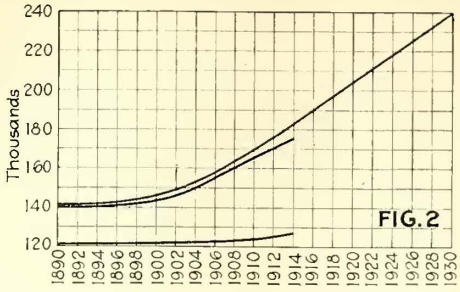
To know how the general finances are tending, most managers keep graphs of the gross earnings, operating expenses, interest charges, net earnings, taxes and the remainder necessary for paying the interest on stocks, bonds, mortgages and reserve funds. They are usually made on what is commonly known as a twelve-months' ending curve, namely, each point on the graph represents the business of the preceding lunar year, like January to December, February to January, inclusive, etc. When we plot the graph on this basis, the influence of fluctuations is decreased so that it is easier to form a direct idea of general tendencies in either the increase or decrease of the different items. This is illustrated by Fig. 6.

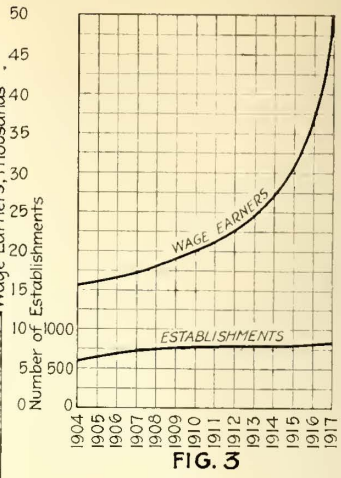
Other important studies are the preparation of graphs to show the gross receipts, increase in population and car-miles. On the same chart are plotted receipts per capita, car-miles per capita, etc., as in Fig. 7.

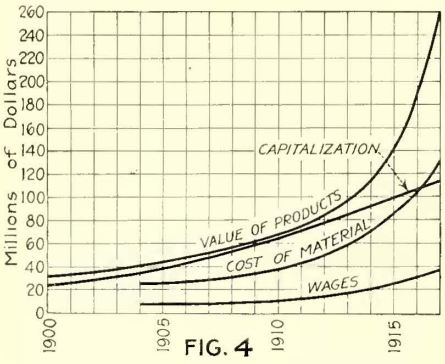
Comparisons of Departmental Expenditures

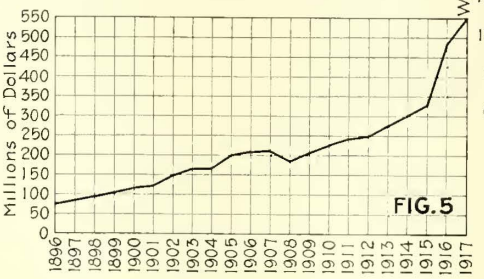
To find if the expenditure of the various departments varies in the same ratio as the gross income of the company, graphs are prepared of the gross receipts, total operating expenses and car-miles, as in Fig. 8. It is good practice to show the gross and operating expenses in total dollars, while plotting directly underneath it the receipts, operating expenses, cost of conducting transportation, power, maintenance of way and structure, maintenance of equipment and general and miscellaneous expenses in cents per car mile. With the car-mile basis, the manager can see at

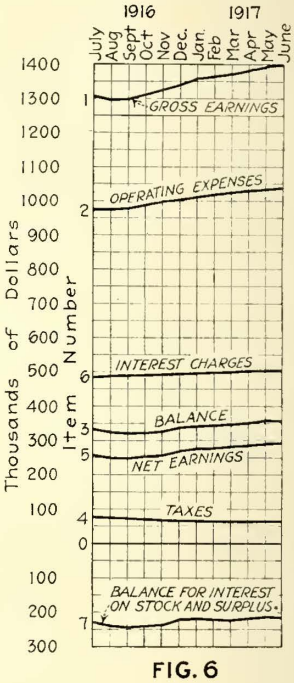


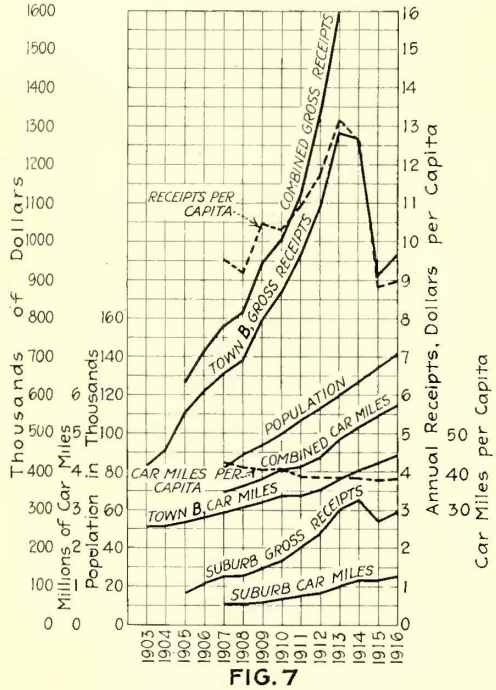


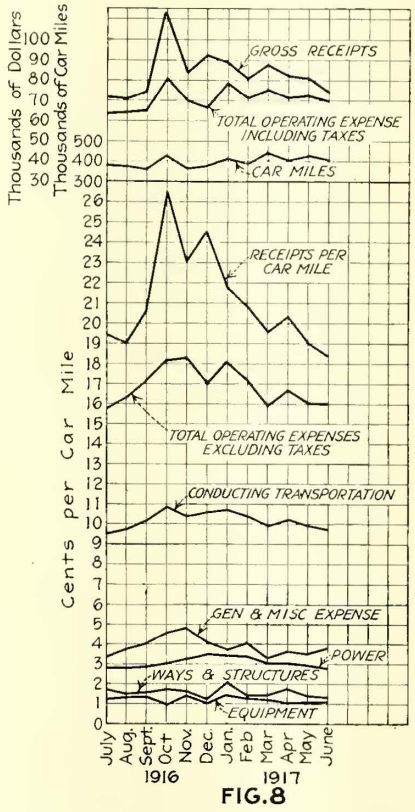


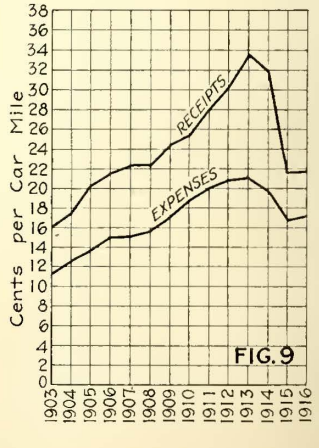


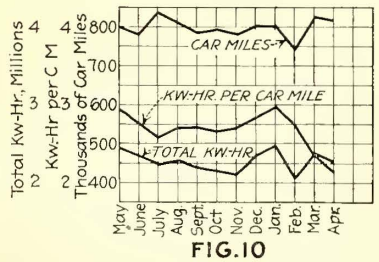


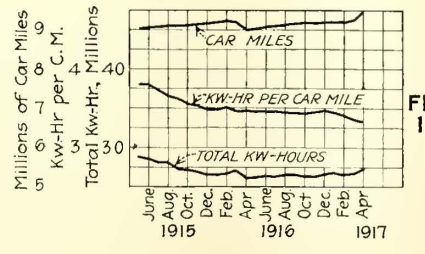












GRAPHICS OF ELECTRIC RAILWAY TRANSPORTATION—PLATE I

Fig. 1—Growth in Population, Town A

Fig. 2—Growth in Population, Town B, from Top Down, Combined, City and Suburbs

Fig. 3—Relation Between Growth in Numbers of Wage Earners and Establishments

Fig. 4—Relative Increases in Value of Products, Capitalization, Cost of Material and Wages, Town A

Fig. 5—Record of Bank Clearings, Town A

Fig. 6—Company Records, Town B, Suburbs Included.

Fig. 7—Company Records, Per Capita Data, Town B, Suburbs Included

Fig. 8—Total Departmental Data, Town B, Suburbs Included

Fig. 9—Gross Receipts and Operating Expenses Per Car-mile, Town B Alone

Fig. 10—Car-miles and Energy for One Year by Months

Fig. 11—Car-miles and Energy for Two Years by Months

once if departmental expenses are increasing or decreasing in proportion to the railway's gross earnings. An opportunity to compare relative total operating expenses and receipts on a cents per car-mile basis is presented in Fig. 9.

It is suggested that these graphs be made on charts of wall-map size, not only for easier reference, but for use in discussions with employees, the public and regulatory bodies.

Of course, in making comparisons of total and departmental expenditures we should be sure that apparent savings in way or equipment maintenance, power or transportation expenses are really savings. They may be merely transfer charges, as when a saving in power possibly is transferred to the cost of transportation. Therefore, each saving must be considered in the light of what effect it will have on other costs.

The importance of departmental studies like Fig. 8 is emphasized by comparisons with the statistics of the United States Census Bureau. Its 1912 report shows that of the gross income of all the electric railways of the United States, the 58.18 per cent operating ratio was divided as follows:

Maintenance of way and structures	8.17 per cent
Maintenance of equipment	7.06 per cent
Transportation	24.42 per cent
Power	9.00 per cent
General expense	9.53 per cent
Total	58.18 per cent

We all know that the recent exceptional increases in the price of labor and material will raise this percentage. Thus the figure for transportation expenses is nearer 35 and 40 per cent than 24.42 per cent.

It would seem advisable also to include the depreciation, contingency funds, taxes and terminal charges in the operating ratio to obtain a true idea of what it really costs to conduct electric railway business.

* * *

What Lines Are Making or Losing Money?

Costs and Earnings of Individual Lines Should Be Known to Give Service with Satisfaction to the Public and Profit to the Railway

THE same method of analyzing accounts applied to the system as a whole should be extended to the individual lines. Not to have such data is to be in the position of a manufacturer who has a surplus or deficit (more often a deficit), yet cannot place the responsibility for the result.

It is absolutely vital to know the earning value of each line by itself; and not the least important reason is the ability which it lends to a manager to prove his case when he is asked to make an unreasonable increase in service.

He knows, for example, that an extra stop slows down schedules and costs money but he must prove this to the satisfaction of the complainants in figures, for his say-so is no better than that of any other man.

Figs. 10 and 11 contrast the average car-mile earnings, car-hours and car-mileage of a certain city with those of its best-paying line. Going still further, Fig. 12, we get a contrast of all the lines individually (on another system) revealing the perceptible disproportion between car-miles and earnings per mile. The operating expenses of a line may seem to be reasonable when measured on a car-mile basis but be found unduly high when measured on a car-hour basis. For this reason, if a railway has the information figured on a basis of both car-miles and car-hours, it comes pretty close to knowing what parts of the system are bringing in the net income, where service should be added and where it should be taken off.

Further Segregation of Accounts Necessary

By further segregation of the standard classification of accounts, the cost of operation of individual lines can be obtained. Thus where several lines operate over one track, the expense of maintenance and operation can be distributed in proportion to the car-mileage of the individual lines.

More refined methods of determining both costs and possible economies and improvements will be found in the traffic studies presented later. These studies will take up schedule speeds, stops, length of stops, voltage, car weights, grades, number of passengers carried in different zones, etc. By giving such points due consideration, we can find directly the cost of giving additional or decreased service. To have exact facts, of course, will put an entirely different face on arguments concerning public policy, and make it quite impossible to ask impracticable things from the railway.

When the service of the individual lines is analyzed, it is well to consider the cost or appraisal value of each of the lines which we are comparing. Frequently, a large amount of money necessarily has to be invested to construct over a bridge or some costly fill—items which are not taken into consideration when operating costs only are borne in mind.

* * *

Car Turn-back Statistics, the Proof of Unnecessary Service, Are of Immediate Value

A Periodical Traffic Analysis of Each Line, Made with the Aid of the Conductors, Will Eliminate Waste Mileage by Indicating Desirable Turn-back Points

STILL another subject of profitable study for the average road is a careful analysis of the turnback situation. Indeed, a company whose needs do not require the compilation of any extended system of graphs will yet find it worth while to take up the subject of passenger loading for turn-back points and the requirements of car capacity. The savings possible in this direction, when they are tabulated and put before the local authorities, will often help a company in receiving permission to extend its system of turn-backs. The greatest gain possible from turn-back cars is to apply them, in whole or in part, for more frequent service on the heavily traveled portion of the line or to take care of increased business without buying new cars.

To determine the turn-back points for any particular line, it is necessary to analyze the passenger loads on all cars at all hours of the day. It is just as wrong to run too much mileage as too little mileage; in one case the hardship suffered by the company is reflected in its finances; in the other, the hardship borne by the public

is reflected both in the decreased earnings and in the increased dissatisfaction. Only an actual survey will bring out these facts, as register turn-ins are useless for records of travel over different parts of one line.

All operators know that the heaviest passenger loads usually are found in the congested portions of the city. This load tapers off gradually as the car advances toward the outer terminals or drops sharply at certain crossings, like transfer points. A few lines may have one or more traffic centers, but this general fact holds.

Principle of Turn-back Is Sound

Despite general knowledge of the "turn-back" principle, "turn-back" service is not used as extensively as it should be. In some cases no attempt has been made to work it out; in others the public has become prejudiced against the system either because the car marker signs were not easily legible or because the question of whether the car should go on or turn back has been left to the will of the individual car crew instead of being placed in the hands of inspectors or of a central dispatcher.

A gratifying feature about the turn-back traffic survey is that except possibly in the largest cities, a company can very easily get, at very little extra expense, all of the information necessary for it to determine turn-backs pretty closely, from its own staff of conductors and inspectors who have already an intimate acquaintance with the cars and their routes.

Quite recently a traffic survey was conducted of all the lines in a city of 150,000 population. It was not necessary to call in any outside help. Eight regular employees transcribed all the information from the conductors' cards and made the graphs within six days from the time we began. Similar surveys have been made in cities up to 300,000 population.

Simultaneous Check by Conductors

With other systems of checking it is necessary to have so many men that usually only one line can be surveyed at a time. With the conductor's card system it is possible and usually advisable to make all observations on all lines at one time. A simultaneous one-day survey avoids errors due to the variations in gross receipts even on successive week days. It is not uncommon to find variations of 25 to 33⅓ per cent on individual and groups of lines; so the picking out of "typical" days with traffic survey systems other than this is extremely difficult, if not impossible.

It is not asserted that the system recommended is as complete as those of our largest engineering organizations, but it is good enough and sufficiently comprehensive so that a survey which will enable the local manager to give the best service with the least waste of mileage may be obtained. Aside from this, periodical checking of traffic for changes in turn-backs are necessary in any event.

To get these data, the superintendent or manager instructs the conductors to count the number of passengers at each point selected, as shown in the instructions on page 28.

Each conductor also receives a printed card, Fig. 13, for writing down his figures. This card carries the name of the possible "turn-back" streets, the line on which the data are taken, the date, car number, conductor's number, conductor's name, run number and trip number. It is necessary to have all these data

To turn back or not to turn back should not be left to the varying judgment of platform men.

to be certain that all cards have been turned in by the conductors and that all the facts needed for the graphs are at hand. Such a card should be about the size of a regular trip card, so that the conductor can fold and place it in his pocket.

Data Helpful to the Men

When orders for the count are issued, the conductors should be informed that it has absolutely nothing to do with register readings; that the management simply wants to secure the most even distribution of passenger loads in all cars at all times, from which it naturally follows that the work of the conductors will also be more evenly distributed when the necessary changes are made.

It is realized that at certain times of the day the conductor will not have the time to make accurate notations just at the point where the count should be taken, so he should be requested to bear this in mind and do the best he can.

Ordinarily it is best to take this traffic count for two or three days, using but one day's figures for the analysis. As the men need a little time to understand exactly what is wanted it is best to discard the first day's count. When this count reaches the office, the delinquents are reinstructed, and usually the second and third days' cards are found in good shape.

Experience shows that the conductor's counts are as accurate as those taken by paid outsiders. The difficulty with outside workers is that the observer must have some training, while an experienced conductor can tell instantly and instinctively how many passengers are in his car without one-by-one counting.

Within the downtown section or in heavy traffic districts, the count should be taken about every 1200 or 1500 ft., and in the outer sections about every 2000 or 3000 ft. On a line 5 miles long the data on ten or twelve checking points will show at a glance the extent of overloading or underloading of the cars, and consequently the changes desirable in the number and capacity of cars routed to each point. The form on pages 28 and 29 shows the distribution of data as tabulated from the cards turned in by the conductors.

Uncle Sam appreciates the need for electric railways. They are in the first ranks in the allotment of coal.

Determining the Size of Car Necessary

From the Turn-back Records It Is Possible to Get Maximum, Minimum and Average Car Loadings Hour by Hour and to Check Them Against Seating Capacity

THE data from the turn-back studies may be used for chief aid in determining another important matter: *The best size of car.*

To do this we must develop loading graphs which will show at each checking point the maximum and minimum number of passengers on all cars at hourly intervals throughout the day, the two classes of loading graph being contrasted with the straight line which represents the seating capacity and with the derived graph of average loading. It is this "average loading" which should determine the size of the car best suited for the line.

For instance, an examination of the upper graphs in Fig. 14 shows that the car should be a little larger to care for the worst condition or that more of the present type should be operated. By making similar studies for say a dozen points (as indicated in Figs. 15 and 16) we can decide definitely what is the best car for the line as a whole, while for the congested sections we can arrange shorter headways through turn-backs or trippers.

Again, we may look at the question in another way: Will the combined effects of increased rates of acceleration and braking, shorter length of stops, fewer stops per mile, etc., be of sufficient importance to give a shorter headway with the same number and size of cars now in use? We must not ignore the probability that shorter headways will bring more gross revenue.

Such studies as these should be considered in connection with the analysis of line travel by zones as detailed in the following paragraphs.

Study Traffic by Zones

Both in securing general data on a line and the making of schedules it is best to divide the line into zones. In the downtown districts the travel is congested and stops frequent, so the running time must necessarily be relatively slow. As we leave the center of the city, stops are less frequent and vehicle and pedestrian interference greatly reduced; therefore the schedule speed is much higher. When we also consider the possible turn-back points, we are ready to lay out the following data:

1—Distance

2—	Running Time	Stops	Length of Stop	Schedule Speed	Average Voltage
A.M. rush	.....	....	.....	.....	.....
A.M. non-rush	.....	....	.....	.....	.....
Noon rush	.....	....	.....	.....	.....
P.M. rush	.....	....	.....	.....	.....
P.M. non-rush	.....	....	.....	.....	.....
Evening	.....	....	.....	.....	.....
Night	.....	....	.....	.....	.....

3—Curves and grade condition

4—Special traffic conditions

When we have these data (see Fig. 17) plus the schedule possibility of each car, we know if we are getting all out of our equipment that is advisable, making due allowance against a schedule that is "too tight" to keep the men ambitious to hold the cars to time. The stops given in Fig. 17 are equivalent stops, and include slowdowns.

At any rate, we are now armed with definite information and can take up intelligently such problems as municipal traffic rules to secure the street car a right-of-way that will increase the schedule speeds so that it will not be necessary for the crew to take chances in meeting tight schedules.

Or to take a less obvious condition: Exact knowledge of the voltage in each of the zones will show if the bonding is right or if there is enough feeder in the section observed. For example, Fig. 18 shows how radically the schedule speed or mileage output of a car is affected over a range of 400 to 600 volts. What this low voltage means can therefore be calculated directly in dollars and cents so that it is easy to determine whether it will pay to buy better bonds, use automatic substations, install more feeder copper or to take any other measures that will improve the quality of service while lowering the cost of service.

Table I—Schedule Speed Efficiency as Affected by Voltage

Stops per Mile	400-Volt Schedule		500-Volt Schedule		600-Volt Schedule	
	M.P.H.	Per Cent	M.P.H.	Per Cent	M.P.H.	Per Cent
3	12.4	79	14.2	90.5	**15.7**	100
5	11.0	84	12.2	93.2	**13.1**	100
7	9.9	86.6	10.75	94.3	**11.4**	100
9	9.1	91	9.6	96.0	**10.0**	100

Calculated on basis of tangent level track and without leeway.

From Fig. 18, just mentioned, Table I has been prepared to show the schedule possibilities with a 20-ton car at 400, 500 and 600 volts.

* * *

A Statistical and Schedule Department of Value

Statistical and Schedule Functions Should Naturally Be Placed Under a Transportation Engineer—The Service Fundamentals

WHAT has already been said about the essential records required by an electric railway indicates the need for a statistical department. Preferably this bureau should be combined with the schedule department because most of its work bears so directly upon transportation problems.

The work should be guided by an experienced transportation engineer who would have the tact to co-operate with all of the other departments and who would also have the ability to analyze every function of operation. To make a success of this department, it is also necessary to have its findings presented to the chief executive in such a way as to make its studies of practical instead of theoretical value.

This would be the department to prepare all the graphs mentioned in the different portions of this study. The chief executive of a railway may lack the time for details, but it is his duty thoroughly to review all of the phases of the work of this department, to keep in touch with the transportation engineer and to

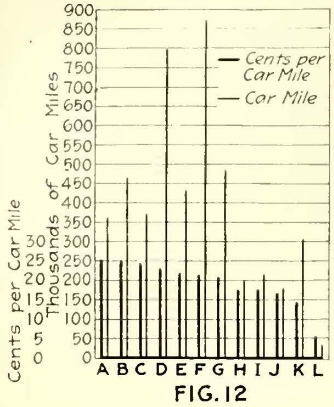


FIG. 12

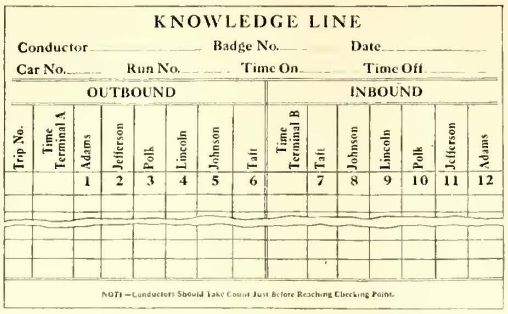


FIG. 13

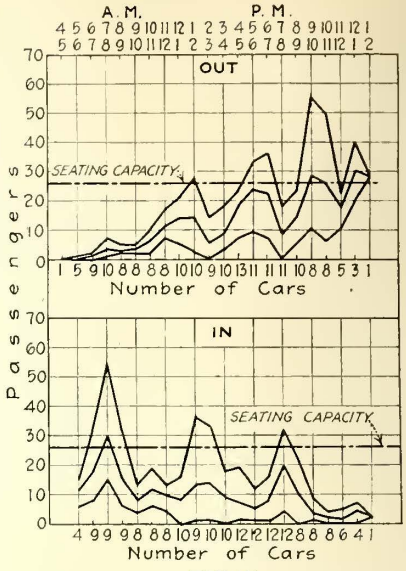


FIG. 15

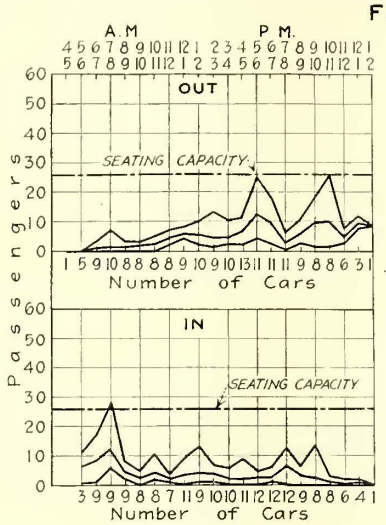


FIG. 16

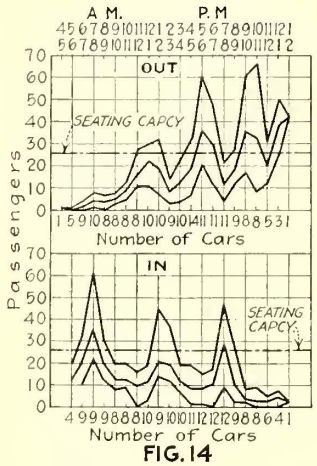


FIG. 14

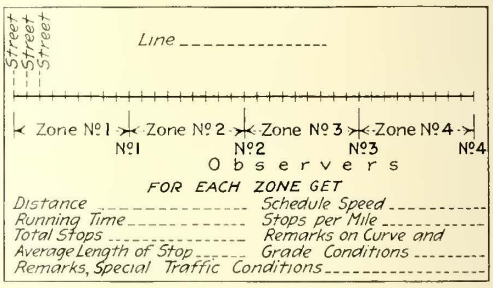


FIG. 17

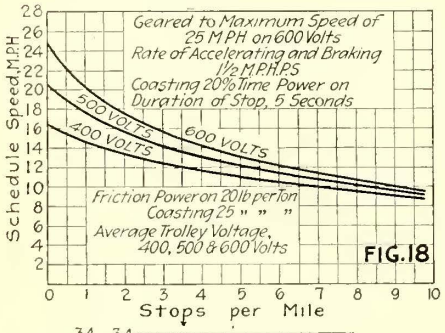


FIG. 18

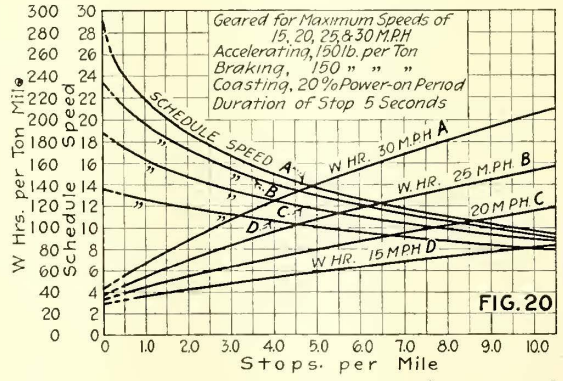


FIG. 20

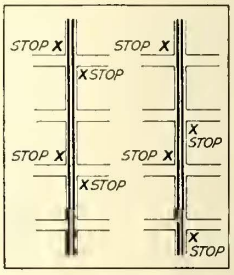


FIG. 23

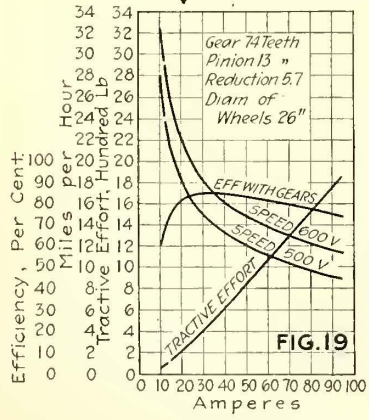


FIG. 19

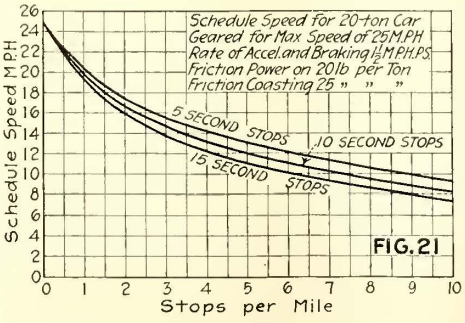


FIG. 21

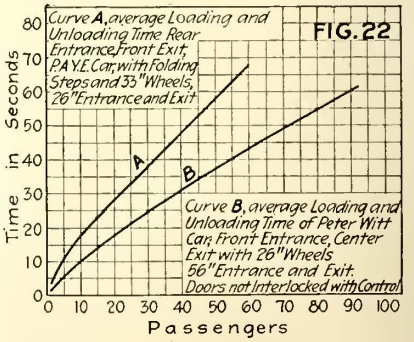


FIG. 22

GRAPHICS OF ELECTRIC RAILWAY TRANSPORTATION—PLATE II

Fig. 12—Gross Earnings Per Car-mile
Fig. 13—Blank Form for Traffic Count
Fig. 14—Determining Car Loading
Fig. 15—Determining Car Loading
Fig. 16—Determining Car Loading
Fig. 17—Layout for Traffic Study by Zones
Fig. 18—Schedule Speed Curves for 20-ton Car
Fig. 19—Characteristic Curves GE-258 Motor, Gear Ratio 13:74
Fig. 20—Schedule Speed and Energy Curves for 20-ton Car
Fig. 21—Influence of Length of Stop on Schedule Speed
Fig. 22—Loading Time Curves for Two Types of Car
Fig. 23—Comparison of Skip Stop (Left) and Stagger Stop (Right)

transmit to him such directions as are necessary to develop the usefulness of the statistical and schedule studies.

A truly scientific schedule department will solve many problems that cannot well be handled directly by the operating department. For example, there is the problem of determining whether it is desirable to have four different running speeds a day; and if so, what are the most economical figures, the question of balancing platform cost against power voltage, and others.

Or if it is a problem of removing an obstacle not within the control of the railway, such as vehicular and automobile congestion, better results will be obtained by publishing charts of surveys and detail reports of the delays so caused to the riding public than any amount of recrimination without evidence. If parking and safety zone ordinances are wanted, let this department prove the necessity for them.

In the past it has been too often the practice to lay out schedules on what might be termed the "cut and try" method. By this is meant that a trial car is operated over the line, usually under the supervision of some competent man, and the running time so made generally determines the future schedule.

On the other hand, every individual type of car has a certain schedule possibility which is almost entirely determined by the free running speed of the equipment, the arrangement of passenger interchange and fare collection facilities. The free running speed of each car being known and the other conditions outlined in the present study being reviewed, schedules can be calculated, based on what each type of car is actually capable of performing. Schedules prepared on such a basis should prove more satisfactory than those established by guess, although they should, of course, be carefully checked by actual trial as formerly.

To facilitate the making up of schedules on this basis, two graphs, Figs. 25 and 26, will be discussed later in this study; one for a 20-ton car and one for a 7½-ton car. These graphs give the schedule speeds which are possible with an equipment geared for any free running speed within certain limits. It is appreciated that the voltage will change the free running speed. The average voltage can be obtained by observation and due allowance made in the free running speed. With but a very small commercial error, free running speeds of all cars decrease in proportion to the voltage, as outlined later.

We may now proceed to a study of the service fundamentals of Safety, Comfort, Speed, Stops, Weight and Costs.

Higher voltage means higher schedule speed.

The First Service Fundamental Is Safety

Faster Schedules Are Not Incompatible with Greater Safety as the Maximum Running Time May Be Even Lower Than Before

ALL of our modern education has been along the lines of safety, not only with regard to the passenger and pedestrian but also to the railway employee. Since this subject is a well-nigh universal topic we need not discuss it in detail.

Nevertheless it is well to point out that in our discussion of car speeds, for example, we do not advocate any practices that could possibly impair safety; but we firmly believe that higher schedule speed and greater safety are compatible in many cases. The air brake, for instance, not only cuts down accidents but raises schedule speed through its reduction of the braking interval. Again, the saving of time due to low steps, pneumatic door and step control, etc., also produces higher schedule speeds without raising and, even by lowering, the maximum running speed. This paradox is due to the fact that in frequent-stop service higher rates of acceleration and retardation are more important for schedule speed than a maximum running speed which is unattainable on the greater part of the run.

* * *

The Second Service Fundamental Is Comfort

Modern Heating, Lighting, Ventilation, Smooth Acceleration and Correct Seating Are All Factors in Comfort

THE comfort of the passenger is second only to his safety. Bare lamp lighting, non-regulated heating and monitor-sash entrances for drafts are giving way to the non-glaring fixture, the thermostat and the mechanical ventilator. What is most satisfactory, too, is that modernizing all of these features saves money in lamp renewals, energy consumption and car construction even if it should fail to add one extra fare to the revenues of the railway.

Still another factor in car comfort as well as accident prevention is that of smooth acceleration. It is not the rate of acceleration that makes for discomfort as much as it is the layout of resistor steps and the ignorance of the motorman. If the steps are correctly reset, half of the car troubles are over; and if automatic acceleration is adopted, all of these troubles are over.

* * *

The Third Service Fundamental Is Speed

How to Determine the Free Running Speed of a Car; Relation to Gear Ratio; Effect on Schedule Speed of Number and Time of Stops and of Rates of Acceleration and Braking

ONE of the most important things is to know the schedule possibility of every car which the company owns.

This is directly affected by the free running speed of the car, namely, the speed which a car will ultimately attain if the controller is at full "on" position and the car is running on tangent level track.

This speed can be raised or lowered by changing the gear ratio. This change affects directly the amount of energy used and so has certain practical limitations set by the horse-power capacity of the equipment. It is always safe to lower the free running speed of the car, assuming this to be advisable, but when the speed is raised it is well to consult the equipment manufacturer and give him all the operating conditions before making a change.

We will assume that we desire to find the full running speed of a car weighing 34,000 lb. complete with all equipment ready to roll. We will also assume the car has 6000 lb. of passengers, which gives a total load of 40,000 lb. We will also assume that this car is equipped with four 25-hp. motors having 74-tooth gear, 13-tooth pinion and 24-in. wheels, and that the average potential is 500 volts.

To determine the free running speed we first must take the complete weight (including the live load) and get the weight in tons per motor. Since the car weighs 40,000 lb., or 20 tons, and there are four motors, we have 5 tons per motor.

The resistance to the keeping of the car in motion is expressed in pounds torque or drawbar pull. It is generally accepted that for city cars this resistance amounts to 20 lb. per ton. This figure includes the rolling friction, windage and force necessary to keep the rotating parts in motion.

Since the car has a weight of 5 tons per motor, this total resistance per motor is 100 lb. By referring to the characteristic curve of the motor shown in Fig. 19 we first find 100 lb. on the torque curve, and then by reading up to the speed curve we find the car speed at 500 volts is 24 m.p.h. and at 600 volts 29 m.p.h. ,

It will be noted that the speed is increased in almost direct proportion to the increase or decrease in voltage. Theoretically there is some difference, but for practical purposes this difference can be neglected on the light motor loads which are obtained with free running speeds.

Stops Affect Schedule Speed

One of the basic factors in the railway business is the number of stops the car has to make. This factor directly affects the line capacity, numbers of cars for a given service, car-hours, power, maintenance of equipment, size of motors, etc. How many operators know the number of stops that are made on their different lines? How many of them are trying to reduce the number of stops to a minimum? This is one of the largest fields for saving that can be made in car operation to-day.

To know how many stops a car makes per mile is not an abstract engineering question of no vital importance to the operation of the property. Of course, a certain number of cars have to be on a line, but it is possible merely by a change in stops to make fewer cars give the same number of seat-miles. If there are but four cars on a line, the displacement of one car would demand a 25 per cent improvement in operation, which would hardly be attainable if the line is within striking distance of proper operation; but if there are six cars on the line, it is often possible either to give more service with the same number of cars or to give the same service with less cars by a better arrangement of stops and shorter length of stops. Of course, the same percentage of saving would apply to lines with a larger number of cars.

If the service is such that there are nine stops per mile with an average length of stops of five seconds each, the values would be as given in Table II.

Table II—Relation of Free Running Speed to Power Cost, Nine Stops per Mile

M.P.H. Free Running Speed	Schedule Speed	Kilowatt-Hours per Car-Mile at the Car	Power Cost for 40,000 Lb. Car-Miles, 1½ Cents per Kilowatt-Hour at the Car	Per Cent
15	8.3	1.52	$912.00	100
20	9.5	2.16	1,296.00	142
25	9.9	3.00	1,800.00	197
30	10.2	3.84	2,304.00	253

Stops Also Influence Costs

Cars in city service run 30,000 to 50,000 miles per annum. Therefore, 40,000 car-miles per annum is a fair average. To get an idea of what number of stops per mile means on a car geared for 25 m. p. h., free running speed, we can study Table III with considerable profit:

Table III—Relation Of Number Of Stops To Schedule Speed and Platform Wages

Stops per Mile	Length of Stop, Seconds	Schedule Speed, M.P.H.	Car-Hours	Platform Wages at 60 Cents per Hour	Per Cent
5	5	13.1	3053	$2,014.98	100
7	5	11.4	3508	2,315.28	115
9	5	9.9	4040	2,666.40	132

Table III especially emphasizes the advantage of eliminating stops. It also brings out the effect on schedule speed of an increased number of stops and the consequent reduction in speed. The savings of the car-hours and power, the most definite figures which we have, are but part of the savings influenced by raising schedule speeds. For instance, if a car operates at an increased schedule speed, the carrying capacity and service of the line are increased in proportion thereto; or the surplus cars are available for use elsewhere.

A further analysis of these figures brings out some very interesting facts. Assuming that a car is geared for 25 m. p. h. free running speed and is in a service with five stops per mile, the car would then be capable of making a schedule speed of 13.1 m.p.h. If the stops are increased to seven per mile, this figure would be decreased to 11.4 m.p.h. If the stops are increased to nine per mile, the schedule speed will be further decreased to 9.9 m.p.h.

It will be noted that there is 10 per cent leeway in the item for platform wages. This 10 per cent will be carried through on all items where wages are specified hereafter. The reason for this is that the schedules which are specified in every place in this discussion are theoretical schedules. To make them practical it is necessary to add 10 per cent for interruptions in traffic, grades, curves and necessary layovers at the end of the line.

Shorter Stops Mean Lower Costs

The length of stop can also be decreased if passengers are urged both by posters and by word of mouth to board and leave the car as expeditiously as possible, while the conductor should be urged to be prompt in giving signals to the motorman through push-buttons or otherwise. The value of decreasing the length of stop is strongly brought out by the following Table IV and Fig. 21:

Table IV—Effect of Length of Stop on Schedule Speed

Stops per Mile	Length of Stop	Schedule Speed	Car-Hours	Platform Wages	Per Cent
5	15	11.1	3603	$2,377.98	118
5	10	12.0	3333	2,199.78	109
5	5	13.1	3053	2,014.98	100
7	15	9.35	4278	2,823.48	140
7	10	10.3	3883	2,562.78	127
7	5	11.4	3508	2,315.28	115
9	15	8.0	5000	3,300.00	164
9	10	8.85	4519	2,982.54	148
9	5	10.0	4000	2,640.00	131

The car on which these figures are based is geared for 25 m.p.h. free running speed. Further, to analyze just what this table means, it might be well to consider a car with fifty passengers. Of course, the entire fifty passengers would not get on the car at the outer terminal of the line, but would be taken on at different points along the route. However, it is fair to assume that out of the fifty passengers twenty-five would be the equivalent number which would be carried over the entire distance.

We will assume that we can reduce the average length of stop from nine seconds to five seconds, saving four seconds per stop. We will also assume the following schedule conditions:

Sixty minutes running time
9 m.p.h schedule speed
Eight and five-tenths stops per mile

It will then be understood that we will have a total of seventy-six stops, and since the time which is saved is four seconds each we shall save 304 seconds or approximately five minutes for the entire run. Since there is an average of twenty-five people and the total time saved on the run is five minutes, the total time saved for all of the passengers will be five times twenty-five or 125 minutes.

It may seem to some that this is figuring down to a rather small point—merely the saving of five minutes on a single run, but as we follow along the argument we can readily appreciate what five minutes means to the entire community.

When you have signs like this or its equivalent, the position of the entrance on the car is a minor matter.

Saving the Rider's Time, Too

Previously we took the average mileage of city cars at approximately 40,000 car-miles per annum. For the sake of argument, we will assume that this car is in a service which averages eight stops per mile. We will also assume that we reduce the length of stop four seconds. This would give a total saving for the year of 1,280,000 seconds or 355½ hours. When we consider that the average passenger load of the car would be approximately twenty-five, it is realized that the accumulated time saved for these passengers represents 8887½ hours.

These arguments illustrate directly the value of a small thing in car transportation. By looking at Table IV—which shows the difference between making nine ten-second stops per mile with seven five-second stops per mile—we see that to operate 40,000 car-miles a car must necessarily be in service 4519 car-hours. This will give a total number of 112,975 accumulated passenger car-hours, while with seven stops per mile and five-second stops, the accumulated passenger-hours would be 87,700. The difference between these two values would be 25,275 passenger-hours. This would be the accumulated time saved by the passengers on each car. If the system operates 200 to 300 cars or more, one can easily realize how this saving for the community is a valuable public service aside from any saving to the railway.

Use Stop Signs Freely

To reduce the length of stop to a minimum, it is advisable to mark all car stops plainly so that both the passengers and train crew will know exactly where the car doors will open. A misunderstanding means the loss of one or two seconds per stop while the passengers are walking up to the car entrance. It is these seconds per stop that in the aggregate are so valuable to the community and to the railway.

If a city car averages 40,000 miles annually and makes six stops per mile, it will make 240,000 stops annually. The average length of stop in city service is seven seconds. If we arrange markings at corners so that passengers will know the exact point at which the car *entrance* will stop and if both train crews and passengers exercise care in the amount of time the car is stopped, we could shorten the average length of stop to five seconds, which is equivalent to a saving of two seconds per stop. For a single car this means a saving in car time of 480,000 seconds annually, or more than 133 1/3 hours.

If the average number of passengers on a car is twenty-five, the annual saving for the passengers in each car would be 3333¼ hours, or, assuming that the average active portion of the day of each person is sixteen hours, this figure would then be equivalent to 208 1/3 days. If figured on a ten-hour day, this amounts to 333 1/3 days for the passengers on a car.

Fifty-three Weeks to the Year!

We have just seen how important decreased stopping time is to both the public and to the railway. The next step is to see how they can co-operate to get the benefit of a smaller number of stops.

When railway officials contemplate inaugurating such service, the number of possible stops and existing stops,

including the distances between them, should be tabulated and analyzed. The distance between the new, possible stops should approximate 600 ft.

The first question that will arise will be not the gain of 10 to 12 per cent in schedule speed, but what will the change do for the individual rider? What does five minutes saved per half trip mean to him? Now this amounts to ten minutes a day, and if we allow 300 working days, the total will be 3000 minutes or 50 hours or 6¼ business days of eight hours each—practically a fifty-third week to the year.

As it is not unreasonable to assume that the time of the average car rider is worth 20 cents an hour, the fifty hours saved by cutting the number of stops would have a commercial value of $10 per annum, the equivalent of 200 five-cent rides! In other words, the time saved for the passenger may be greater in value than the receipts per annum per capita! On the basis of 30,000,000 car-miles per annum, one railway is saving $200,000 a year.

As with any other innovation, the public and the regulatory officials should be fully apprised of the railway's plans and purposes, for the success of the fewer-stop service will depend largely upon how it is introduced. To begin with, it is generally recognized that this service should be operated only in the outer district beyond the normal walking zone, and that in the downtown section and at transfer points the cars should make all stops. The near-side stop should be made standard, as this is a great time saver.

Further, the new plan should be introduced in the spring or summer months so that the riders will have learned to appreciate its advantages in the saving of time and the increasing of comfort in riding before the few days of severe snowy weather show them the change in its one unfavorable light. The matter should be thoroughly explained beforehand to the public also, so that the people will understand that they are to be the beneficiaries as well as the railway companies.

Play-Fair or Stagger Skip Stop

One way of operating fewer-stop service is to stop on alternate corners; the other is to have outbound cars stop at one series of corners while inbound cars stop at the other series of corners. The latter method, or "stagger" stop, illustrated in Fig. 23, has the advantage of equalizing the walking done by all passengers, since the passenger who walks an extra block in the morning does not have to do so at night—and vice versa. The stagger stop has been successfully introduced at Cleveland, Detroit, Buffalo, Kansas City and Toledo, and is now being tried at Baltimore, Dallas, Cincinnati and Columbus.

To show that the stagger stop plus walking is quicker for the patron than haphazard stopping, Fig. 24 has been prepared. This shows the time required to walk distances up to 1000 ft. Of course, the distance between stops does not have to be traversed by every individual car user. The greatest distance which he will have to walk will be one-half of the distance between the possible car stops.

It is to be expected that when some stops are eliminated, a few people will appear before regulatory bodies to contend that it is a personal inconvenience for them to walk an additional square. Not only do such complainants fail to consider the benefit to the community in general, but they also fail to appreciate their personal gain and convenience. As for the storekeeper who wants every car to stop in front of his emporium, the rule of the greatest good to the greatest number should be rigidly applied.

It may be interesting to add that in European cities, the spacing between stops ranges from 250 meters (820 ft.) up* and that the stop signs are placed regardless of crossings—a practice which is safer and more equitable than the use of corners.

Save Time in Passenger Interchange

One of the most important studies, especially on city railways, is the proper design of car entrances and exits. These studies should be made in conjunction with different systems of fare collection. To be sure, the height of step, width of entrance and means of signaling from the conductor to the motorman are features which have long been studied. Nevertheless, the variations in the designs of cars purchased by different railways plainly show that the underlying principles of correct design have not yet been properly outlined and universally accepted.

To make the conductor reach up or out to some remote point to pull a bell rope instead of pushing a button on a fare box pedestal seems a trifle; but for the combined stops on a run it surely involves the loss of enough fractions of a second to be exceedingly important. Very profitably could we enter into studies such as those outlined in Frank B. Gilbreth's book on "Motion Study." The number of useless motions that are made by the passenger and also by the conductor should receive careful study. Until this study is made and followed to a conclusion, we shall never have a car which is properly arranged.

In all probability, the ultimate city car will be so arranged that the natural inclination of the passenger will be to follow a series of movements that will result in reducing the length of stops to a minimum. Every railway should study each type of car which it is now operating to ascertain the number of passengers which can be loaded and unloaded within a given time. These graphs of passenger interchange will plainly show the time effect of the different heights of steps, different widths of entrances and different methods of fare collection. If investigations of this kind are carried out we can rest assured that a number of operating com-

*See Blake & Jackson's "Electric Railway Transportation," page 84.

Table V—Effect of Two Rates of Acceleration and Braking and Different Number of Stops on Power Costs and Platform Wages While Maintaining the Same Schedule Speed

Stops per Mile	Acceleration and Braking Rate	Schedule Speed	Power, Kilowatt-Hour per Car-Mile	Car-Hours for 40,000 Car-mile Operation	Platform Wages per Hour Plus 10 per Cent	Power Cost at 1½ Cents per Kilowatt-Hour at the Car, 40,000 Car-Mile Operation	Total Cost	Per Cent
3	1½	15.6	1.84	2564	$1692.24	$1104.00	**$2796.24**	106
3	2	15.6	1.56	2564	1692.24	936.00	**2628.24**	100
5	1½	13.1	2.28	3053	2014.98	1368.00	**3382.98**	128
5	2	13.1	1.90	3053	2014.98	1140.00	**3154.98**	120
7	1½	11.4	2.66	3508	2315.28	1596.00	**3911.28**	148
7	2	11.4	2.18	3508	2315.28	1308.00	**3623.28**	138
9	1½	9.9	3.00	4040	2666.40	1800.00	**4466.40**	170
9	2	9.9	2.36	4040	2666.40	1416.00	**4082.40**	155

panies would either dispose of some present equipment or change the entrance, exit and step arrangements to such advantage that a very handsome interest would be returned on the expenditure.

The great importance of the system of fare collection on loading time is shown in Fig. 22, which brings out the greater passenger-interchange speed of the pay-as-you-pass car over a prepayment car in exactly the same service. Thus the pay-as-you-pass car interchanged sixty on or off passengers in forty-three seconds, while the other car required sixty-eight seconds, or twenty-five seconds more!

Accelerate Quickly Brake Quickly

For a long time we have realized that by accelerating and braking at relatively rapid rates we could make faster schedule speeds. To what extent this would affect the schedule speed has not, in so far as the writer knows, been previously worked out. The Twin City Rapid Transit Company has for years been accelerating its cars at a rate of 2 m.p.h.p.s. and also braking at rates which were as fast as was consistent with good practice. Within the last few years the Chicago Surface Lines have done likewise.

To show definitely what can be secured from schedules with different rates of acceleration and braking, three sets of graphs have been made up. Fig. 25 shows a 40,000-lb. car complete with load and geared for a free running speed of 25 m.p.h., assuming a definite length of stop of five seconds. The calculations are made on the basis of accelerating and braking at 1, 1½, 2 and 2½ m.p.h.p.s. With an equipment on cars of this weight the best rate of acceleration which we have been able to obtain commercially is 2 m.p.h.p.s. However, since the future may give us an equipment and car construction which will enable us to accelerate at 2½ m.p.h.p.s. we have included this figure.

On the automatic safety car, Fig. 26, data have been prepared for a car which will weigh complete with live load 7½ tons or 15,000 lb. The rates of acceleration and braking specified for this car are 1½, 2 and 2½ m.p.h.p.s. This car is also geared for 25 m.p.h. free running speed, and we are assuming that the stops are of the same length as for the larger car, that is five seconds. On these two graphs we have taken the example of a car accelerating and braking at different rates and have taken full advantage of all the schedule possibilities of the equipment when accelerating and braking at 1½ m.p.h.p.s. It will be noticed that the power increases with the more rapid rate of acceleration, but that we secure a greater schedule speed.

Another condition which we can consider is that illustrated in Fig. 27. This graph shows the maximum speed which can be obtained by accelerating and braking at 1½ m.p.h.p.s. The power when this acceleration is in use is shown in the upper graph.

We all know that by accelerating and braking at 2 m.p.h.p.s. rather than 1½ m.p.h.p.s. there is a considerable saving in energy consumption, providing the same schedule is maintained in both cases. This fact is brought out by Figs. 28 and 29, which show the power saving which can be made by accelerating and braking at different rates, while maintaining the same schedule. These two graphs are made for cars operating in runs of 1000 ft. each.

Fig. 27 shows the saving which can be made in energy by operating a maximum schedule with 1½ m.p.h.p.s. acceleration and braking; and also the energy which will be used providing this acceleration and braking are changed to 2 m.p.h.p.s. With this latter condition we will still maintain the maximum schedule possible with the lower rate of acceleration and braking.

Higher Speeds Save

In order that we may analyze more thoroughly just what different rates of acceleration and braking mean, Table V has been prepared from Fig. 27, showing the effect of accelerating at 1½ and 2 m.p.h.p.s. for 40,000 car-miles. In this table we have merely considered the cost of power and platform wages. It will be noticed that we have taken three stops per mile with 2 m.p.h.p.s. accelerating and braking as a basis of comparison, using this figure as 100 per cent. By accelerating and braking at 1½ m.p.h.p.s. with three stops per mile we notice that the percentage expense for energy and wages alone has increased to 106 per cent. With seven stops per mile this is increased from 138 to 148 per cent and with nine stops per mile from 155 to 170 per cent.

In Fig. 25 we considered the 40,000-lb. car in service of three, five, seven and nine stops per mile and used rates of acceleration and braking of 1, 1½, 2 and 2½ m.p.h.p.s. We also took three stops per mile with 2½ m.p.h.p.s. acceleration and braking as 100 per cent. It will be noticed from Table VI that with three stops per mile the total cost of platform wages and power has advanced with 2, 1½ and 1 m.p.h.p.s. from 100 up to 102, 103 and 108 per cent respectively. With seven stops per mile the percentage is increased from 139 up to 155 per cent, and with nine stops per mile from 155 up to 174 per cent.

Table VI—Effect of Three Rates of Acceleration and Braking and Different Number of Stops on Power Costs, Platform Wages and Schedule Speeds, 40,000-Lb. Car

Stops per Mile	Acceleration and Braking Rate	Schedule Speed	Power, Kilowatt-Hour per Car-Mile	Car-Hours for 40,000 Car-Mile Operation	Platform Wages 60 Cents per Hour plus 10 per Cent	Power Cost at 1½ Cents Kilowatt-Hour at the Car, 40,000 Car-Mile Operation	Total Cost	Per Cent
3	1	14.3	1.80	2797	$1827.54	$1080.00	**$2907.54**	108
3	1½	15.6	1.84	2564	1692.24	1104.00	**2796.24**	103
3	2	16.4	1.86	2439	1609.74	1116.00	**2725.74**	102
3	2½	16.9	1.89	2366	1561.56	1134.00	**2695.56**	100
5	1	11.6	2.20	3448	2275.68	1320.00	**3595.68**	133
5	1½	13.1	2.28	3053	2014.98	1368.00	**3382.98**	126
5	2	13.9	2.34	2877	1898.82	1404.00	**3302.82**	123
5	2½	14.4	2.38	2777	1832.82	1438.00	**3270.82**	122
7	1	9.95	2.52	4020	2653.20	1512.00	**4165.20**	155
7	1½	11.4	2.66	3508	2315.28	1596.00	**3911.28**	145
7	2	12.2	2.75	3278	2163.48	1650.00	**3813.48**	141
7	2½	12.8	2.80	3123	2061.18	1680.00	**3741.18**	139
9	1	8.75	2.80	4571	3016.86	1680.00	**4696.86**	174
9	1½	9.9	3.00	4040	2666.40	1800.00	**4466.40**	166
9	2	10.9	3.10	3669	2421.54	1860.00	**4281.54**	159
9	2½	11.6	3.18	3448	2275.68	1908.00	**4183.68**	155

In like manner Table VII shows what can be done with a lightweight safety car at three different rates of acceleration and braking and four different numbers of stops.

The annual cost is estimated to be $832.44, or 62 per cent, more at 2½ m.p.h.p.s. and three stops per mile than at 1½ m.p.h.p.s. and nine stops per mile.

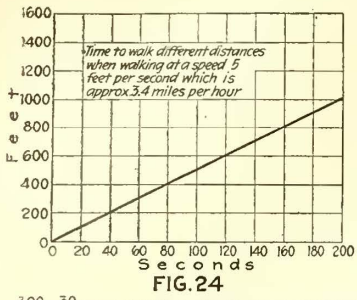


FIG. 24

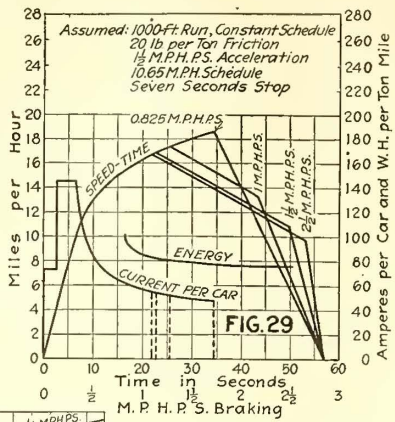


FIG. 29

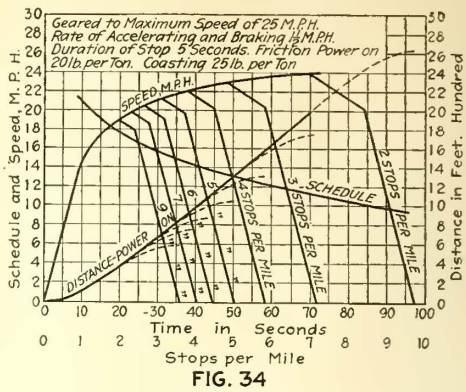


FIG. 34

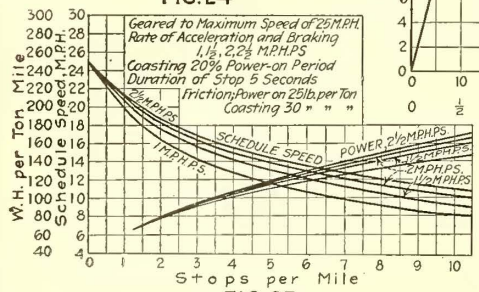


FIG. 25

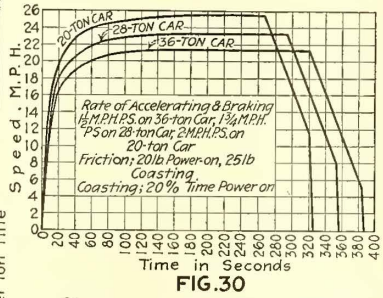


FIG. 30

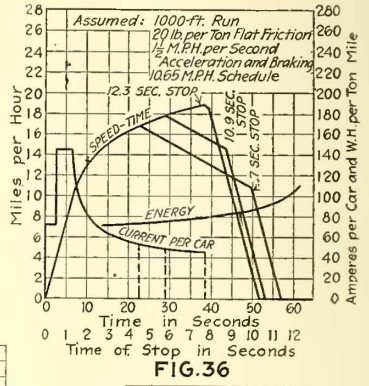


FIG. 36

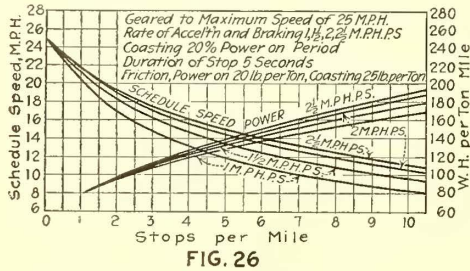


FIG. 26

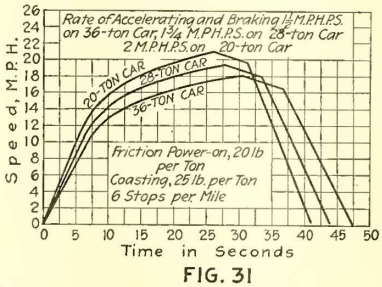


FIG. 31

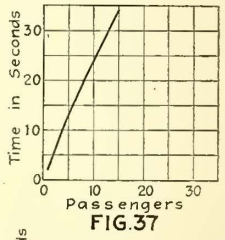


FIG. 37

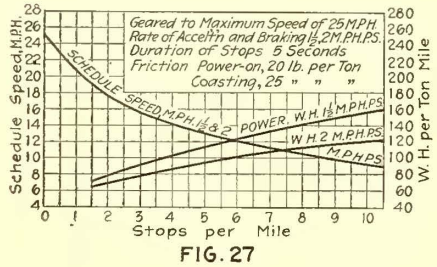


FIG. 27

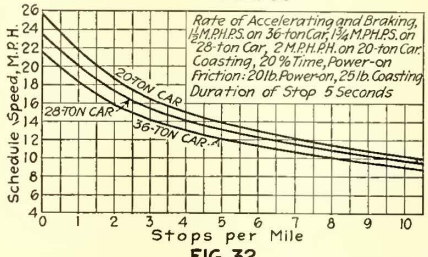


FIG. 32

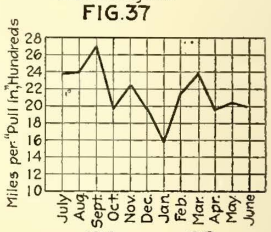


FIG. 38

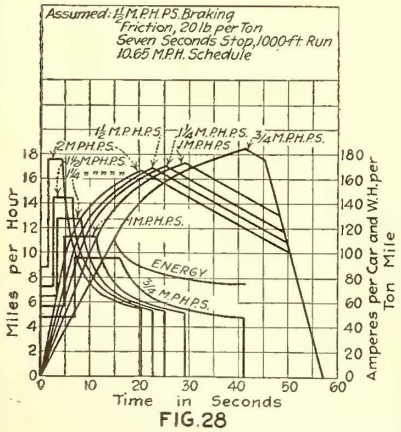


FIG. 28

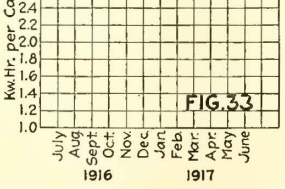


FIG. 33

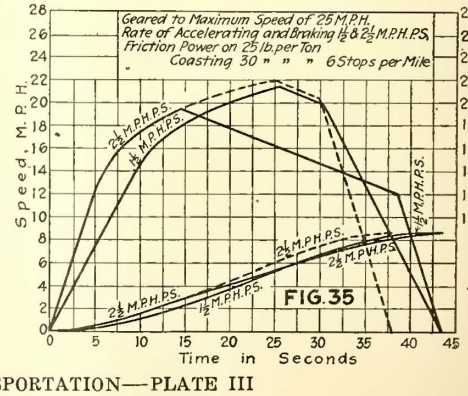


FIG. 35

GRAPHICS OF ELECTRIC RAILWAY TRANSPORTATION—PLATE III

Fig. 24—Relation of Walking Distance and Time
Fig. 25—Schedule Speed and Energy Consumption Curves for 20-ton Car
Fig. 26—Schedule Speed and Energy Consumption Curves for 7½-ton Car
Fig. 27—Schedule Speed and Energy Consumption Curves for 20-ton Car
Fig. 28—Chart Showing Decrease in Energy as Rate of Acceleration is Increased
Fig. 29—Chart Showing Decrease in Energy as Rate of Braking is Increased
Fig. 30—Speed-Time Graphs for 20-ton, 28-ton and 36-ton Cars
Fig. 31—Speed-Time Graphs for 20-ton, 28-ton and 36-ton Cars
Fig. 32—Schedule Speed Curves for 20-ton, 28-ton and 36-ton Cars
Fig. 33—Graph Showing Effect of Heating on Energy Consumption
Fig. 34—Speed, Schedule Speed and Distance Graphs for 20-ton Car
Fig. 35—Speed and Distance Graphs for 7½-ton Car
Fig. 36—Chart Showing Increase in Energy Consumption as Duration of Drop Is Increased
Fig. 37—Loading Time of Fort Worth Safety Car
Fig. 38—Graph of Miles per "Pull In" (Total "Pull Ins")

Table VII—Effect of Three Rates of Acceleration and Different Number of Stops on Power Costs, Platform Wages and Schedule Speeds, 15,000-Lb. Safety Car

Stops per Mile	Rate of Acceleration	Schedule Speed	Power Consumption per Car-Mile	Car-Hours for 40,000 Car-Mile Operation	Platform Wages at 36 Cents per Hour Plus 10 per Cent	Power Cost, 40,000 Car-Mile Operation	Total	Per Cent
3	1½	15.4	.825	2597	$934.92	$495.00	**$1429.92**	107
3	2	17	.84	2353	847.08	504.00	**1351.08**	101
3	2½	17.45	.85	2292	825.12	510.00	**1335.12**	100
5	1½	13.45	.915	2974	1070.64	549.00	**1619.64**	121
5	2	14.4	.945	2777	999.72	567.00	**1566.72**	117
5	2½	15	.96	2666	959.76	576.00	**1535.76**	115
7	1½	11.6	1.08	3448	1241.28	648.00	**1889.28**	141
7	2	12.65	1.18	3161	1138.96	708.00	**1846.96**	139
7	2½	13.2	1.23	3030	1090.80	748.00	**1838.80**	138
9	1½	10.2	1.26	3921	1411.56	756.00	**2167.56**	162
9	2	11.2	1.32	3571	1285.56	792.00	**2077.56**	155
9	2½	11.8	1.35	3389	1220.04	810.00	**2030.04**	152

These savings, of course, cannot be obtained in their entirety. We all know that there are certain operating conditions which have to be considered in connection with any calculated savings. However, it is fair to assume that by explaining these different features to all of the men, we can secure under favorable conditions at least half of these savings.

To determine what is the maximum rate at which a car can be accelerated, it is necessary to have the following data:

Weight of car complete with live load.
Number of motors per car.
Size of motor, that is, hourly rating.
Motor gearing.
Size of wheel.
Characteristic curve of the motor arranged for the proper size of wheel and gearing.

From these data it is possible to secure the amount of current which the equipment will require for different rates of acceleration. We will assume we have a car weighing 40,000 lb. and that the car is equipped with four 25-hp. motors having 74-tooth gear and 13-tooth pinion and that the wheel diameter is 26 in. To calculate this, proceed as follows:

Since the car weighs 40,000 lb. or 20 tons complete with live load this will be equivalent to 5 tons per motor. Let us assume that we are desirous of knowing if the car can be accelerated at 2 m.p.h.p.s. To accelerate 1 ton at 1 m.p.h.p.s. 91.2 lb. tractive effort or drawbar pull is required. It is also customary to add approximately 7 per cent for the rotary effect of wheels, gears, axles and armatures, which will give a total of 98 lb. per ton. Therefore, to accelerate this mass at 2 m.p.h.p.s. this figure will have to be doubled, by which we obtain a figure of 196 lb. per ton merely to accelerate the mass. To this figure for tangent level track it will be necessary to add 20 lb. per ton friction, which is the figure ordinarily used for rolling friction, energy, etc. Hence we would have a cumulative value of 196 plus 20, or 216 lb. per ton. Multiplying this by five tons we find that we have a total of 1080 lb., or by referring to the characteristic curve, Fig. 19, we find that 61 amp. will be required to produce the desired torque which gives the desired rate of acceleration. The hourly commercial rating of this motor is 37 amp., and it will be noted that the 61 amp. represents a value of 165 per cent of the hourly rating. With this particular motor it will be satisfactory with the weight given to accelerate with the currents specified. In the old non-commutating pole motors it is always safe to use accelerating currents up to the full one-hour rating of the motor, and on certain non-commutating motors we can use accelerating currents as high as with the newer type commutating pole motors where it is safe to accelerate up to 150 per cent of the hourly current rating. However, it is always best to consult with the motor manufacturer before accelerating with currents which are in excess of the hourly rating.

That the motorman may know positively what maximum rates of braking and acceleration are permissible, it is advisable to have a sign placed above the controller, which sign should state distinctly the time in seconds in which it is safe to accelerate up to full series and full parallel when operating on level track.

Before the inauguration of a campaign for the maximum rates of acceleration and braking, it is necessary to have the mechanical department set up the circuit-breakers to a point which will allow them to open only when actual overloads occur. If this is not done, the circuit-breaker may be set so low that it will blow continually during the normal operation of the car. The controllers and motors should also be overhauled and cleaned up. It is also important that the piston travel be of the proper length to secure the maximum braking effect.

After we have reviewed the tables which show the effect of different stops per mile with different rates of acceleration and different length of stop, we are bound to feel that we should do everything we can to eliminate all possible stops. We should not simply refer to the stops as "useless," but consider how they tend greatly to increase or decrease the schedule speeds.

Public Puts Speed Before Comfort

An example of what can be accomplished and how popular is bound to be a reduction in the number of stops is strikingly illustrated in the service which is given in the New York subway between Forty-second Street and Fourteenth Street. At these two points there are island platforms from which it is possible to take either express or local trains; the express train having a running time between express stations of approximately two minutes less than the local. Passengers almost invariably use the express train between these two points regardless of whether there is ample seating room on the local train. Here is a case absolutely free from coercion which proves that passengers are willing to sacrifice a seat to avoid four stops, in order to save two minutes and enjoy the exhilaration of riding in a vehicle which is not continually accelerating and braking.

This is a point which we should study and try to follow through to a conclusion. If we do this we shall be in better position to guide our public relations. This illustration of the use of the express train leads us directly to the conclusion that fast schedules and fewer stops build up business.

Proper Gear Ratio Important

If we assume that the railway has been permitted to put into effect the speed-raising improvements discussed, it can go a step further—provided it can get the money—namely, rearrange its gear ratios. An idea of the schedule speeds which can be made with cars geared for different free running speeds

may be obtained from Table II and Fig. 20. We have assumed that the car weight complete with all equipment and live load will total 40,000 lb. and that by substituting different gearing we can arrange the car to have free running speeds of 15, 20, 25 or 30 m.p.h. This car would then be capable of making the schedule speeds shown in Table VIII when operating in a service of seven stops per mile with an average of five seconds per stop:

Table VIII—Relation of Free Running Speed to Power Cost, Seven Stops per Mile

M.P.H. Free Running Speed	Schedule Speed*	Kilowatt-Hours per Car-Miles at the Car	Power Cost for 40,000-Lb. Car-Miles—1½ Cents per Kilowatt-Hours at the Car	Per Cent
15	9.2	1.36	**$816.00**	100
20	10.3	1.84	**1104.00**	154
25	11.4	2.66	**1596.00**	223
30	11.7	3.32	**1992.00**	278

*Schedule speed in all tables are understood to be the maximum speeds obtainable, no allowance being made for curves, grades and traffic interruptions. Actual schedule speeds will be 10 per cent lower.

* * *

The Fourth Service Fundamental Is Weight

The Advance Made by the Car Builder in Weight Reduction Is But One Item; the Operation of Smaller But Faster Cars Is Still More Important

THE service fundamental of weight embraces the size of car or seating capacity and the design and structure of a comfortable vehicle capable of operating at a speed which will satisfactorily meet the conditions of traffic.

We need not enter here into the province of the car builder except to note how the evolution from rule-of-thumb methods to the days of stress diagrams has brought down the weight per seated passenger from 1500 lb. to 500 lb. or less, as in the safety car, thus making an enormous saving in the cost of the weight propelled. Recently, detailed investigation was made on a prosperous, well-managed property which had inherited certain equipments. It has in city service a number of cars which weigh approximately 60,000 lb. each. These cars seat forty-eight passengers (1250 lb. per seated passenger) and are geared for a speed which is higher than necessary. A new car, weighing only 40,000 lb. and seating fifty-eight (687 lb. per seated passenger) was purchased to give even better service than the present equipments at an annual power saving of more than $1,500 per car.

Even before a railway decides upon new equipment, it will do well to review all the weights of existing types so as to select the extra heavy cars for trippers and exclude them, wherever possible, from any runs on which the maximum mileage is operated.

The following Table IX shows the comparative power costs for 15,000-lb., 40,000-lb. and 60,000-lb. cars, assuming schedule conditions to be alike, length of stop five seconds, rate of acceleration 1½ m.p.h.p.s. and the cost of energy 1½ cents per kilowatt-hour at the car.

But the problem is far broader than is expressed by those savings in weight which are due to the advances in car building, because we can make still greater savings in the ton-miles propelled by using smaller but

Table IX—Power Consumption and Power Costs for 15,000 Lb., 40,000-Lb. and 60,000-Lb. Cars with Power Costs of 1½ Cents per Kilowatt-Hour at the Car

Stops per Mile	15,000-Lb. Car Power, Kw.-hr. per Car-Mile at Car	40,000-Lb. Car. Power, Kw.-hr. per Car-Mile at Car	60,000-Lb. Car. Power, Kw.-hr. per Car-Mile at Car	Power Cost for 15,000-Lb. Birney Car, 40,000-Car-Mile Operation	Power Cost, 40,000-Lb. Car, 40,000-Car-Mile Operation	Power Cost 60,000-Lb. Car, 40,000-Car-Mile Operation
3	.825	1.84	2.76	$495.00	$1,104.00	**$1,656.00**
5	.915	2.28	3.42	549.00	1,368.00	**2,052.00**
7	1.08	2.66	3.99	648.00	1,596.00	**2,394.00**
9	1.26	3.00	4.50	756.00	1,800.00	**2,700.00**

faster cars. In other words, the capacity of the cars should be considered on the basis of how many people they can carry per hour and not on how many they can carry per trip.

The but recent realization of the principle that schedule speed is a vital factor of car capacity accounts largely for the popularity of the big pay-as-you-pass car and the small safety car.

One beauty of the small car is the fact that it is the car with the least idle or excess weight during the light hours of the day.

To help us review the influence of weight propelled on a particular motor on which the same gearing is used, graphs have been prepared to show the free running speed which determines the schedule possibilities with cars having a total weight of 20, 28 and 36 tons respectively.

Fig. 30 shows that the free running speed with the three different classes of equipment will be

20-ton car—25.6 m.p.h. free running speed
28-ton car—23.4 m.p.h. free running speed
36-ton car—21.4 m.p.h. free running speed

It will be noted that this graph has been made up to show three different runs which are of the same distance. However, the time of making the run varies with the different weights of cars.

By referring to Fig. 31 we see that the highest speeds which are attained when the car is making six stops per mile are as follows:

20-ton car—21.0 m.p.h. max running speed
28-ton car—19.4 m.p.h. max. running speed
26-ton car—18.1 m.p.h. max. running speed

The time required for each cycle of operation will be as follows:

20-ton—41.00 seconds
28-ton—44.00 seconds
36-ton—47.25 seconds

By referring to Fig. 32 on page 20 we find that the schedule speeds which can be operated without leeway are as follows:

Stops per mile.....	3	5	7	9
20-ton car.....	16.5	13.9	12.25	10.9
28-ton car.....	15.4	13.2	11.65	10.4
36-ton car.....	14.6	12.2	10.8	9.65

This is but one phase of the study of what weight means. Another phase is that every time excess weight is moved it is paid for in power. So we should keep weights down to the possible minimum and still retain safety and reasonable maintenance. If we desire to know the influence of weights of all different cars on the system which are in service, we can ascertain from characteristic curves what is the free running speed of each car which is in service. We can also follow up the service conditions as they actually are and obtain

the number of stops per mile with which the cars are operating. From these data, and also from the data which are given on the graphs of power consumption and schedule speed possibilities, we can determine to a surprising degree of accuracy the amount of power taken by the different cars on the system. Due allowance can be made for transmission, substations and line losses, and so we can figure out the total amount of power used by any combination of equipments.

Where the mileage operated by each car and also the service in which it is operated are given, relative comparisons can be made as to what different cars cost for power consumption. Our estimates for wear and tear on track by equipments of different weight are not definite, but approximate figures can be taken to enable the operator practically to determine just what heavy cars cost. By making a comparison of this kind, the operating department will learn what cars should be run for the maximum mileage and what cars should only be used as trippers.

* * *

The Fifth Service Fundamental Is Cost

The Elements of Both Time and Weight Enter, Aside From Which Energy Savings Are Possible Through Anti-Friction Equipment and Scientific Operation with Maximum Coasting

A NUMBER of factors which affect cost of power, such as number and time of stops, gear ratios, weights, etc., have already been discussed. The time elements, of course, also have considerable effect on platform costs.

Undoubtedly there is a great deal of loss through wasteful operation of electric heaters and motor-driven hot-air heaters. If thermostats and automatic switches were used, the car-heating peak shown in Fig. 33 would be reduced 25 to 33⅓ per cent. At the same time, the riders would be more comfortable, because of the more uniform temperature attained. Thirty per cent of the electric heaters ordered last year from one maker included thermostats.

Among the minor power losses are those due to dragging brakeshoes—a condition that can be eliminated partly by the use of air brakes, automatic slack adjusters and more coasting. The installation of these devices will require new capital, which the operating company may or may not be able to secure at a reasonable rate of interest.

Coasting Extremely Important

In addition to these factors is the overwhelmingly important one of the motorman's handling of the car operating cycle, namely acceleration, coasting, braking. Here are important opportunities if we first learn how to analyze the possibilities for ourselves and then instruct the motormen with the aid of car checking instruments to operate exactly as they should.

Therefore, it will be of decided advantage to know just how many seconds are required for each particular part of the cycle of car operation. In order to facilitate our study Figs. 34 and 35 have been made up for the big and small cars respectively. Fig. 34 illustrates a car weighing 20 tons, which is geared for a maximum free running speed of 25 m.p.h., when accelerating and braking at 1½ m.p.h.p.s. using 20 lb. per ton friction during the power-on period and 25 lb. per ton friction during the coasting period. Let us assume that this car is operating in a service with six stops per mile. Then the car will require 26.3 seconds to reach the point where the current is cut off and will have to traverse a distance of 580 ft. The time required to the end of the coasting will be 31.7 seconds and the distance will be 700 ft. The time required to the end of the braking, namely, when the car comes to a complete stop, will be 44.5 seconds and the distance traveled will be 880 ft. On the lower ordinate it will be noted that time and stops per mile are specified. The stops per mile refer to the schedule speed graph which is shown above and should not be confused with the distance graph or with the graphs which illustrate the actual car speed, coasting and braking.

Since the energy that can be saved during the run cycle depends largely upon the time available for coasting, it is not only desirable to use high rates of acceleration and braking, but also to shorten the length of stop. By referring to the graphs, Fig. 36, we see that by making a seven-second stop the coasting will amount to 120 per cent of the power-on period, while by extending the length of stop to 10.9 seconds, this figure is further reduced to 47.8 per cent; by further increasing the length of stop to 12.3 seconds, the coasting period is reduced to 2.63 per cent. It will therefore be readily appreciated that if we are operating a car at a given schedule, the length of stop is a big factor in the amount of coasting possible. We should, therefore, help the crews all we possibly can to take advantage of this phase of operation in addition to obtaining the permissible maximum rates of acceleration and braking.

The use of anti-friction bearings, particularly for the journals, naturally will extend the coasting period.

It may be added here that even on lines of three or four cars, where the larger economies (like saving a car) are impracticable it is at least possible to get more coasting, which means power savings.

* * *

The Cars of To-day

Why the Light-Weight One-Man Safety Car and the Pay-as-You-Pass Car Loom Up So Largely on the Electric Railway Horizon

FROM the car-loading graphs presented earlier in this article, we have seen how readily a small car meets the average car loading. When we give this small car 15 per cent greater schedule speed, or mobility, through the use of higher accelerating and braking rates and fewer stops, and then economically give a 25 to 50 per cent shorter headway, we shall find that the safety car can be run to good advantage on a large number of lines.

Table X has been prepared to show just what the safety car does under stated conditions for say a year's operation of 30,000 or 40,000 miles. By the use of this car with the fair average of seven stops per mile and five seconds per stop the cost of platform wages and power for 40,000 car-miles is estimated to be $1,964.90. This figure is but 41½ per cent of the $4,727.70 cost of

Table X—Possibilities of the Safety One-Man Car

40,000 Car-Miles Operation

Stops per Mile	Length of Stop	Schedule Speed with 2 m.p.h. p.s. Acceleration and Braking	Kilowatt-Hours per Car-Mile 2 m.p.h.p.s. Acceleration and Braking	Car-Hours, 40,000 Car-Mile	Power Costs 1.5 Cents per Kilowatt-Hour at the Car	Platform Wages 36 Cents per Hour plus 10 per Cent	Total Wage and Power
3	5	17	.84	2353	$504.00	$931.78	**$1435.78**
5	5	14.4	1.02	2777	612.00	1099.69	**1711.69**
7	5	12.6	1.18	3174	708.00	1256.90	**1964.90**
9	5	11.2	1.32	3571	792.00	1414.11	**2206.11**

30,000 Car-Miles Operation

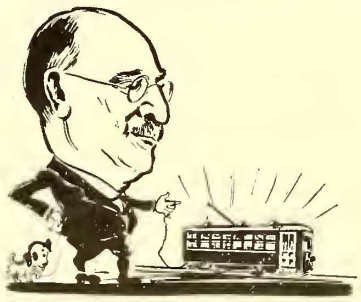
3	5	17	.84	1764	378.00	698.54	**1076.54**
5	5	14.4	1.02	2083	459.00	794.86	**1253.86**
7	5	12.6	1.18	2381	531.00	942.87	**1473.87**
9	5	11.2	1.32	2878	594.00	1060.48	**1654.48**

a large two-man car in a service of nine stops per mile with ten seconds per stop.

Car Sizes Contrasted

From the traffic checks previously described, we can find the total number of passengers for cars for each hour of the day; also the total number of cars passing the checking point. With these data we can readily calculate what the seating capacity and size of car should be. We can also see just what will be the effect of putting on a lesser number of large cars or a greater number of small cars.

Now the only limitation of the small car is the number of units that can be run through the congested por-



This is the originator of the safety car

tion of the city. The studies of B. J. Arnold in Chicago indicate that the least permissible time between following cars is approximately twenty seconds. But looking at the subject in a broader way, we can well afford to consider what other possible parallel avenues of travel could be utilized if necessary to give adequate service with economy.

Another fact to be considered is that in accordance with old-time viewpoints railways frequently have operated cars over certain streets and to special points because they feared to offend public opinion. To put this in another way: a few prominent citizens, to serve their own selfish mercantile interests, wisely or unwisely have dictated to the railway where cars should be operated. Their will prevailed, not because the greatest number of citizens were properly accommodated thereby but because these few citizens who thought they had something big at stake, possessed the largest, loudest and most persistent voice as regards the accommodations which the railways should provide for the public.

Recent events and conditions have accelerated the spread of the modern idea that all service, public and private, must be operated on the basis of the greatest economy consistent with public policy. In short, we must consider first the good of the largest number.

For the purposes of comparison in costs, we have taken a 40,000-lb. car complete with load and 15,000-lb. car with load, as shown in Table XI. Let us first review the cost of platform wages and power of the large car on a line with ten-minute non-rush and 6.6-minute rush service. By putting on the small car with higher schedule speed we can give twice the service at an estimated operating saving of $3,674.60 per annum. In many cases this increase in service will produce 30 to 40 per cent more gross.

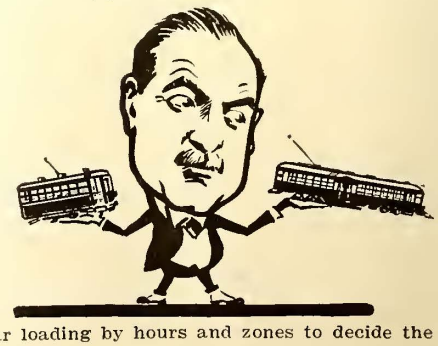
Table XI—The Superiority of the Safety Car for a Given Service

	40,000-Lb. Car Seating Fifty-four	15,000-Lb. Car Seating Twenty-eight	15,000-Lb. Car Seating Twenty-eight
Length of line, miles	10.5	10.5	10.5
Interval between cars, non-rush, minutes	10	5	10
Interval between cars, rush, minutes	6.6	3.3	3.3
Cars required, non-rush	6	10	5
Cars required, rush	9	15	15
Stops per mile, non-rush	5	4	5
Stops per mile, rush	6	5	5
Average length of stop, seconds, non-rush	5	5	5
Average length of stop, seconds, rush	5	5	5
Running time, minutes, non-rush	57.5	45	48.5
Running time, minutes, rush	60	50	48.5
Schedule speed, miles per hour, non-rush	11	14	12.9
Schedule speed, miles per hour, rush	10.5	12.9	12.9
Rate of acceleration and braking, miles per hour per second	1½	2	2
Layover in minutes, non-rush	2½	5	1½
Layover in minutes, rush	0	1½	1½
Seats per hour, non-rush	324	336	168
Seats per hour, rush	486	504	504
Car-miles per day	1260	2510	1677
Car-hours per day with four hours, rush service	120	200	130
Crew wages per hour, cents	60	36	36
Total platform wages with four hours' rush service	$72.00	$72.00	$46.80
Power cost per day	47.19	35.57	27.17
Combined wages and power per day	119.19	107.57	73.97
Combined wages and power per year, 330 days	$39,172.70	$35,498.10	$24,310.10

In each case studies should be made of the riding habits of possible customers to determine how many ride in automobiles, and we should also consider the class of people along the line to get an idea of what increased service is likely to do in changing the shopping habits of the community and other habits which are affected by transportation facilities.

Of course, our small units will operate more car-miles, but the cost of maintenance per unit is sufficiently low to make one grade of service cost practically about as much as the other.

The field of the small car yet remains to be determined, but on routes of light or moderate traffic where the rush-hour requirements are not so greatly in excess of those during the rest of the day as to impose an excessive penalty in the form of numerous tripper cars, the electric railway manager can well consider the possibility of this type of car.



Analyze car loading by hours and zones to decide the size of car

Make Every Car Make Good

Car-Mile Records Should Be Kept of All Equipment Defects and Their Influence on Service Analyzed. Every Railway Should Also Know the Use Factor of Its Equipment

THE number of cars taken from service every day because of equipment defects directly pictures the physical condition of the apparatus and, broadly speaking, usually represents the amount of money which is spent for equipment maintenance. Where there are a large number of failures the cost of maintenance is in proportion.

Records should be made of all crippled cars turned in by the transportation department; and it is advisable to transcribe this information into classified graphs which will show on the basis of car-miles per failure, the failures to motors, electrical equipment, car trucks, bodies and brakes respectively. On large, well-operated systems mileage per failure varies from 2800 to 4400 car-miles. By the proper segregation of these failures the mechanical department knows exactly what portion of the equipment is causing the largest number of troubles and can use its energies intelligently to care for each trouble as it comes along.

It is even more important to know just how many minutes delay certain defects caused in service on the line. With such a comparison, added to the mechanical analysis, it will not take long to learn what equipments are unprofitable and unsatisfactory.

What's Your Use Factor of Cars?

Perhaps the first thing to do is to determine the use factor of the cars, namely, the actual daily car-hours against the ideal car-hours obtained by multiplying the number of cars by twenty-four. At the very least, this will be good material for publicity; but going deeper, we see how this ratio is affected by the proportion of cars unsuitable for the season or just out of a job, the proportion in for inspection, for repairs and for painting. Take the last-named item for example. If a car is painted once a year, a week saved by quick-painting methods corresponds to 2 per cent of its working time.

The use factor, which varies between 30 per cent and 40 per cent, gives a definite idea of the number and consequent value of the extra cars required to give adequate rush-hour service. Interest, depreciation and upkeep of this extra equipment are parts of the cost of giving rush-hour service.

Car Failure Analysis

The superintendent of equipment should classify all failures of equipment for each class of cars carefully. The following list of headings will be found convenient in this connection:

Car Bodies

Car-body parts
Sash or glass
Ventilators
Registers
Gong signals
Sand box
Drawbars
Fenders
Trapdoors
Seats
Doors and operating mechanism
Signs
Heaters
Headlights
Light circuits
Window shades

Trucks

Wheels
Axles
Journal bearings
Truck frame
Brakeheads and shoes
Brake rods
Brake levers
Bolster springs
Loose brakes
Tight brakes

Electrical Equipment of Cars

Trolley base
Trolley pole or wheel
Wiring
Fuse box
Circuit-breaker
Controller
Grid resistance

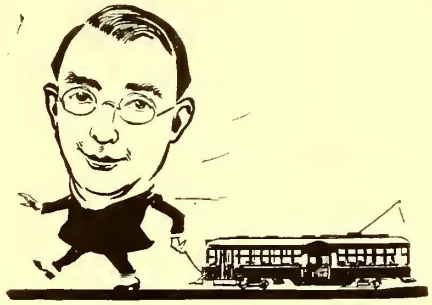
Motors

Field coils
Low bearings
Armatures
Brush-holders
Pinions
Gears
Gear case
Motor frame
Motor leads

Air Brakes

Compressor
Motor
Governor
Air-brake parts frozen
Engineers valve
Reservoir
Piping or brake cylinder

If this classification is followed for each series of cars, we can ascertain what particular cars and kinds of failures recur again and again. Under each of the five general headings, it is advisable to chart the car-miles per pull-in. Of course, there should always be graphs showing the effect of the total pull-ins. A glance at these charts, such as Figs. 38, 39 and 40, will show whether or not the mechanical department is maintaining the proper relations between failures and pull-ins.



We are indebted to this man for the pay-as-you-pass car

Equipment failures are very expensive and unsatisfactory. Each car taken from service makes for serious public inconvenience and costs the railway much more in transportation losses and interruptions to service than for repairs to the car alone. Thus the book costs of replacing a defective coil may be only $9 or $10; but this takes no account of the cost of moving the dead car to and from the shops nor of the losses in revenue and payment for idle platform time on all of the cars delayed —not to mention the inconvenience to the public.

What we have said about the value of high rates of acceleration and braking will help to give a true appreciation of what it means to have equipments capable of meeting fully the requirements of an efficient transportation department. The maintenance cost of the equipment is but a small portion of the other expenses which may be incurred due to the failure of obsolete equipment to measure up to modern standards. It behooves the manager to investigate with particular care the merits of the higher acceleration four-motor equipment as compared with two-motor equipment. In fact, now that we understand better the dollars and cents value of higher rates of acceleration, we may expect the old controversy of four-motor versus two-motor equipment to be decided soon in favor of the former.

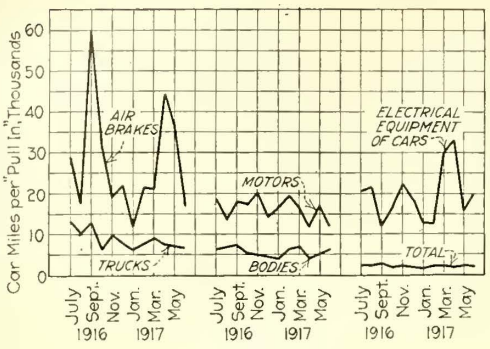


FIG. 39.

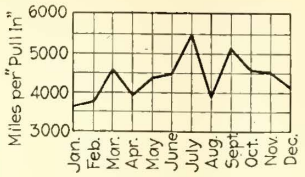


FIG. 40

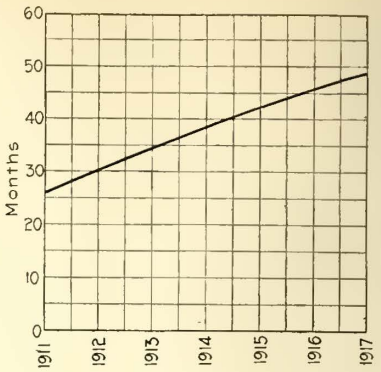


FIG 41

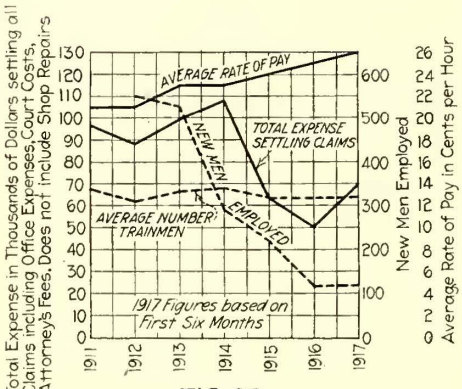


FIG. 42

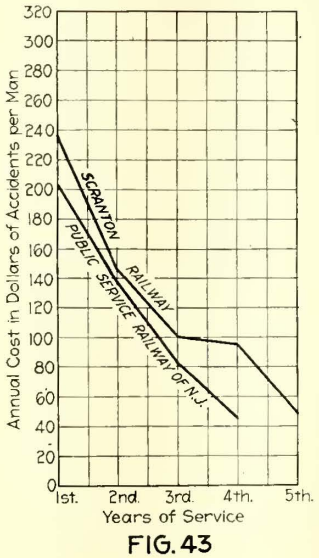


FIG. 43

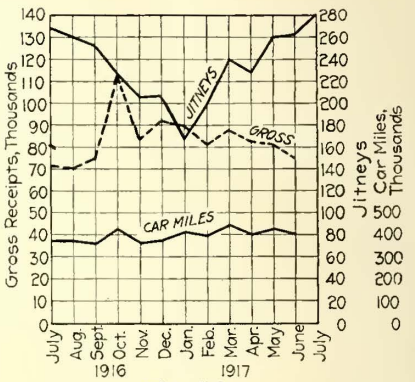


FIG. 44

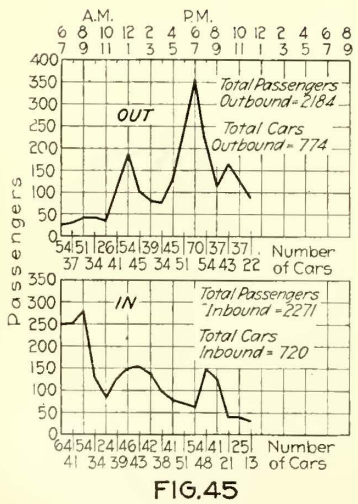


FIG. 45

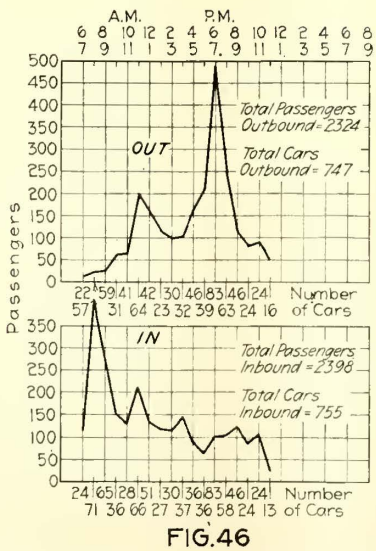


FIG. 46

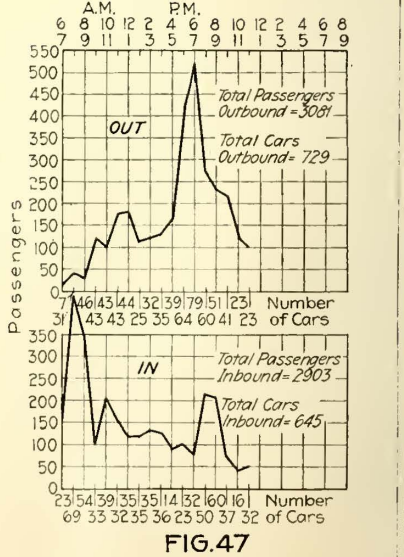


FIG. 47

GRAPHICS OF ELECTRIC RAILWAY TRANSPORTATION—PLATE IV

Fig. 39—Car-miles per "Pull In," i.e., Cars Removed from Service Due to Car Defects

Fig. 40—Car-miles per "Pull In"

Fig. 41—Average Duration of Service of Trainmen, Dallas

Fig. 42—Relation of New Men Employed and Cost of Settling Claims

Fig. 43—Graphs Showing How Platform Experience Cuts Platform Cost

Fig. 44—Graphs Showing Irregularity of Jitney Service and Regularity of Street Car Service, Town B, Excluding Suburbs

Fig. 45—Jitney Check in Town B, on C Street at Corner of First Street

Fig. 46—Jitney Check in Town B, on E Street at Corner of Tenth Street

Fig. 47—Jitney Check in Town B, F Street, corner Fifth Street

Fare Boxes Will Get More Money

It's Not Only Good Policy to Waste Less But Also to Get Every Fare Possible

IN A REVIEW of the operations of a company recently it was found that the cars were operated without fare boxes. After investigation the management concluded if fare boxes were installed, there would be an increase of 5 per cent or $100,000 in the gross receipts of the company, because with the present system of fare collection a large number of fares are lost either through indifference or dishonesty of passengers and conductors.

The psychological effect of having a fare box which every passenger must pass seems to be the one best way to get all the money due. The fact that a person passes the fare box means to both the person and the conductor that some fare must be put into it. If the fare is not deposited, not only the riders who try to slip by the box but others within earshot and eyeview are likely to have that fact called to their attention—a factor that helps greatly to deter theft.

Aside from its direct fare-collection value, the fare box also keeps the conductor in the proper place to give signals promptly and safely. Therefore the fare box is a logical part of our "safe speed" campaign for producing additional business. Since the conductor is at the door, he can supervise the entrance and exit of all passengers regardless of whether or not the car is empty or full. With hand-to-hand collection it is necessary for the conductor to go up in the car and depend at these times upon the passengers to inform him if the starting signal should be given or not. This is not only an element of delay but of danger also, because the passengers have not got the skill nor should they be given the responsibility to observe whether it is safe for the car to be started.

* * *

How Can We Keep Satisfactory Men Satisfied?

Real Instruction, Complete Publicity As to Costs and Earnings, Agreeable Working Conditions on the Car and Recognition of Efficiency and Experience Are Among the Ways to Do It

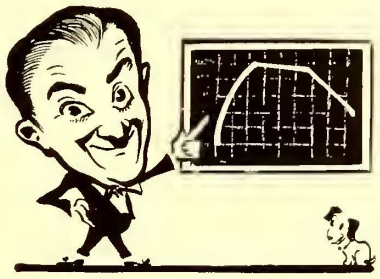
WHEN we have dug out every technical and analytical resource that can be applied within the organization, we still have the great, big human problem of relations with the employees who are expected to apply those resources. In short, the personal equation of management remains the greatest single factor.

We ought to leave nothing undone to get the right kind of men; to instruct them in the right way without any concealment of motives; to make their jobs as pleasant as possible so they will feel like really enthusiastic salesmen; to use open inspection by "big brother" veterans who will say: "Haven't you *overlooked* a couple of fares, Jim?" and finally to make wages and bonuses rewards for honest service. Splendid results are being secured where the man at the top is in it heart and soul.

It is very important that the trainmen have the privilege of receiving correct instruction in every branch of their duty. More can be accomplished for public relations by showing the employees how to handle the public than by any other means.

Technical Knowledge Necessary

To begin right, the instruction rooms should be well-lighted, well-ventilated and quiet, the newcomers being treated as guests. Great care should be taken in selecting an instructor. He should be a man who is thoroughly in sympathy with the management and who understands the fundamentals of the operation and running of equipment, having gathered his technical knowledge through experience and study. It should be his duty to inform the men how every portion of the equipment is made, and to confer with the mechanical and power departments at regular intervals to know what car-operating defects and wastage, respectively, are most frequent. He should be able to explain the benefits of proper rates of acceleration and braking, proper amounts of coasting, advantages of short length of stop, etc. Complete rule books should



A trainman instructor ought to know a speed-time curve and how to talk about it.

not only describe the apparatus used on the cars, but should also include a general description of what power and schedule savings mean to the company. If properly handled such instructions will greatly assist the management in the general campaigns of economy now so necessary.

Give the Men All the Facts

As to the general policy of the railway, if we do not convince our own employees that what we are doing is right, we certainly never can expect to convince the public. Inasmuch as each one of our employees is a salesman for the company, it will be necessary to have him thoroughly believe the doctrines which we preach. It will be necessary to make known to all the men all of the expenditures of the company in the simplest form so as to be readily understandable. If the company is losing money, the employees should know it so that they can make every effort to keep the company on a sound financial basis. If the company is making money they are equally entitled to the information. In these days when full financial reports are required by the authorities there would be little possibility of a company concealing information about its financial status, even if it desired to do so.

Experience Costs Less Than Accidents

The influence of rates of pay and considerate treatment of platform employees is strongly brought out by a study of the Dallas Railway under Richard Meriwether, now general manager. The attached graphs, Figs. 41 and 42, show how a voluntary increase in the average rate of pay from 21 cents to 26 cents an hour over a period of six years held the men.

Distribution of Conductors' Figures Obtained in Traffic

Run Number		4-5		5-6		6-7		7-8		8-9		9-10		10-11		11-12		12-1		1-2		2-3	
		Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In
	18																						
	5			2			8	5		1	10		0	2			2	9	4				
	17																					5	
	10																						23
	15																						
	12																						
	14																			13		2	8
	11																			5			9
	4			0	5	7		6	8		7	7		5	1		9	9			1	1		0
	24																						
Point No. 1	21			4		1	29		10														
	17			14	0																		
	20	11			14	71			8														
	1				20	31			1	6	1	13			4	4	8	14			6	5	
	15			29			48	10	15	0			22	4	1	7			6	6	5		
	7			2		3	14		7	1		2	4		2	2		2	2			17	
	6						11	3		3	11		10	5		5	6		6	6		5	7
	13																						
	3					40	12	0			8	2	11	5			1	5	6	6			8
	2				7	70	30	6			19	3	12	10			3	3	14				
	25																						
	19	13		100	6		23	61			6												
	9				24	18		9	14		2	6		4	10		0	5		3	2		5
	16																					5	
Total		24		151	76	241	175	100	63	11	64	33	59	35	18	18	29	47	38	40	24	22	60
Number of cars		2		7	7	8	8	8	7	5	8	6	6	7	5	4	7	7	6	7	5	5	7
Average		12		21.5	10.85	30.2	21.9	12.5	9	2.2	8	5.5	9.8	5	3.6	4.5	4.1	6.7	6.3	5.7	4.8	4.4	8.5
Maximum		13		29	24	70	48	61	15	6	19	13	22	10	10	7	9	14	14	13	10	5	23
Minimum		11		0	0	1	8	0	1	0	1	2	0	2	1	2	0	2	2	1	1	2	0

In 1911 the average length of service of a trainman was twenty-six months, while in the first half of 1917 the average length of service had increased to forty-nine months.

The influence which the retention of the men in the service has to accidents is very striking. It will be noted that the total expense in settling claims for this property was reduced from approximately $97,000 in 1911 down to aproximately $50,000 in 1916. The costs in each case are exclusive of the shop repairs and mileage losses due to shopping time.

Aside from the decreased cost of accidents we must consider the saving in instruction cost and apprenticeship periods.

Fig. 43, derived from Blake & Jackson's "Electric Railway Transportation," presents these figures on a year-by-year basis.

* * *

How About Automobile Competition?

The Sporadic Competition of the Jitney and the Continuous Competition of the Private Automobile Have Forced Us to Find Out Why People Do Ride or Don't Ride—Short-Headway, Fast Service, Accurate Time-Points the Only Solution.

AT THE very opening of this article it was said that the automobile manufacturers expected to get in use at one time 10,000,000 machines, or thrice the present number, before the saturation limit was reached—dour warning that unless electric railways revolutionize their ways in the right direction "the worst is yet to come."

In this journal it is unnecessary to rehearse the all-too-recent jitney history. Only one example of the effect of this competition will be quoted to show what records were kept as a basis for discovering the habits of the intruder, for determining the extent of the losses and for finding a remedy.

Although the jitney appeared in this particular city in 1914, there were still 268 jitneys in July, 1916, and by July, 1917, the number actually rose to 282. In the intervening months, however, as Fig. 44 shows, the number declined with the severity of the weather—only 167 being run in January. Now compare this ground and lofty tumbling with the almost uniform record of electric car-miles throughout the twelve months.

Isn't this a splendid exhibit of the dependability of electric railway service?

BULLETIN No. 300

NOTICE TO CONDUCTORS

February 14, 1917.

The company desires to make as close a traffic check as is possible. The object of this check is to ascertain the number of passengers in cars at definite fixed points on all lines. This information will assist us to determine if any improvement can be made in the service.

Each conductor will be furnished with a blank on which he is to note the number of passengers on his car at the different check points. Above each of the numbers a space has been left which can be filled in by the conductor to show the definite point at which the count is taken.

The following points on the different lines have been selected and numbered as the best points for the counts. We desire this count on all lines, both inbound and outbound.

Main Line—
1—Car house
2—3rd and Jones
3—5th, 6th and Williams
4—Union Depot
5—Cross Street

Spall Line—
1—8th and April
2—22nd Street
3—33rd and Washington

Waverly Line—
1—10th and Wood
2—24th and Waverly
3—26th and Abner

It is appreciated that there are certain times when it will be practically impossible for conductors to make an actual count of the passengers. At these times it is requested that the conductor use his own best judgment as to the number of passengers that are on the car, regardless of what the register reading is. It is the intention to have the figures as near right as is possible. Your cordial co-operation toward this end is requested.

Asst. Supt. Transportation

FORM OF ORDER FOR SURVEY

Survey at a Given Point—Baskerville Line, June 15, 1917

3-4		4-5		5-6		6-7		7-8		8-9		9-10		10-11		11-12		12-1		1-2		2-3		3-4		Car Number	Seating Capacity
Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In	Out	In		
8			14	13			10	2	2	3		1	2		0												
	13	21	11	5			3	6		4	4		1	6	2	4			0							625	42
12	79	0			39		8	34			0	34	1	32			1									628	"
10			20	25		6	2		5	2		4	1		0	1	1									621	"
	18	21			26	9		4	6		5	4		2	5		1	3								626	"
	3	9		15	3		0	3			0															623	"
11	3	15			14	4	4	4			0															625	"
				1			1																			617	"
		23			17																					624	"
		40			35																					579	"
																										507-660	"
		130	63	80			1																			633	"
																										577-597	"
																										621	"
	3																									628	"
10		15	9		11	3			11	4	1	6		5	0		0									627	"
																										626	"
																										624	"
							0																			623	"
				11	2																					622	"
7																										634	"
2	2		13	8			4	3		5		6	1		0	3			0							582-655	"
																										629	"
70	121	304	130	225	147	22	33	56	25	18	10	55	6	45	7	8	3	3	0							627	"
7	7	9	6	9	8	4	10	7	5	5	6	6	5	4	6	3	4	1	2								
10	17.3	33.5	21.7	25	17.1	5.5	3.3	8	5	3.6	1.6	9.1	1..	11.2	1.1	2.6	.7	3	0								
12	79	130	63	80	39	9	10	34	11	5	5	34	2	32	5	4	1	3	0								
7	2	9	9	1	2	3	0	2	1	2	0	1	1	2	0	1	0	3	0								

The small initial investment in a jitney and the usual absence of all service obligations make it easy to withdraw individual machines from service; the large collective investment and fixed charges in an electric railway and the franchise requirements compel a large measure of service. Interest necessarily has to be paid on the investment, and every intelligent effort possible must be made to conserve that investment so that new capital may be obtained for new work.

Of course, those companies which tried to answer jitney competition by cutting down their own service made a tactical error. It was not necessary, however, to go to the other extreme of increasing the service at all hours of the day. If the jitney traffic had been plotted by hours, as in Figs. 45, 46 and 47, the extra service could have been put on only when it served the purpose of making competition unprofitable.

That the electric railway can win on this basis by the use of small, fast, one-man cars on short headways is now certain. The safety car in particular has proved that fact in a host of places. Electric railway men now know that the public isn't quite so prejudiced against them after all. What it really does is simply to take the first low-price transportation at hand—and if the street car is first, the street car gets the fare.

Private Autos Are Tractable, Too

The competition of the private automobile, naturally, is more subtle than of the jitney. Its severity also fluctuates with the weather, and it can be attacked directly only by zoning and parking restrictions. The latter are palliatives. As in the case of the jitney, the real deterrent is fast service with cars that the railway can afford to operate on short headways. Furthermore, exact operation to time-points will also help greatly—a feature which can be made effective automatically by the use of headway recorders, as at Fort Worth.

Accurately synchronized watches are a most decided factor in making time-point operation a success. Up-to-date electric railways use watch movements equivalent to steam railroad standards. New speed, headway and time-point operation often will call also for the better relocation of many switches.

Experience in several cities indicates that with such standards the private automobile returns to its old limitations as a holiday car. Why bother to open and close the garage when the trolley car will start you on your trip downtown before you can get your automobile started?

This Car Card just issued is reproduced at the end of Mr. Layng's article because it illustrates the kind of co-operation which he describes.

THE Motorman *and* Conductor of this car are members of the

U.S.FUEL ADMINISTRATION

and *they* are pledged to save Electricity, which means COAL

WAR BOARD AMERICAN ELECTRIC RAILWAY ASSOCIATION

The United States Fuel Administration, through the Electric Railway War Board, will furnish car cards like this to electric railways which will co-operate in the conservation movement by securing pledges from platform men to conserve energy.

PETER WITT CAR LOADING AND UNLOADING AT CLEVELAND DOCK TERMINAL OF ONE-CENT FARE LINE

How the Pay-As-You-Pass Car Was Developed

By PETER WITT
Formerly Street Railroad Commissioner of Cleveland

The Pay-As-You-Leave System, Introduced First in Cleveland, Prevented Boarding Delays, But Caused Congestion at Important Leaving Terminals—The Present Cleveland Car Cuts Down the Time of All Boarding and Alighting and Insures the Collection of All Fares—At the Same Time It Reduces the Work of the Conductor—The Peter Witt Car Is Also Well Adapted to the Zone System, Which the Author Considers the Best Solution for the Fare Problem

ON Jan. 1, 1912, by appointment, I became the city's street railroad commissioner, an office created under the ordinance then and now in effect for the operation of the property of the Cleveland Railway Company. By reason of the long drawn-out war (covering a period of ten years) the property not only was run down, but there was a lack of equipment, which produced during the rush hours a condition of crowding which can be described only by saying it was indecent. Bad as it was for the public to endure this kind of service, there was another phase not generally known to the car riders as a whole, and that was the inability of the conductors to collect all the fares due. The cars were all of the pay-enter type, and some had very large platforms. With a crowd of twenty-five or thirty riding on one of these platforms it became very easy, especially for the persons riding on the steps of the cars, to do their riding without paying fare.

Since new cars could not be ordered and delivered for many months, this condition called for the application of a speedy remedy, otherwise, the loss of fares, large as it was, would continue to grow as the news of the dishonest car riders was carried to the honest ones who were riding on the crowded platforms and still paying their fares. To give the full force of what I mean, let me quote a favored lecture of the late Albert Johnson to the conductors in his employ. He used to say:

"Don't steal, for if you are caught you will be fired, but I would rather have you steal a dollar than miss one nickel. Why? Because every passenger up till the time that the conductor has failed to get his fare not only pays, but will make an effort to get the nickel to the conductor. But once you miss him and he has enjoyed the sensation of riding free he will be on the lookout to beat you ever afterward."

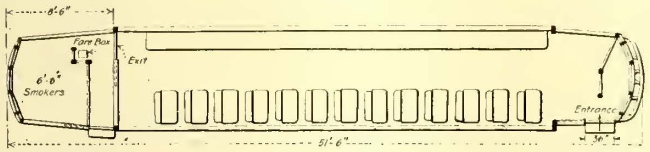
What was to be done? This soon gave way to, What can be done? Several weeks of earnest and hard thinking brought me to the place where I was convinced that to remedy the situation there was but one thing to do, and that was to operate the cars by reversing the time of payment, *i. e.*, changing from pay-enter to pay-leave. Not only would it be possible for the conductor to get all fares because car riders get off in ones, twos and threes, but there would be a swiftness of loading at terminals which would solve the old standing and ever-pressing problem of congestion. So in February I requested John J. Stanley, president of the Cleveland Railway, to rebuild one of the large platform cars by removing the forward bulkhead and changing from transverse to longitudinal seats on the devilstrip side. This change meant a wider aisle and the consequent reduction of the inconvenience of going through the car when the passengers entered at the front door and made their exit at the rear.

The Pay-Leave Plan Was Started in 1912.

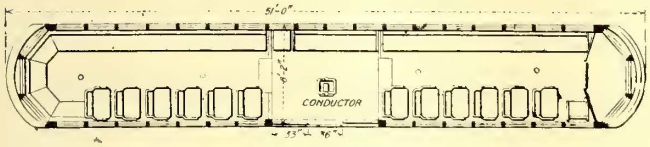
The first car so reconstructed was put into service on April 10 following. Its success was immediate, but as it ran on a line which carried ninety pay-enter cars,

in-bound cars were delayed at the downtown terminal because of the large number of fares which had to be collected there. What was gained by loading by this method of fare collection was at once offset by unloading. One day's trial resulted in the making of a combination of the two systems of fare collection. When the car was being operated to the city we adopted the pay-enter plan, with entrance at the rear door, and when the car was out-bound, the pay-leave plan, with entrance at the front door. So successful did this change prove that all the other cars of this type, 100 in number, were speedily changed to this type of seating arrangement and alternation of fare collection.

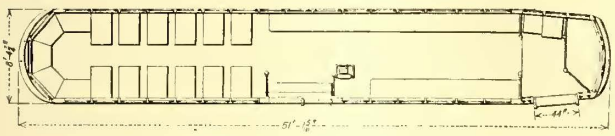
In September of the same year the first of the 100 center entrance trailers, which had been ordered in January, were delivered and ready for service. Here was still another problem; cars without a platform. How to load them became the question. To use the method employed on the pay-enter platform cars meant confusion at the fare box, keeping the car riders out in the weather and the slowing down of the schedule. In order that the reader may get the full import of this



PLAN OF ORIGINAL PAY-LEAVE CAR IN CLEVELAND, PUT IN SERVICE IN APRIL, 1912



PLAN OF CENTER-ENTRANCE TRAIL CAR ON WHICH THE PAY-PASS SYSTEM WAS INTRODUCED, THE NEXT STEP IN THE DEVELOPMENT OF THE PETER WITT CAR

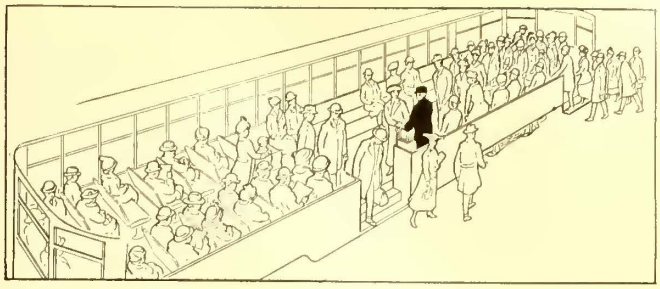


PLAN OF CAR DESIGNED BY PETER WITT FOR CROSSTOWN SERVICE IN CLEVELAND

let me say that the alternate stop had already been established in Cleveland, and this means that at such stops there accumulate all the car riders who under the old scheme are distributed at all street intersecting stops.

The solving of this problem, however, was easy. All we did was to regard the rear half of the car a loading platform, then make all car riders as they deposited their fares proceed to the forward end of the car. When the car reached the terminal all the conductor had to do was to open both doors. Then he need pay no attention to the front end, but simply watch the tickets drop from those in the rear. It was found that the non-paid, or rear, end of the car would empty just as fast as the paid end, for the rider in the rear end, having plenty of time, would have his ticket ready long before he would reach the box. Here was speed and convenience combined.

The next step was easy, as the pay-as-you-leave system was already in operation and familiar to the car



IN THIS VIEW THE ROOF HAS BEEN OMITTED TO SHOW HOW PEOPLE PAY THEIR FARES AS THEY PASS THE CONDUCTOR IN GOING FROM THE FRONT OF THE CAR TO THE REAR OR OUT AT THE EXIT

riders in Cleveland. We made all cars pay-leave when leaving the downtown loops. To all unacquainted with the street layout of Cleveland and who desire to grasp it quickly it might be likened to a three-quarter wheel, with the hub for the heart of the city and the spokes for the radiating streets. What through lines there were we cut and made the hub (the Public Square) the transfer point.

Under the former pay-enter system it was a nightly sight to see on all streets long lines of cars moving slowly toward the loop, because at the loop it used to take from two to three minutes to load a car. Under the new system these long lines disappeared, for a train now unloads and gets away in fifty seconds, in spite of the fact that a train covers more than 100 ft. of track, seats 127 passengers and has its complement of strap hangers. This method of operation was equal to doubling the terminal, which with us was impossible owing to an absence of streets.

The Pay-Pass Principle Developed for Crosstown Traffic

Now, in addition to the lines which radiate from the Public Square, we have five crosstown lines. The principal one of the five is the first one east of the Public Square, known as the East Fifty-fifth Line. This line, in a distance of three miles, crosses nine radial streets, over which run the cars of sixteen routes. On this line it is not unusual but ordinary for a car to discharge and take on anywhere from a score of riders from the

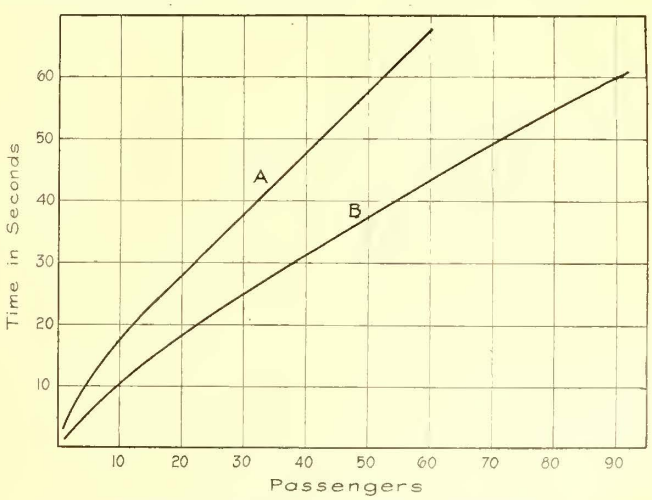


CHART OF LOADING AND UNLOADING TIME

Curve A—Average loading and unloading time of rear-entrance, front-exit, pay-as-you-enter car with folding steps, 33-in. wheels and 26-in. entrance and exit.

Curve B—Average loading and unloading time of Peter Witt car with front entrance, center exit, 26-in. wheels and 56-in. entrance and exit. Door not interlocked with control.

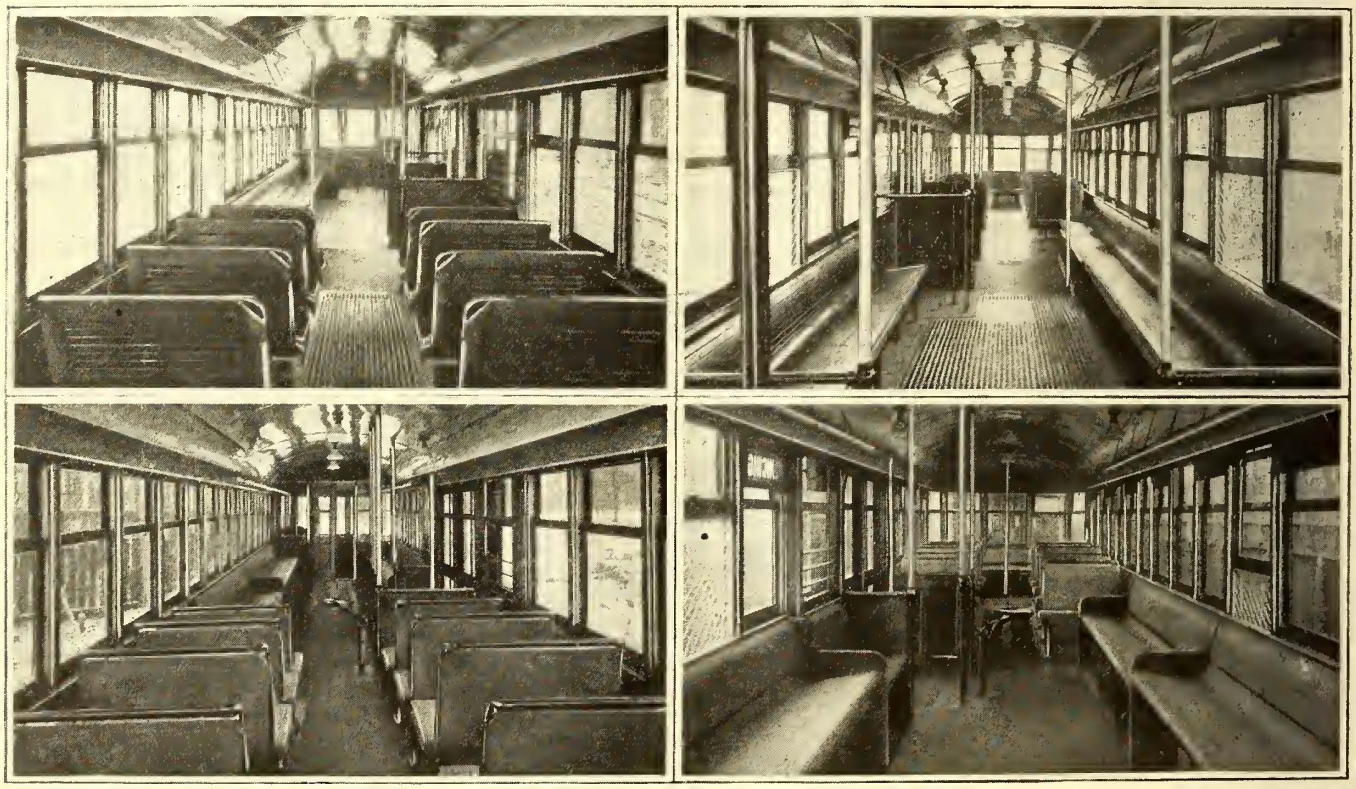
lightest of the radial lines to a full load at the heaviest ones. The need for a car to meet these most unusual transportation demands of this line called for a car having the advantages of both the pay-enter and pay-leave method and yet free from the shortcomings which both methods had developed, as already mentioned. The car had to be at once a front-end loader, and a quick loader, and it had also to be provided with a sure means of getting all the fares from the riders on a quick filling car. Knowledge of what was needed and the experience had with the first pay-leave car were of great help in solving this problem. The answer was the design which has since become known as the Peter Witt front-entrance center-exit car riders' car, the car with the pay-as-you-pass principle of fare collection.

As the entrance to this car is through the front door and the exit is by way of the center door, the movement within the car is all one way, with the consequent absence of the confusion which comes from a conflicting movement. The doors are very wide, permitting the car riders to enter or leave two abreast. In the forward half of the car, which is really nothing more or less than a loading platform, longitudinal seats are used. This gives a very wide aisle and makes possible that rapidity of loading for which the design is particularly noted. It becomes a very easy matter for twenty or thirty people to board this car and to have the last one on before the first one arrives at the fare box. The paying then goes on while the car is in motion.

The rear half of the car is provided with transverse seats. As these seats are of the type which the public prefers, quite naturally they are the first to be occupied. The effect of this is to remove the car rider from the entrance, so the incoming crowd can move in without interference. There being no crush at the fare box, the collection of fares not only becomes easy but sure as well. This means that in a very short while the man conductor will go. His place will be filled by a woman, partly because man labor is scarce but also because this is a woman's job. She will perform her duties more quickly than a man and also more neatly. At the same time the order and decorum will be better. Scrapping between the payer and the receiver of fares will be but a memory.

How the Peter Witt Car Can Be Used with the Zone System

The biggest thing for the car is yet to come, for the present method of charging a unit fare regardless of the length of haul must give way to the zone system. The rider who covers 9 blocks ought not to be obliged to pay the fare of the one who rides 9 miles. The street railway companies must become the equalizer between the short haul and long-distance rider. It must stop robbing the former, who now gets less than he pays for and refuses to stand for the larceny of the latter, who pays less than the service costs.



THESE VIEWS SHOW DIFFERENT TYPES OF INTERIORS OF PETER WITT CARS, OPERATED ON THE PAY-AS-YOU-PASS SYSTEM

This change, which is bound to come, should receive more than seriou consideration at this time, when the nickel is becoming less valuable every minute. It should be put in o effect, for through it and it alone will come the remedy for the present-day transportation ills. It will even do more. It will easily prevent future ills, as come they will, to both owner and user of cars alike, for the stability of the nickel is gone. Its shrinkage hurts the former; its expansion injures the latter. Any change then needed to meet new conditions can easily be brought about by the simple and easy process of shortening or lengthening the zone. Such a plan of charging for rides is much less revolutionary than the present way of increasing the unit. The latter method kills the short and profitable haul

and fails to get what is due from the long haul. The zone system will save the short-distance rider to the transportation company and at the same time make the long-distance traveler pay the full price for the service he receives.

Right here the objector to the zone system will appear and give as his reason for opposition to the change that old hackneyed and threadbare argument that the present way is the only way of preventing congestion. But does it? Of course not, and it never will. Wherever you find the haul the longest then you will find congestion the greatest.

To him who refuses to take that answer as complete, let him look about. If he can show one extension that was ever made to relieve congestion which did not raise the value of land along the route traversed by the extension, he can show something no searcher has been able to find.

In Cleveland we carry people nine miles for three cents. Experience has shown that if the fare were six

A PAY-AS-YOU-PASS CAR IN BUFFALO DURING THE RUSH HOUR ON A SNOWY AFTERNOON JUST BEFORE CHRISTMAS

cents just as many inhabitants would be living along this line, but with this difference: The land would sell for less, the decrease in the value of the lot would be measured by the increase in the fare. In other words, a high rate of fare means low land values in the suburbs, and a low rate of fare means high land values there. The owner of land at a distance from the center of a city capitalizes the industry and thrift of others. His is the game unbeatable and will remain so until the state appropriates for social purposes the social product—the unearned increment.

But I am off the track. What I started out to say was that when the zone system comes the front-entrance center-exit car will be the one for such measured service. Not that some other designs cannot be used, for they can, but not with the same degree of convenience to the car rider, whose welfare should always be uppermost in the minds of every street railway operator. He must learn what up to the present he has failed to understand—the car rider is a customer. Such being the case, what is the operator? Nothing more or less than a merchant. His occupation is that of merchandising rides.

I still have not disclosed the method of determining the cost or the scheme of fare collection when the zone system prevails. So here it is, not what is going to be, but what will be when the three Peter-Witt cars now building for the Mahoning & Shenango Railway Company are put into service.

This company operates a line from Warren to Lowellville, Ohio, passing through five 5-cent zones. Passengers when they board will receive from the motorman a check showing point of origin. When the passenger gets ready to leave he will proceed to the conductor, who, from the check, will know the amount due. Simple, isn't it?

The experience in Cleveland of low fares shows conclusively that the riding habit can be stimulated, and since the greater part of every railway company's equipment is dead for twenty-two out of every twenty-four hours, everything should be done which will bring this dead equipment into use. To me the easiest way to do this is through the zone system, with fares so low that walking will become costly.

A 1-Cent Line Is Run at a Profit

Since the doubting ones will want more than my word for what I have said, let me cite briefly the story concerning the one-cent line in Cleveland by way of illustrating the wisdom of the zone system. This 1-cent line is a mile long and runs from the Public Square, where all our lines converge, to the Municipal Docks, where land the boats from Detroit and Buffalo. These boats arrive at 6 o'clock in the morning and in the summer months come heavily loaded. To take care of the throng, cars must be on hand. About one hour after the arrival of the boats the place is dead. There is very little occasion for anybody to go to the boat landing. At night the boat passengers commence making their way to the dock after 7 o'clock, for the Buffalo boat leaves about 9, and this movement continues until 11.45, when the Detroit boat departs.

From this it will readily be seen that the line running on a five-minute headway from 7 to 12 o'clock is over-serviced. Notwithstanding this and the big mileage cost of bringing these cars from the nearest operating station, which is five miles away, immediately after this line was put into operation it earned within 2 cents per car-mile of what was earned by the whole Cleveland system. Were these cars operating through two parts of the city where people desired to travel, I have no hesitancy in saying that the 1-cent line, instead of earning within 2 cents of the average of the system, would have earned many cents above it.

Coal Production Falls Off

Supplementing the diagram and table printed on page 1120 of the issue of the ELECTRIC RAILWAY JOURNAL for Dec. 22, the United States Geological Survey has issued a statement containing among others the following data: The average total bituminous coal mined per working day for the week ending Dec. 8 was 1,853,030 tons; for the week ending Dec. 15, 1,406,425 tons, and for the week ending Dec. 22, 1,652,858 tons. The total production for the week of Dec. 22 was 9,917,145 tons. The depression in the bituminous industry is accounted for by prolonged cold weather continued during the week of Dec. 22.

New Electric Rolling Stock for 1917

Orders Placed for New Cars and Those Built in Companies' Shops During the Last Year Total 2455, Which Is a Marked Decrease from Figures for Each of the Last Ten Years—One-Man Cars Increasingly Popular

THE new rolling stock ordered during 1917 or built in the shops of the various electric railways of the United States and Canada and roads having electrified divisions is tabulated herewith. Although reports from all the companies were not received in time for compilation, the figures represent the railways having about 96 per cent of all the electric cars operated. The total of 2455 cars marks a return to the low figure of two years ago. The number of companies which reported new equipment is 182 as compared with 250 in 1916, which is proportionately less of a decrease than in the total number of cars.

The following table indicates the new rolling stock for the years since 1907, divided into city and interurban passenger cars and freight and miscellaneous equipment. In this summary cars for subway and elevated lines have been classed as city equipment and those for suburban or both city and interurban service have been placed in the interurban column. Freight and express cars, electric locomotives and work cars of all kinds have been grouped as miscellaneous cars. As heretofore, the number of city cars predominates, the figure for 1917 having been affected by a single order for 477 subway cars for the Interborough Rapid Transit Company.

Year	City Cars	Interurban Cars	Freight and Misc. Cars	Total
1907	3,483	1,327	1,406	6,216
1908	2,208	727	176	3,111
1909	2,537	1,245	1,175	4,957
1910	3,571	990	820	5,381
1911	2,884	626	605	4,015
1912	4,531	783	687	6,001
1913	3,820	547	1,147	5,514
1914	2,147	384	479	3,010
1915	2,072	336	374	2,782
1916	3,046	374	522	3,942
1917	1,998	185	272	2,455

An increase of nearly 50 per cent in the number of one-man cars purchased as compared with 1916 figures is a noteworthy feature of these data, the number of cars listed of this type being 280, besides thirty-three which were arranged for either one or two-man operation. The number of locomotives ordered was forty-nine, showing a decided increase over the numbers for 1916 and 1915, which were thirty-one and forty-three respectively. Cars of all kinds built in railway shops total 281, four companies contributing 176 of this number. The number of home-made cars is about two-thirds of that for 1916, which was a distinct advance over previous years. The use of interurban trailers continues to diminish, only twenty-seven cars of this type having been ordered, as opposed to seventy-one of a year ago. Trailers that may be considered for city service, however, number 402, while for 1916 the corresponding figure was 128. This difference is effected in part by 140 subway trailers for the Interborough Rapid Transit Company, which were included this year in the large order already referred to. No data were secured regarding orders for auto buses and motor trucks.

In the following alphabetical list space limitations have made it necessary to condense the data as much as possible. All cars are specified as either passenger or miscellaneous, the former including also combination passenger and baggage cars and the latter consisting of freight, express, service, work cars, etc. Locomotives are entered separately. In classifying passenger cars for city or interurban service, disposition was made here also as previously explained, and no attempt was made to classify the miscellaneous equipment with respect to service.

While in a canvass of this magnitude and one which must close on a definite date it is not possible to get reports from 100 per cent of the industry, every attempt has been made to present complete and accurate data. It has been possible in most cases to check the companies' figures against reports of the various car builders, and the courtesy of all who have co-operated in supplying statistics is earnestly appreciated.

Railway	*Number*	*Type*	*Overall Length*	*City or Interurban*	*Motor or Trailer*	*One or Two Man*
Aberdeen Railroad	1	Misc.	..	..	Mot.	..
Alabama City, Gadsden & Attalla Ry.	1	Psgr.	44	Int.	Mot.	Two
Alton, Granite & St. Louis Trac. Co	3	Psgr.	53½	Int.	Mot.	Two
	1	Psgr.	53½	Int.	Trail	..
Appalachian Power Co.	1	Psgr.	38½	City	Mot.	Two
Augusta-Aiken Ry. & Elec. Corpn.	4	Psgr.	47½	City	Mot.	Two
Austin Street Ry.	4	Psgr.	30	City	Mot.	One
Bangor Ry. & Elec. Co.	3	Psgr.	30	City	Mot.	One
Beaumont Trac. Co.	7	Psgr.	30	City	Mot.	Two
Blue Ridge Lt. & Pwr. Co.	4	Psgr.	25	City	Mot.	One.
Boston & Worcester St. Ry.	6	Misc.	45	..	Mot.	..
Boston Elevated Ry.	35	Psgr.	69	City	Mot.	Train
	1	Psgr.	28	City	Mot.	One
	7	Misc.	40½	City	Mot.	..
Bristol & Plainville Tramway Co.	2	Psgr.	39	Int.	Mot.	Two
Brockton & Plymouth St. Ry.	2	Psgr.	29½	City	Mot.	One
Brooklyn Rapid Transit Co.	1	Misc.	47	City	Trail.	..
	2	Misc.	50	City	Mot.	..
Buffalo & Depew Ry.	1	Loco	34	16 tons	..	..
Burlington County Transit Co.	1	Psgr.	41	Int.	Mot.	Two
Cape Breton Elec. Co.	2	Psgr.	28	City	Mot.	One.
Cedar Rapids & Marion City Ry.	15	Psgr.	31	City	Mot.	Either
	10	Psgr.	37½	City	Mot.	Either
Centralia & Central City Trac. Co.	2	Psgr.	28	City	Mot.	One.
Chambersburg, Greencastle & Waynesboro St. Ry.	1	Misc.	24	..	Mot.	..
Charleston-Dunbar Trac. Co.	2	Psgr.	45	City	Mot.	Two
Charleston Interurban R.R.	1	Misc.	45	Int.	Mot.	..
	4	Psgr.	38	Int.	Mot.	Two
Chicago & West Towns Ry.	5	Psgr.	45	City	Mot.	Two
Chicago, Milwaukee & St. Paul Ry.	2	Locos.	4½	70 tons	..	..
	5	Locos.	76	265 tons	..	..
	10	Locos.	90½	266 tons	..	..
Chicago, No. Shore & Milwaukee R.R.	2	Locos.	37½	50 tons	..	..
Chicago, So. Bend & No. Indiana Ry.	5	Misc.	40	Int.	Trail.	..
Chicago Surface Lines	5	Misc.	40½	City	Mot.	..
Cincinnati & Columbus Trac. Co.	1	Misc.	50	Int.	Mot.	..
Cleveland Ry.	25	Psgr.	49	City	Trail.	..
	2	Misc.	28	..	Mot.	..
	51	Psgr.	49	City	Trail	..
Cleveland, Southwestern & Col. Ry.	2	Psgr.	22	City	Mot.	One.
Colorado Springs & Int. Ry.	11	Psgr.	28	City	Mot.	One
Columbia Ry. Gas & Elec. Co.	28	Psgr.	47	City	Mot.	Two
Columbus Railroad	8	Psgr.	28	City	Mot.	One
Columbus Ry. Pwr. & Lt. Co.	10	Psgr.	48	City	Mot.	Two
Conestoga Trac. Co.	8	Psgr.	44	City	Mot.	Two
	2	Misc.	4	Int.	Mot.	Two
Cumberland & Westernport Elec. Ry.	5	Psgr.	45	Int.	Mot.	Two
Cumberland County Pwr. & Lt. Co.	8	Psgr.	44	City	Trail.	..
	2	Misc.	36	..	..	..
Danville St Ry. & Lt. Co.	4	Psgr.	41	City	Mot.	Two
Dayton, Covington & Piqua Trac. Co.	2	Psgr.	50	Int.	Mot.	Two.
Dayton, Springfield & Xenia Southern Ry.	2	Psgr.	43½	Int.	Mot.	Two
Denver Tramway	1	Misc.	17	..	Mot.	..
	4	Misc.	40	..	Trail.	..
	2	Misc.	40	..	Mot.	..
Duluth Street Ry.	8	Psgr.	46	City	Mot.	Two
	1	Misc.	..	..	Mot.	..
Durham Trac. Co.	2	Psgr.	30	City	Mot.	Either
E. Liverpool Trac. & Lt. Co.	1	Misc.	40½	..	Mot.	..

Railway	*Number*	*Type*	*Overall Length*	*City or Interurban*	*Motor or Trailer*	*One or Two Man*
East St. Louis Ry	5	Psgr.	46½	City	Mot.	Two
	25	Psgr.	41	City	Mot.	Two
Eastern Pennsylvania Rys	8	Psgr.	50	Int.	Mot.	Two
	2	Misc.	28	..	Mot.	..
Eastern Wisconsin Elec. Co	1	Misc.	46	Int.	Mot.	..
El Paso Electric Ry	10	Psgr	30	City	Mot.	One
Enid City Ry	2	Psgr.	30	City	Mot.	One
Fairburn & Atlanta Ry. & Elec. Co	1	Psgr.	30	Int.	Mot.	Two
Fonda, Johnstown & Gloversville R.R.	4	Psgr.	33½	City	Mot.	Two
Fort Dodge, Des Moines & Sohn R.R.	2	Psgr.	47	Int.	Mot.	Two
Fort Dodge Street Ry	1	Psgr.	30	City	Mot.	One
Fort Wayne & Decatur Trac. Co	3	Psgr.	47	Int.	Mot.	Two
	1	Misc.	40	Int.	Mot.	..
Fort Wayne & No. Indiana Trac. Co	10	Psgr.	41	City	Mot.	Two
	2	Misc.	53	Int.	Mot.	..
Fox & Illinois Union Ry	1	Misc.	50	Int.	Mot.	Two
Gary & Interurban R.R	4	Psgr.	44	Int.	Trail	..
	2	Psgr.	44	Int.	Mot.	Two
Georgia Ry. & Pwr. Co	10	Psgr.	40	..	..	..
Glendale & Montrose Ry	3	Psgr.	..	..	..	..
Grafton & Upton R.R	2	Locos.	26	30 tons		..
Gd. Rapids, Gd. Haven & Muskegon	3	Misc.	44	Int.	Mot.	..
	1	Psgr.	55	Int.	Mot.	Two
Gray's Harbor Ry	6	Psgr.	..	City	Mot.	One.
Hagerstown & Frederick Ry	3	Psgr.	31½	City	Mot.	One
	3	Psgr.	48	Int.	Mot.	Two
Hammond, Whiting & E. Chicago Ry.	2	Psgr.	52	City	Mot.	Two
Harrisburg Rys	5	Psgr.	44	City	Mot.	Two
Hocking-Sunday Creek Trac. Co	1	Psgr.	44½	Int.	Trail	..
	1	Psgr.	47½	Int.	Mot.	Two
Holyoke Street Ry	2	Misc.	40½	..	Mot.	..
	1	Misc.	28	City	Mot.	..
Honolulu Rapid Trans. & Land Co	10	Psgr.	40	City	Mot.	Two.
Hot Springs Street Ry	7	Psgr.	28	City	Mot.	One.
Illinois Traction System	6	Locos.	..	60 tons		..
Indiana Ry. & Lt. Co	2	Psgr.	39	City	Mot.	Two
Interborough Rapid Transit Co	337	Psgr.	51½	City	Mot.	Train
	140	Psgr.	51	City	Trail	..
International Ry	100	Psgr.	50	City	Mot.	Two
	4	Misc.	40	City	Mot.	..
	3	Misc.	28	..	Mot.	..
Interstate Public Service Co	2	Misc.	40	Int.	Trail.	..
	1	Misc.	60	Int.	Mot.	..
Inter Urban Ry	2	Locos.	..	60 tons		..
Johnstown Trac. Co	10	Psgr.	40	City	Mot.	Two
Kankakee & Urbana Trac. Co	1	Psgr.	51	Int.	Mot.	Two.
	1	Psgr.	42	Int.	Trail.	..
Knoxville Ry. & Lt. Co	12	Psgr.	47½	City	Mot.	Two.
Lake Shore Elec. Ry	12	Psgr.	60	Int.	Mot.	Two
	1	Misc.	60	..	Mot.	..
Lancaster & York Furnace Lt. Ry	1	Psgr.	28	City	Mot.	One.
Lehigh Valley Transit Co	24	Psgr.	47	City	Mot.	Two
Lewiston, Augusta & W'v'le St. Ry	10	Misc.	34	..	Trail.	..
	6	Psgr.	34	City	Mot.	Two
	3	Misc.	34	..	Mot.	..
	2	Misc.	46	..	Mot.	..
	2	Misc.	36	..	Trail.	..
Linwood Street Ry	1	Psgr.	40	City	Mot.	Two
Little Rock Ry. & Elec. Co	6	Psgr.	47½	City	Mot.	Two
London Street Ry	5	Psgr.	33	City	Mot.	Two
Lorain Street R.R	5	Psgr.	49	City	Mot.	Two
Louisville & So. Indiana Trac. Co	10	Psgr.	28	City	Mot.	One
Louisville Ry	6	Misc.	40½	Int.	Trail.	..
Macon Ry. & Lt. Co	6	Psgr.	41	City	Mot.	Two
	1	Misc.	38	..	Mot.	..
Madison Rys	5	Psgr.	28	City	Mot.	One
Mahoning & Shenango Ry. & Lt. Co	13	Psgr.	46½	City	Mot.	Two
	3	Psgr.	49	Int.	Mot.	Two.
Mason City & Clear Lake R.R	5	Psgr.	31	City	Mot.	One
Massachusetts Northeastern St. Ry	12	Psgr.	50	Int.	Mot.	Two
Michigan Ry	5	Psgr.	41½	City	Mot.	Two
	4	Psgr.	61	Int.	Mot.	Two
	2	Psgr.	53	Int.	Trail.	..
	3	Psgr.	46	Int.	Trail.	..
	1	Misc.	60	Int.	Mot.	..
	1	Misc.	50	....	Mot.	..
Milwaukee Electric Ry. & Lt. Co	2	Misc.	36	City	Mot.	..
	2	Misc.	40½	City	Mot.	..
	2	Misc.	36	..	Trail.	..
	2	Misc.	50	Int.	Mot.	..
Monongahela Valley	6	Psgr.	40	City	Mot.	Two
	4	Psgr.	51	Int.	Mot.	Two
	2	Psgr.	42	Int.	Mot.	Two
	1	Misc.	45	Int.	Mot.	....
	3	Misc.	40	Int.	Trail.	..
	1	Loco.	32½	40 tons		..
Montreal & So. Counties Ry	3	Psgr.	55	Int.	Mot.	Two
	3	Psgr.	55	Int.	Trail.	..
Montreal Tramways	50	Psgr.	44	City	Mot.	Trail.
	50	Psgr.	47	City	Trail.	..
Morgantown & Wheeling Ry	1	Psgr.	45	Int.	Mot.	Two
Nashville Interurban Ry	1	Misc.	46	Int.	Mot.	..
Newport News & Hampton Ry. Gas. & Elec. Co	6	Psgr.	47	City	Mot.	Two
New York Central R.R	30	Psgr.	69½	Int.	Mot.	Train
New York, New Haven & Hartford R.R.	1	Loco.	62	145 tons.		..
	5	Locos.	69	180 tons.		..
New York State Rys. (Rochester)	2	Misc.	28	City	Mot.	..
New York State Rys. (Syracuse)	25	Psgr.	47½	City	Mot.	Two
	1	Psgr.	60½	Int.	Trail.	..
	1	Misc.	28	City	Mot.	..
New York State Rys. (Utica)	1	Misc.	50	Int.	Mot.	Two
No. Carolina Public Service Co	15	Psgr.	28	City	Mot.	..
Northern Elec. Co	2	Psgr.	28	City	Mot.	One
Northern Ohio Trac. & Lt. Co	10	Psgr.	47	City	Trail.	..
	10	Psgr.	46½	City	Mot.	Two
	25	Psgr.	41½	City	Mot.	Two
	4	Misc.	60	Int.	Mot.	..
	4	Misc.	50	Int.	Trail	..
	3	Misc.	40½	..	Mot.	..
	1	Locos.	37½	50 tons.		..

Railway	*Number*	*Type*	*Overall Length*	*City or Interurban*	*Motor or Trailer*	*One or Two Man*
Northern Texas Trac. Co	20	Psgr.	28	City	Mot.	One
No. Kankakee Elec. Lt. & Ry	2	Psgr.	32	City	Mot.	Either
Northwestern Pennsylvania Ry	2	Misc.	36	Int.	Trail.	..
	5	Psgr.	47	Int.	Mot.	Two
	6	Psgr.	28	City	Mot.	One.
	2	Misc.	46	Int.	Mot.	Two
Ohio Electric Ry	4	Misc.	50	Int.	Mot.	..
	16	Misc.	38½	Int.	Trail.	..
	10	Misc.	40	Int.	Trail.	..
Oklahoma Ry	12	Psgr.	41	City	Mot.	Two
	4	Psgr.	49	Int.	Mot.	Two
	1	Locos.	36	30 tons		..
Omaha & Council Bluffs St. Ry	40	Psgr.	45	City	Mot.	Two
Omaha, Lincoln & Beatrice Ry	1	Psgr.	18	Int.	Mot.	One
	1	Psgr.	28	Int.	Mot.	Two.
Ottawa Electric Ry	3	Psgr.	45	City	Mot.	Two
Pacific Electric Ry	3	Misc.	40	Int.	..	..
Pacific Power & Lt. Co	2	Psgr.	28	City	Mot.	One
Pennsylvania R.R. (Elec. Div.)	1	Loco.	76	250 tons		..
Pennsylvania & Ohio Rys	1	Misc.	36	..	Mot.	..
Peoria Ry	18	Psgr.	41	City	Mot.	Two
Peoples Ry. of	10	Psgr.	44	City	Trail	..
Philadelphia & Garrettford St. Ry	1	Misc.	50	Int.	Mot.	..
Pittsburg County Ry	6	Psgr.	37	City	Mot.	One
Pittsburg, Harmony, Butler & New Castle Ry	2	Psgr.	47	..	Mot.	Two
Pittsburgh Rys	50	Psgr.	45	City	Trail.	..
Portsmouth St. R.R. & Lt. Co	3	Psgr.	48	City	Trail	One
Princeton Power Co	1	Psgr.	34	Int.	Mot.	Two.
	1	Psgr.	25	City	Mot.	One.
Public Service Ry	100	Psgr.	51½	City	Mot.	Two
	50	Psgr.	48½	City	Mot.	Two
Puget Sound Int. Ry. & Pwr. Co	10	Psgr.	28	City	Mot.	One
Puget Sound Trac. Lt. & Pwr. Co	24	Psgr.	28	City	Mot.	One.
Quebec Ry., Lt. & Pwr. Co	2	Psgr.	41	City	Mot.	Two
Reading Transit & Lt. Co	6	Psgr.	46	Int.	Mot.	Two
	3	Psgr.	34	City	Mot.	Either
Rhode Island Co	2	Misc.	38	..	Mot.	..
Roanoke Ry. & Elec. Co	6	Psgr.	41	City	Mot.	Two
Rockford & Interurban Ry	13	Psgr.	41½	City	Mot.	..
	5	Psgr.	46	City	Trail.	..
Salt Lake, Garfield & Western Ry	6	Psgr.	56	Int.	Mot.	Train
San Antonio Public Service Co	20	Psgr.	26	City	Trail	One
	2	Psgr.	46	City	Mot.	Two
Sand Springs Ry	1	Psgr.	57	Int.	Mot.	Two
Sandwich, Windsor & Am'b'g Ry	3	Psgr.	34	City	Mot.	Two
Scioto Valley Trac. Co	6	Misc.	42½	Int.	Trail.	..
Seattle Municipal St. Ry	6	Psgr.	30	City	Mot.	One
Sherbrooke Ry. & Pwr. Co	1	Psgr.	32½	City	Mot.	Either
Shore Line Electric Ry	2	Misc.	45	Int.	Mot.	Two
Sioux City Service Co	7	Psgr.	30	City	Mot.	One
Sioux Falls Trac. System	1	Psgr.	28	City	Mot.	One
Slate Belt Elec. St. Ry	4	Psgr.	47	Int.	Mot.	Two
Southern New York Pwr. & Ry. Corpn.	1	Misc.	..	..	Mot.	..
Southwest Missouri R.R	7	Psgr.	44	Int.	Mot.	Two
Springfield Street Ry	20	Psgr.	43½	City	Mot.	Two
	2	Misc.	40½	..	Trail	..
	1	Misc.	40½	..	Mot.	..
St. Joseph Ry., Lt., Ht. & Pwr. Co	8	Psgr.	..	City	Mot.	One
Tacoma Ry. & Pwr. Co	32	Psgr.	28	City	Mot.	One
Tampa Electric Co	23	Psgr.	28	City	Mot.	One
Tarentum, Brackenridge & Butler St. Ry	1	Psgr.	31	City	Mot.	One
Terre Haute Trac. & Lt. Co	1	Psgr.	55	Int.	Mot.	Two
	2	Misc.	38	Int.	Trail	..
	1	Misc.	43	Int.	Trail.	Two
Terre Haute, Indianapolis & Eastern Ry.	5	Misc.	40	Int.	Trail	..
Texas Electric Ry	2	Misc.	40	Int.	Trail	..
Three Rivers Trac. Co	3	Psgr.	27	City	Mot.	One
Toledo, Bowling Green & So. Trac. Co.	4	Psgr.	60	Int.	Mot.	Two
Trenton & Mercer County Trac. Corpn.	10	Psgr.	43	City	Mot.	Two
Tri-City Ry. of Iowa	3	Psgr.	42½	City	Mot.	Two
Tuscaloosa Ry. & Utilities Co	1	Loco.	30	30 tons		..
Twin City Rapid Transit Co	8	Misc.	36½	City	Mot.	..
	34	Psgr.	46½	City	Mot.	..
	1	Misc.	37	..	Mot.	..
	1	Misc.	27	City	Trail.	..
Twin State Gas & Elec. Co	3	Psgr.	31	City	Mot.	One
Union Street Ry	6	Psgr.	44	City	Mot.	Two
	1	Misc.	43	..	Mot.	..
United Rys. & Elec. Co. (Baltimore)	80	Psgr.	46½	City	Mot.	Two
	12	Misc.	40½	..	Mot.	..
United Rys. of St. Louis	40	Psgr.	45	City	Trail	..
	1	Misc.	30	..	..	..
Vicksburg Light & Trac. Co	4	Psgr.	28	City	Mot.	One
Virginia Ry. & Pwr. Co	20	Psgr.	45	City	Mot.	Two
Washington, Balt. & Annapolis Elec. R.R	8	Locos.	58	47 tons.		..
Western New York & Penn. Trac. Co	2	Psgr.	47	Int.	Mot.	Two
Western Washington Pwr. Co	2	Psgr.	28	City	Mot.	One
Wheeling Trac. Co	14	Psgr.	49	City	Mot.	Two
	1	Misc.	..	City	Mot.	..
Wichita Falls Trac. Co	5	Psgr.	28	City	Mot.	One.
Williamsport Passenger Ry	4	Psgr.	40	City	Mot.	Two
Wilmington & Philadelphia Trac. Co	15	Psgr.	41	City	Mot.	Two
Winnipeg Elec. Ry	1	Misc.	40	..	Mot.	..
Winona Interurban Ry	2	Misc.	40	Int.	Trail.	..
	1	Misc.	50	Int.	Mot.	..
Worcester & Warren St. Ry	1	Psgr.	30	City	Mot.	One.
Worcester Consolidated St. Ry	10	Psgr.	43½	City	Mot.	Two
	4	Misc.	45	City	Mot.	..
	3	Misc.	45	City	Trail.	..
	1	Misc.	46	City	Mot.	..
York Rys	3	Psgr.	45	City	Mot.	Two

Track Rebuilt and New Track Placed in Service in the Year 1917

Electric Railways of the United States and Canada Report a Total of 442 Miles of Track Constructed or Electrified During the Year. This Is Less Than in Any Corresponding Period During the Last Ten Years—Approximately an Equal Amount of Track Was Rebuilt

THE results of a canvass of the electric railways of the United States and Canada to determine the single-track mileage of lines built or electrified and placed in operation during the year 1917, and also the amount of track reconstructed, are shown in the accompanying lists. Although reports were not received from all of the companies, the data can be considered representative of 97 per cent of the total mileage under electric operation, and this is quite satisfactory in view of the difficulties involved in conducting a canvass of such wide scope.

The following table, which was prepared from previous compilations by the ELECTRIC RAILWAY JOURNAL, shows that the additions made during the past year to the electric railway trackage were considerably less than for any year since 1907. Exclusive of electrified steam lines there were 376.7 miles of new electric railway track built, of which 71.1 miles were represented by new rapid transit lines in Greater New York and 305.6 miles by additions to various city and interurban lines. Although a comparison of the new electrified mileage placed in operation in the last two years shows a large decrease for 1917, the 1916 figure was greatly augmented by the 225-mile extension of the Chicago, Milwaukee & St. Paul electrification, and exclusive of this project the amount of new electrified line for the past year represents a slight increase.

	New Electric Railway Track Built	Electrified Steam Line	Total New Electric Mileage
1907	....	....	1880.0
1908	1174.5	84.0	1258.5
1909	774.7	112.4	887.1
1910	1204.8	192.4	1397.2
1911	1105.0	86.5	1191.5
1912	869.4	80.8	950.2
1913	974.9	119.0	1093.9
1914	716.5	229.0	946.4
1915	596.0	448.2	1044.2
1916	356.3	388.0	744.3
1917	376.7	66.0	442.7

The 376.7 miles of new line constructed and placed in operation can be divided roughly into two-thirds city and one-third interurban track. In 1916 the interurban track represented two-thirds of the total and the city track one-third. The number of states represented in the accompanying lists is practically the same as a year ago, while the number of companies that reported new work is about 15 per cent greater.

Among the states in which new track was reported, New York leads with 82.9 miles, consisting, as already stated, principally of extensions to the rapid transit lines in Greater New York. This figure compares favorably with the 78.4 miles constructed during 1916 in the State of California, which was the largest amount of new construction done in any one state, excepting, of course, Montana, in which a large amount of steam road had been electrified. In California and Ohio about 33 miles of new track have been built during the last year, this being the second largest amount reported for any state. This, of course, does not include Oregon where the greater part of the new line indicated was an extension of the Portland electrified division of the Southern Pacific Company.

Electric railway construction in Canada suffered a decline from the good record of 1916, due, no doubt, to effects of the war. While several companies are mentioned, by far the greater proportion of work done has been in rebuilding existing track.

The total rebuilt mileage for the year was 375.4, about 85 per cent of which was city track. The Connecticut Company seems to have been most active in this regard, having rebuilt a total of 25 miles. Since corresponding data were not compiled in previous years, no figures are available to use as a basis for comparison.

	New Track, Miles	Rebuilt Mileage
ARKANSAS		
Fort Smith Light & Trac. Co.	1.0	1.4
	1.0	1.4
CALIFORNIA		
Los Angeles Ry. Corporation		10.1
Municipal Ry. of San Francisco	11.7	
Northern Electric Ry.	0.4	0.36
Pacific Electric Ry.—La Habra to Fullerton	5.06	
San Diego Electric Ry.	2.34	0.77
Tidewater Southern Ry.—Hatch to Hilmar, 8 miles; Small to Mateca, 6 miles	14.0	
United Railroads of San Francisco		4.26
	33.50	15.49
COLORADO		
Colorado Springs & Interurban Ry.	0.90	1.5
Denver & Interurban R. R.—Electrification extended 1.67 miles in Boulder	2.11	
Denver Tramway	0.67	0.54
	3.68	2.04
CONNECTICUT		
Connecticut Co.	2.57	25.06
Danbury & Bethel St. Ry.		1.0
	2.57	26.06
DELAWARE		
Wilmington & Philadelphia Trac. Co.		6.04
		6.04
DISTRICT OF COLUMBIA		
Washington & Maryland Ry.	0.87	
Washington Ry. & Electric Co.	1.35	
	2.22	
FLORIDA		
Jacksonville Traction Co.	0.7	
Key West Electric Co.		0.25
Miami Traction Co.	1.5	
Tampa Electric Co.	0.75	
	2.95	0.25
GEORGIA		
Athens Ry. & Electric Co.		0.25
Columbus Railroad		2.0
Georgia Ry. & Power Co.	4.0	
Macon Ry. & Light Co.		1.8
Valdosta Street Ry.	1.0	
	5.0	4.05
IDAHO		
Boise Valley Trac. Co.	0.5	
	0.5	
ILLINOIS		
Alton, Granite & St. Louis Trac. Co.		0.53
Bloomington & Normal Ry. & Light Co.		1.23
Central Illinois Public Service Co.	0.31	0.03
Chicago & Interurban Trac. Co.		2.5
Chicago & Joliet Electric Ry.		2.0
Chicago & West Towns Ry.	1.0	
Chicago, North Shore & Milwaukee R. R.	4.33	2.02
Chicago, Ottawa & Peoria Ry.	0.28	0.38
Chicago, So. Bend & No. Indiana Ry.	5.1	0.4
Danville, Urbana & Champaign Ry.		3.57
Decatur Ry. & Lt. Co.		0.43
East St. Louis & Suburban Ry.		2.3
East St. Louis Ry.		0.19
Galesburg & Kewanee Elec. Ry.		0.8
Galesburg Ry., Ltg. & Pwr. Co.	0.09	

	New Track, Miles	Rebuilt Mileage
ILLINOIS (Continued)		
Hammond, Whiting & E. Chicago Ry.		2.0
Jacksonville Ry. & Light Co.		1.0
Peoria Ry.		6.0
Rockford & Interurban Ry.—New track built from Rockford to Camp Grant	3.0	0.4
Rockford City Trac. Co.	0.34	0.8
St. Louis, Peoria & Springfield R. R.		0.25
Southern Illinois Lt. & Pwr. Co.	0.37	
Tri-City Ry. of Illinois	0.19	0.91
	15.01	27.74
INDIANA		
Central Indiana Lighting Co.		0.24
Indianapolis Trac. & Term. Co.	1.4	2.27
Interstate Public Service Co.	0.96	0.06
Madison Light & Ry. Co.		0.43
Public Utilities Co.	0.38	
Terre Haute, Indianapolis & Eastern Trac. Co.	0.94	
Terre Haute Trac. & Light Co.		0.55
Union Traction Co. of Indiana	0.87	2.5
	4.55	6.05
IOWA		
Cedar Rapids & Marion City Ry.		3.6
Clinton, Davenport & Muscatine Ry.	0.06	
Dubuque Elec. Co.		2.0
Fort Dodge, Des Moines & Southern R. R.—Fort Dodge to Webster City and Lehigh	25.0	
Keokuk Electric Co.		0.57
Mason City & Clear Lake R. R.	1.5	1.5
Oskaloosa Trac. & Light Co.	0.12	0.21
Sioux City Service Co.		0.5
Tri-City Ry. of Iowa	2.62	1.64
	28.30	10.02
KANSAS		
Joplin & Pittsburg Ry.		2.65
Kansas City, Lawrence & Topeka Elec. R. R.	0.5	1.0
Southwest Missouri R. R.—Electrified between Galena, Kan., and Baxter Springs, Kan.	8.0	
Topeka Ry.		0.66
Wichita R. R. & Light Co.		0.9
	8.5	5.21
KENTUCKY		
Kentucky Trac. & Terminal Co.		0.6
Louisville Ry.—Extension to Camp Taylor	4.0	
So. Covington & Cincinnati St. Ry.		0.82
	4.0	1.42
MAINE		
Bangor Ry. & Electric Co.		1.33
Cumberland County Pwr. & Lt. Co.	0.28	1.87
Lewiston, Augusta & Waterville St. Ry.	1.78	0.78
	2.06	3.98
MARYLAND		
Cumberland & Westernport Elec. Ry.		1.32
Cumberland Electric Ry.	1.0	
United Railways & Electric Co.	5.03	13.3
Washington, Baltimore & Annapolis Elec. R. R.—Naval Academy Junction to Camp Meade	4.5	
	10.53	14.62
MASSACHUSETTS		
Bay State Street Ry.		5.8
Berkshire Street Ry.	11.0	1.2
Massachusetts Northeastern St. Ry.		4.08
Norfolk & Bristol St. Ry.		0.34
Plymouth & Sandwich St. Ry.—Plymouth to village of Sagamore	11.07	
Springfield Street Ry.	3.17	2.2
Union Street Ry.		2.68
Worcester Consolidated St. Ry.	1.49	4.7
	26.73	21.00
MICHIGAN		
Detroit & Port Huron Shore Line Ry.	2.03	0.73
Detroit, Jackson & Chicago Ry.	0.6	
Detroit, Monroe & Toledo Short Line Ry.	0.75	
Detroit United Ry.	14.87	11.39
Grand Rapids Ry.		3.51
Grand Trunk Ry. (St. Clair Tunnel Co.)		1.5
Menominee & Marinette Lt. & Trac. Co.		0.5
Saginaw-Bay City Ry.		0.51
	18.25	18.14
MINNESOTA		
Twin City Rapid Transit Co.	6.79	13.52
St. Cloud Public Service Co.		0.5
	6.79	14.02
MISSOURI		
Blue Valley Ry.	1.5	0.5
Hannibal Ry. & Elec. Co.		6.0
Kansas City Rys.	10.81	5.08
United Railways of St. Louis		19.5
	12.31	31.08
NEW JERSEY		
Morris County Trac. Co.		3.0
Public Service Ry.	0.15	
Trenton & Mercer County Trac. Corpn.		0.39
	0.15	3.39
NEW YORK		
Auburn & Syracuse Elec. R. R.	0.21	
Binghamton Ry.		1.73
Brooklyn Rapid Transit Co.—New track: 19.1 miles rapid transit; 6.18 miles surface lines	25.28	6.72
Buffalo & Depew Ry.		0.5
Elmira Water, Light & R. R. Co.	0.83	2.14
Hornell Traction Co.		0.13
Hudson Valley Ry.		2.0
Interborough Rapid Transit Co.	52.01	
International Ry.	2.1	6.59
New York & Stamford Ry.		0.28
New York Central R. R. (Elec. Div.)	0.55	
New York, Westchester & Boston Ry.	0.01	
Niagara Junction Ry.	0.77	
Orange County Trac. Co.	0.5	0.5
Schenectady Ry.	0.2	0.51
Second Ave. Ry.		0.3
Southern New York Pwr. & Ry. Corpn.		1.75
Third Ave. Ry.	0.34	
Westchester Street R. R.	0.11	0.7
	82.91	23.85
NORTH CAROLINA		
Southern Public Utilities Co.—Between Charlotte and Camp Greene	4.75	
	4.75	
NORTH DAKOTA		
Northern States Pwr. Co.		1.0
		1.0
OHIO		
Cincinnati, Milford & Loveland Trac. Co.		10.0
Cincinnati Trac. Co.		4.92
City Ry. of Dayton		2.25
Cleveland Ry.	10.61	15.43
Cleveland Southwestern & Col. Ry.		3.0
Columbus Ry., Pwr. & Lt. Co.	0.82	1.85
Dayton & Troy Elec Ry.		3.0
Gallipolis & Northern Trac. Co.	0.15	
Mahoning & Shenango Ry. & Lt. Co.	1.72	0.91
Northern Ohio Trac. & Light Co.	2.1	5.58
Portsmouth Street R. R. & Lt. Co.—Between Wheelersburg and Ironton	18.0	2.5
	33.40	49.44
OKLAHOMA		
Ardmore Ry.	0.3	0.9
Oklahoma Ry.	0.5	0.6
	0.8	1.5
OREGON		
Pacific Pwr. & Lt. Co.		3.5
Portland & Oregon City Ry.	1.0	
Portland Ry., Lt. & Pwr. Co.	1.95	1.83
Southern Pacific Co. (Portland Div.)—Electrification between Whiteson and Corvallis	47.5	
	50.45	5.33
PENNSYLVANIA		
Altoona & Logan Valley Elec. Ry.	0.85	
Ardmore & Llanerch St. Ry.	0.93	
Carbon Transit Co.		0.5
Harrisburg Rys.		0.62
Mahoning & Shenango Ry. & Lt. Co.	0.66	0.65
Montgomery Transit Co.		1.0
Northwestern Pennsylvania Ry.	3.65	1.09
Philadelphia & Garrettford St. Ry.	0.31	
Philadelphia Rys.		0.5
Philadelphia Rapid Transit Co.	0.71	16.33
Reading Transit & Light Co.		4.17
Scranton Ry.		0.5
Wilkes-Barre Ry.		1.0
York Rys.	0.28	0.75
	7.39	27.11
RHODE ISLAND		
Rhode Island Co.	1.44	5.36
	1.44	5.36
SOUTH CAROLINA		
Columbia Ry., Gas & Electric Co.—To Camp Jackson, 8 miles	10.0	
	10.0	
SOUTH DAKOTA		
Aberdeen R. R.		0.6
Sioux Falls Trac. System		1.0
		1.6
TENNESSEE		
Chattanooga Ry. & Light Co.	3.0	
Jackson Ry. & Light Co.		2.6
Memphis Street Ry.	0.3	0.75
Nashville Ry. & Light Co.		4.56
	3.3	7.31
TEXAS		
Austin Street Ry.	1.5	
Beaumont Trac. Co.	0.15	0.66
Bryan & Central Texas Interurban Ry.—New track between Whittaker and Wilcox	2.25	1.0
Bryan & College Interurban Ry.		2.5
El Paso Electric Ry.		1.6
Galveston Electric Co.		0.7
Jefferson County Trac. Co.	0.11	
Marshall Traction Co.	4.7	
Northern Texas Trac. Co.	4.2	
San Antonio Public Service Co.	4.7	3.55
Southwestern Trac. Co.		1.2
Tarrant County Trac. Co.	1.02	
Texas Electric Ry.	1.55	
	20.18	11.21
UTAH		
Ogden, Logan & Idaho Ry.		2.7
Salt Lake & Utah R. R.—Between Grangee and Magna	9.0	
	9.0	2.7

	New Track, Miles	Rebuilt Mileage
VIRGINIA		
Danville Traction & Pwr. Co.	.02	
Hampton & Langley Field Ry.—Between Hampton and Government Reservation at Langley Field.	3.5	
Roanoke Ry. & Elec. Co.	1.0	
Virginia Ry. & Pwr. Co.	2.23	0.93
	6.75	0.93
WASHINGTON		
Puget Sound Int. Ry. & Pwr. Co.	0.25	
Puget Sound Trac., Lt. & Pwr. Co.		0.19
Seattle & Rainier Valley Ry.	1.25	2.0
Tacoma Ry. & Pwr. Co.	2.0	
Yakima Valley Transportation Co.	3.55	
	7.05	2.19
WEST VIRGINIA		
Monongahela Valley Trac. Co.	5.5	0.8
Norfolk & Western Ry. (Elec. Div.)—Electrified between Cooper and Simmons	7.5	
Ohio Valley Electric Ry.		0.87
	13.0	1.67
WISCONSIN		
Eastern Wisconsin Elec. Co.		3.99
Milwaukee Electric Ry. & Lt. Co.	2.19	5.84
Wisconsin Ry., Lt. & Pwr. Co.		1.33
	2.19	11.16
CANADA		
Cape Breton Elec. Co., Ltd.	0.15	1.0
Hull Electric Co.	1.0	0.95
International Transit Co.		0.32
Janesville Trac. Co.		0.51
Levis County Ry.		0.57
London & Port Stanley Ry.	0.34	
London Street Ry.		1.68
Niagara, St. Catharines & Toronto Ry.	0.66	3.5
Nova Scotia Tramways & Pwr. Co., Ltd.		0.17
Ottawa Electric Ry.		0.6
Port Arthur Civic Ry.		1.51
Quebec Ry., Light & Pwr. Co.	0.18	
Sandwich, Windsor & Amherstburg Ry.		1.0
Sudbury, Copper Cliff Suburban Elec. Ry.	1.0	
Toronto Civic Ry.	0.49	
	3.82	11.81
Total for all companies	442.7	375.4

California Joint Committee on Inductive Interference Completes Report*

A COMMITTEE which has, for the last five years, been investigating disturbances in communication circuits caused by induction from neighboring power circuits, under the auspices of the California Railroad Commission, has completed its work and presented its report.

A preliminary report, rendered by the committee in 1914, was printed in the Transactions of the American Institute of Electrical Engineers, Vol. 33, 1914, page 1441. The final report of the committee will be published by the commission if a sufficient number of subscriptions is received to cover the actual cost of printing and binding. This is estimated not to exceed $10. It is proposed to publish thirty of the technical reports presented in the course of the work, selected as being of general interest and applicability.

The complete report contains the following sections:

1. Historical sketch, regarding the formation, personnel, organization, investigations and finances of the committee.

2. Review of the basic principles, comprising a simple statement of the nature of the subject, a summary of the facts established or agreed upon, and a concise statement of the guiding principles for the prevention of interference.

3. Recommendations for revised rules to govern the design, construction and operation of power and communication lines and associated apparatus, to prevent or mitigate inductive interference, followed by explanatory comments. An exhibit accompanying the rules discusses the arrangement and spacing of power conductors.

4. Five appendices dealing with: (1) Interference not covered by the recommended rules, which apply to constant-potential a.c. power circuits of more than 5000 volts between wires or 2900 volts to ground and exclude telephone subscribers' loops. (2) List of technical reports prepared by the committee as a record of its investigations. (3) Comments on the 1914 report. (4) Bibliography. (5) Chart showing the organization of the committee.

*Following are references to articles in this paper during the period covered by the report: June 8, 1912, page 963; June 15, 1912, pages 1002, 1019; Aug. 24, 1912, page 288; Aug. 31, 1912, pages 308, 336; March 15, 1913, page 512; March 22, 1913, page 531; Oct. 11, 1913, page 690; Nov. 19, 1913, page 1141; Jan. 10, 1914, page 82; Feb. 7, 1914, page 313; March 7, 1914, page 529; March 28, 1914, page 706; May 2, 1914, pages 958, 960; Sept. 12, 1914, page 485; Oct. 3, 1914, page 636. Since 1914 the matter has not had much attention in the electric railway field.

Send-Off for Mr. Cairns

Officials of the Manila Electric Railway & Light Corporation Pay Respect to Associate Departing for America

A STRIKING testimonial of the popularity with which L. S. Cairns, recently assistant general manager Manila Electric Railway & Light Corporation, has been regarded during his five-year connection with that company was shown by the ceremonies at his departure from Manila on Oct. 17 to take charge of the Eastern Pennsylvania Railways of Pottsville, Pa. One function of the farewell exercises was held in the Manila Grand Opera House on the evening of Oct. 15, at which this large house was crowded. After an interlude of music and other entertainments there was an address by Mr. Santiago of the claims department, a reply by Mr. Cairns, and closing remarks by Vice-President Duffy. The following day there was a formal parade to the pier. About 1200 employees of the company participated, marching in eight divisions, representing the different departments of the company, and acting as an escort for Mr. Cairns and his family, who followed in an auto. On arrival at the pier the lines opened, giving an opportunity to the former assistant general manager to bid farewell to all as he passed through the two lines.

1200 PARTICIPATED IN PARADE FOR DEPARTING MANILA OFFICIAL

In addition, a silver tablet, inscribed with best wishes for his future success, was presented to Mr. Cairns.

The Financial Wrecks of 1917

Electric Railway Receiverships and Foreclosure Sales, in Mileage and Capitalization Involved, Show Heavy Increase Over Those of 1916—This Due to One Large Company—Score of Small Companies Abandon Operation on Their 207 Miles of Track

THE high cost of electric railway operation during 1917 has left many a company in a disabled condition. The most striking result is the number of total wrecks. Heretofore, when electric railways have been forced into the hands of receivers because of accumulated burdens of regulation, unrestricted competition, over capitalization, or weaknesses of organization, they have almost invariably been able to effect some financial or operating readjustment so as to insure continuance of service.

The last year has seen about the usual number of companies either entering upon or completing their readjustments, but, more significant still, it has seen the passing of companies that have given up hope of any successful reorganization. A score of railway properties have suspended service and in most cases have dismantled or are planning to dismantle their lines. In many instances this action has been taken voluntarily by the management and not under court orders, and in several others the only willing purchaser at the forced sale has been the junk dealer.

Such total wrecks, it is true, have all been small properties, and some of them were probably constructed without adequate, if any, transportation studies, and have never even approached operation on a sound basis. Yet at other times they all would undoubtedly have tried to struggle along. Their collapse, in this period of inflated costs, simply shows that the industry is now passing through a stage where mere existence for its weakest members is being found impossible.

Bay State Line Swells Receivership Figures

Owing to one large company, the Bay State Street Railway, the new receiverships in 1917 were greatly in excess of those in the preceding year, the mileage of 1,139.37 involved being, next to the record in 1915, the largest in the last nine years. The capitalization of companies placed in receiver's hands was nearly three times as large as in 1916, and the figures for outstanding stock and funded debt are well up the list for the nine years. The record for this period (adjusted in a minor point to cover a late 1916 return) follows:

	Number of Companies	Miles of Track	Outstanding Stock	Outstanding Funded Debt
1909	22	558.00	$29,962,200	$22,325,000
1910	11	696.61	12,629,400	75,490,735
1911	19	518.90	29,533,450	38,973,293
1912	26	373.58	20,410,700	11,133,800
1913	18	342.84	31,006,900	47,272,200
1914	10	362.39	35,562,550	19,050,460
1915	27	1,152.10	40,298,050	39,372,375
1916	15	359.26	14,476,600	10,849,200
1917	18	1,139.37	33,497,925	33,394,400

The accompanying table gives the details of electric railway receiverships in the last calendar year. An attempt was made in all cases to take the figures from the most up-to-date and most authoritative sources, and to secure the correct data in cases of disagreement among the financial manuals, a by no means infrequent occurrence in connection with the smaller companies. These, it will be observed, constituted the great majority of the companies placed in receivership, only three having more than 30 miles of track. The 867 miles of the Bay State receivership formed more than 75 per cent of the whole sum.

Most of the receiverships were evidently caused by the decreasing margin between revenues and expenses, operation in territory of a poor character, and inherent defects of organization; but in certain cases special reasons existed. The Bay State Street Railway, for example, was confronted with unusual cash requirements and a lack of borrowing capacity, and the receivership is a "breathing spell." The Cincinnati, Milford & Loveland Traction Company has at last succumbed to the effects of the flood damages in 1915. The receivership of the Cleveland & Chagrin Falls Railway was precipitated by an award of $50,000 for injuries to a passenger, appeal on which is pending. Serious accidents also figured in the cases of the Southern Cambria Railway and the Hornell Traction Company. The Plymouth & Shelby Traction Company receivership is the result of a court decision holding the company to be a fraudulent corporation.

Foreclosure Sales Increased

The number of electric railways sold at foreclosure in 1917 was twenty-five, a substantial increase over the nineteen of the year before. The mileage of 737.69 compares with only 430.14 in 1916, and the capitalization figures are considerably larger. The miles of track sold in 1917 were greater than those in any of the preceding eight years. The following adjusted table gives all the comparative figures for the last nine years:

	Number of Companies	Miles of Track	Outstanding Stock	Outstanding Funded Debt
1909	21	488.00	$22,265,700	$21,174,000
1910	22	724.36	19,106,613	26,374,065
1911	25	660.72	91,354,800	115,092,750
1912	18	267.18	14,197,300	10,685,250
1913	17	302.28	15,243,700	19,094,500
1914	11	181.26	26,239,700	44,094,241
1915	19	308.31	30,508,817	16,759,997
1916	19	430.14	13,895,400	22,702,300
1917	25	737.69	27,131,900	27,083,045

The detailed foreclosure sales are shown in the accompanying table. As in previous years, some electric railways for which receivers had been appointed or against which foreclosure suits had been brought were able to carry out reorganization plans without the properties being offered at public sale. All the various forms of reorganization, readjustment and change in ownership without formal foreclosure sales were passed over in compiling the table.

The sale of the Mt. Vernon Railway, reported in 1916, was not confirmed, and the property was resold late this year. Furthermore, it should be noted that several properties were sold piecemeal, some parcels in certain cases remaining under the receivership. The Gary & Interurban Railroad, for example, was all sold

ELECTRIC RAILWAY RECEIVERSHIPS IN 1917

	Miles of Track	Out-standing Stock	Outstanding Funded Debt
Bay State Street Railway	867.78	$24,531,500	$24,345,500
Beech Grove Traction Company	3.90	150,000	100,000
Cincinnati, Milford & Loveland Traction Company	37.00	1,649,425	441,000
Cleveland & Chagrin Falls Railway	12.00	300,000	251,900
Danbury & Bethel Street Railway	16.00	320,000	588,500
Eastern New York Railroad	15.00	275,000	150,000
Grafton Light & Power Company	7.00	400,000	300,000
Hornell Traction Company	10.90	117,900	150,000
Manhattan & Queens Traction Corporation	22.00	†20,000	None
Minster & Loramie Railway	3.30	34,100	20,000
Orleans-Kenner Electric Railway	11.60	250,000	250,000
Pennsylvania & Ohio Railway	26.00	1,300,000	900,000
Pittsburgh & Butler Railway	33.00	1,750,000	3,688,000
Plymouth & Shelby Traction Company	6.97	200,000	200,000
Richmond & Rappahannock River Railway	25.40	500,000	490,000
Southern Cambria Railway	30.00	1,000,000	1,284,500
St. Louis, Lakewood & Grant Park Railway (*a*)	4.00	300,000	85,000
Trans-St. Mary's Traction Company	7.52	400,000	150,000
	1,139.37	$33,497,925	$33,394,400

†This sum represents installments paid in on subscriptions, there being no capital stock outstanding.
(*a*) Not in operation since flood of 1915.

in sections. The properties of the Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, the Sunbury & Susquehanna Railway and the Richmond & Rappahannock River Railway, however, were only partially sold. In such cases the capitalization figures have been prorated on a mileage basis, with full weight given to any underlying liens.

In most cases the foreclosure sales in 1917 were the forerunners to the beginning of business through a reorganized company or a new one. Some properties, however, went from the sales to the junk pile. These, with the lines whose owners voluntarily abandoned operation, are shown in the accompanying table. An effort was made to segregate actually wrecked companies into two classes, the first, or "Dismantlements," including properties actually scrapped, in process of being scrapped or having the necessary legal sanction for such treatment. The second class, or "Suspensions," includes lines where the service has been discontinued or the question of dismantlement, as far as can be learned, is still pending. No attempt was made to cover the abandonments of small sections of route by operating companies.

The 14-mile parcel of the Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, purchased by a committee of bondholders in December, was acquired under a court order expressly permitting abandonment if this was desired. It is reported, however, that operation has not yet been discontinued.

Although the Norwood, Canton & Sharon Street Railway was sold in November to a junk dealer, it has not been included in the compilation. The prospective purchaser forfeited his deposit rather than become involved in certain litigation regarding the company, and the property reverted to its owners. Service has not been suspended.

In closing, two instances may well be cited to show how electric railway service is better appreciated when its continuance is threatened. The Cape May, Delaware Bay & Sewell's Point Railway, a 20-mile property, was sold and became headed for dismantlement. The local

ELECTRIC RAILWAY FORECLOSURE SALES IN 1917

	Miles of Track	Out-standing Stock	Outstanding Funded Debt
Algiers Railway & Lighting Company	6.00	$430,000	$35,000
Amarillo Street Railway	8.20	212,000	125,000
Bluffton, Geneva & Celina Traction Company	19.00	675,000	None
Boise Railroad, Ltd	8.00	510,400	389,000
Bristol Traction Company	15.30	143,800	192,500
Cape May, Delaware Bay & Sewell's Point Railroad	20.00	150,000	150,000
Catskill Traction Company	5.50	60,000	70,000
Cincinnati, Dayton & Toledo Traction Company	83.90	2,250,000	5,000,000
Cleburne Traction Company	8.00	*15,000	None
Columbus, Delaware & Marion Railway	60.00	300,000	2,533,000
Empire United Railways, Inc. (*a*)	246.22	11,600,000	10,057,900
Gary, Hobart & Eastern Traction Company	9.00	125,000	125,000
Gary & Interurban Railroad	85.00	4,720,850	2,537,225
Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company (*b*)	14.00	2,082,750	250,000
Minster & Loramie Railway	3.30	34,100	20,000
Mt. Vernon (Ohio) Railway	9.00	10,000	40,000
Nashville - Gallatin Interurban Railway	27.05	750,000	600,000
Pittsburgh & Butler Railway	33.00	1,750,000	3,688,000
Providence & Fall River Street Railway	10.12	165,000	165,000
Richmond & Rappahannock River Railway (*c*)	9.10	179,000	175,420
Sacramento Valley Electric Railroad	12.30	250,000	None
Southwestern Traction Company	15.00	189,000	130,000
Sunbury & Susquehanna Railway (*d*)	6.00	400,000	560,000
Taunton & Pawtucket Street Railway (*e*)	17.50	100,000	200,000
Waycross Street & Suburban Railway	7.20	30,000	40,000
	737.69	$27,131,900	$27,083,045

*Authorized amount; outstanding amount not ascertainable.
(*a*) This entry covers the controlled Rochester, Syracuse & Eastern Railroad (as in 1915 Table of Receiverships), although this company was sold separately.
(*b*) Total trackage, 56 miles, was offered for sale on Dec. 18, but only a 14-mile section was sold.
(*c*) See 1917 Table of Receiverships. Only the Seven Pines line has been sold.
(*d*) Remaining mileage, 9 miles, still in hands of receiver. Sold portion represents property of consolidated Northumberland County Traction Company.
(*e*) Sale covered all mileage of Bristol County Street Railway under old $200,000 mortgage, held in 1915 to be valid lien assumed by successor, Taunton & Pawtucket Street Railway.

ELECTRIC RAILWAY ABANDONMENTS IN 1917

	Miles of Track	Out-standing Stock	Outstanding Funded Debt
I. DISMANTLEMENTS			
Alton & Jacksonville Railway (*a*)	21.30	$142,000	$450,000
Arkansas Northwestern Railroad	2.13	.....	.....
Catskill Traction Company	5.50	60,000	70,000
City Railway, Mt. Vernon, Ill.	3.25	40,000	None
Cleburne Traction Company (*b*)	8.00	*15,000	None
Goshen, South Bend & Chicago Railway (*c*)	20.00	1,109,400	519,900
Mexico Investment & Construction Company (*d*)	16.00	30,000	11,550
Mt. Vernon (Ohio) Railway	9.00	10,000	40,000
Norfolk City & Suburban Railway	4.50	50,000	50,000
Norfolk & Ocean View Railway (*e*)	10.00	62,500	625,000
St. Lawrence International Electric Railroad & Land Company	7.79	250,000	200,000
Sacramento Valley Electric Railroad	12.30	250,000	None
Waycross Street & Suburban Railway	7.20	30,000	40,000
	126.97	$2,048,900	$2,006,450
II. SUSPENSIONS			
Amarillo Street Railway	8.20	$212,000	$125,000
Bluffton, Geneva & Celina Traction Company (*f*)	19.00	675,000	None
Bristol Traction Company	15.30	143,800	192,500
Fort Smith-Oklahoma Light & Traction Company	1.21	30,000	None
Richmond & Chesapeake Bay Railway	14.80	2,500	1,000,000
Southern Traction Company, Inc. (*g*)	4.50	10,000	24,500
Taunton & Pawtucket Street Railway (*h*)	17.50	100,000	200,000
	80.51	$1,173,300	$1,542,000
	207.48	$3,222,200	$3,548,450

*Authorized amount; outstanding amount not ascertainable.
(*a*) Dismantlement order issued in December by Illinois Public Utilities Commission.
(*b*) City Council has authorized removal of physical property.
(*c*) Nineteen miles are being junked now; city of La Porte has option to purchase remaining 1 mile of track and equipment within city.
(*d*) Actual dismantlement began at end of year.
(*e*) Six miles of track were taken over by Virginia Railway & Power Company.
(*f*) Purchaser bought property to dismantle, but work is held up pending hearing before commission.
(*g*) Sold for dismantlement and work started, but city and county have asked for receiver. Suit is pending.
(*h*) Sold to wreckers for dismantlement when sale is confirmed. See note in 1917 Table of Foreclosure Sales.

public then made various efforts to secure the operation of the property, even at the hands of the steam lines in the same territory. Nothing was accomplished, however, until the United States Navy Department recently commandeered the railway for government use.

The Providence & Fall River Street Railway, actually sold for junk, was saved from the scrap heap last November. Service was suspended, and the removal of the line was imminent. Public-spirited citizens, however, secured an option and organized a successor company, which took over the property and resumed operation.

Electric Railway Statistics

Figures Are Given by States of the Miles of Track and Number of Cars Owned

THE accompanying table gives statistics of the miles of track and cars of the electric railway companies in the United States, made up from the August, 1917, Electric Railway Directory of the McGraw Hill Company. The dates of the reports in this directory average about June, 1917, so that the table may be considered to represent the statistics of the industry at about that time.

A comparison of the totals given in this table with those in a somewhat similar table, published in the issue of Jan. 6, 1917, will show for all states a total of 1029 companies instead of 1045, a decrease during the year of sixteen. The miles of track total 48,175 as compared with 47,562 in June, 1916, an increase during the year of 613, and the motor passenger cars total 81,383, as compared with 80,058 last year, an increase of 1335. The total number of cars, according to the table, increased from 100,476 to 102,359, or a total of 1883.

The decrease in the number of companies is due in most part to the abandonment of operation by companies which had not found the service financially profitable, although there were a few consolidations. There were also several cases of the splitting up of former consolidated properties by action of the court or for some other reason. Some of the cases of segregation of individual properties brought changes in the mileage credited to different states, because under the plan followed the miles of track and number of cars belonging to each company are credited to the state in which the greater part of the mileage lies. Of the total increase in mileage, more than 25 per cent is accounted for by the increase in rapid transit mileage in New York City. Part of the rest of the increase is probably due to seemingly inevitable discrepancies which occur when reports are made out by different officials each year.

A few other words of explanation are necessary. The electrified mileage of steam railroads is included, but as this is reported to the directory usually as route mileage, that figure is continued in the table, although the mileage of the city and interurban electric railway companies is figured as single track as usual. Under cars, the statistics include only the electric locomotives and the motor passenger cars of electrified steam railroads. Gasoline and storage battery cars are included as passenger motor cars.

Many electric railway companies use the expressions express cars, freight cars, and service cars as interchangeable terms. The table shows the way in which cars of these types are reported by the different companies, but what is known as a service car on one road may be called a freight car or an express car on another road. In a few cases, where a company owns a large number of freight cars compared with the number of passenger cars owned, the total number of such freight cars has been intentionally omitted from the table. The most notable instances of this are the Chicago Tunnel Company with 3000 "other cars" and the Fort Dodge, Des Moines & Southern Railroad with 2300 "other cars."

TABLE SHOWING STATISTICS OF ELECTRIC RAILWAY COMPANIES IN THE UNITED STATES

	Number of Companies	Miles of Track	Motor Passenger Cars	Trail Passenger Cars	Electric Locomotives	Express or Freight Motor Cars	Freight Cars	Service or Other Cars	Horse or Cable Cars
New England States:									
Connecticut	8	1,624	2,269	....	102	....	....	67	....
Maine	15	534	540	....	3	3	30	177	....
Massachusetts	43	3,243	7,893	357	8	27	33	1,146	....
New Hampshire	14	252	286	....	2	1	....	35	2
Rhode Island	3	439	1,056	27	....	....	....	246	....
Vermont	10	128	141	....	....	....	12	13	....
Total	93	6,220	12,185	384	115	31	75	1,684	2
Eastern States:									
Delaware	2	153	309	....	....	....	....	81	....
District of Columbia	7	412	1,074	....	....	....	....	480	....
Maryland	12	674	2,143	....	13	5	70	98	....
New Jersey	29	1,545	3,286	3	2	19	4	78	....
New York	108	5,637	16,851	1,116	151	12	35	2,000	207
Pennsylvania	124	4,579	8,732	15	2	8	75	875	2
Virginia	15	590	900	25	....	....	....	173	....
West Virginia	24	639	611	....	12	....	5	41	....
Total	321	14,229	33,906	1,159	180	44	189	3,826	209
Central States:									
Illinois	72	3,774	5,962	696	48	....	962	633	....
Indiana	43	2,378	1,920	6	3	11	....	401	....
Iowa	25	881	962	13	19	....	....	364	....
Kentucky	10	462	995	26	....	12	....	58	....
Michigan	26	1,666	2,273	8	20	105	10	472	....
Minnesota	14	722	1,329	....	8	....	....	110	....
Missouri	22	1,135	2,621	105	....	....	....	285	....
Ohio	80	4,280	5,466	68	12	16	24	1,304	....
Wisconsin	18	768	975	113	....	....	....	90	....
Total	310	16,066	22,503	1,035	110	144	996	3,717	....
Southern States:									
Alabama	15	367	444	17	....	....	2	250	....
Arkansas	10	128	231	....	....	....	....	44	....
Florida	9	183	265	7	....	....	....	53	....
Georgia	17	501	699	14	....	....	....	69	2
Louisiana	10	327	681	....	....	....	....	140	....
Mississippi	11	123	159	2	....	....	....	27	....
North Carolina	12	292	303	....	6	....	8	200	....
South Carolina	5	120	173	6	....	2	....	16	....
Tennessee	15	475	820	....	1	1	2	111	....
Total	104	2,516	3,775	46	7	3	12	910	2
Western States:									
Arizona	4	54	44	1	....	....	....	1	....
California	42	3,293	3,686	82	62	12	403	1,562	119
Colorado	13	492	463	16	5	1	143	299	2
Idaho	6	180	68	....	2	....	....	18	....
Kansas	18	553	415	3	....	....	12	106	3
Montana	9	658	128	20	42	32	....	17	....
Nebraska	6	254	538	10	1	....	....	65	....
Nevada	2	11	12	....	....	....	....	....	....
New Mexico	2	9	11	....	....	....	....	....	....
North Dakota	6	38	72	....	....	....	....	14	....
Oklahoma	16	310	267	....	....	....	....	77	....
Oregon	10	679	749	94	25	29	449	218	....
South Dakota	3	26	34	2	....	....	....	7	....
Texas	38	1,003	1,200	84	....	11	....	223	....
Utah	5	470	276	....	7	2	....	311	....
Washington	19	1,092	1,049	23	26	16	442	929	48
Wyoming	2	22	12	7	....	....	....	3	....
Total	201	9,144	9,024	342	170	103	1,449	3,850	172
Total, all States	1,029	48,175	81,393	2,966	582	325	2,721	13,987	385

The skip-stop plan, which has been in trial use in Buffalo during the past few months, has finally been extended to include most of the routes in that city. The company states that the change has met with almost universal commendation throughout the city, for the service has been speeded up and the number of car stops has been actually reduced 50 per cent.

American Association News

Electric Railway War Board Co-operating with New York Public Service Commission for Second District

Board Issues Bulletin No. 3

New York Fuel Economy Campaign Begins

After Address by C. Loomis Allen of War Board at Conference in Albany Resolutions Are Passed Requesting Commission to Give Consideration to Adoption of Staggered Hours of Labor and Other Means of Conserving Fuel

AS THE result of a conference on Jan. 3 between officials of electric railway lines doing business within the jurisdiction of the Public Service Commission, Second District, held at the Albany offices of the commission, steps have been taken whereunder the consumption of coal by the seventy-two operating electric railways in the State of New York will be greatly diminished. The conference was called by the commission for the purpose of aiding in the nation-wide movement for the conservation of fuel. Chairman Van Santvoord opened the conference with a short address in which he dwelt upon the object of the meeting and touched upon the conditions which make it paramount that everybody should lend a helping hand in the general conservation movement.

C. Loomis Allen, director of the American Electric Railway Association's War Board at Washington, then took the floor. He voiced the warning that unless coal is saved there will be a shortage next year. "The production of coal in this country is at its absolue maximum," he said. "The output of coal during the year 1917 was the greatest in the history of the country. It cannot be increased. Yet this coming year we must add at least 50,000,000 tons to our present output. The only way in which we can provide that is not by production but by economy."

Mr. Allen went on further to state that the electric railways of this country are now annually consuming about 16,000,000 tons of coal and that of this amount they are being asked to save 1,000,000 tons. He then cited five principal methods which had been suggested in connection with an engineering study which had recently been made of the electric railway situation in Washington, D. C., and which, it is believed, will result in the annual saving of 25,790 tons of coal. These measures include the skip or stagger stops, elimination of unnecessary car mileage, reduction of heating in the cars, a gradation of the dismissal hours of employees in large plants and stores, and the operation of both traction systems in that city by means of the same power supply.

At the termination of the hearing a committee was appointed which was intrusted with the task of drafting resolutions. It was directed to make a thorough investigation into the means by which savings in coal can be effected, and to report its findings at the earliest possible date. This committee consisted of:

Charles R. Barnes, chief of the division of electric railways, member ex officio; J. P. Barnes, general manager Schenectady Railway; H. B. Weatherwax, vice-president United Traction Company, Albany; W. H. Collins, general manager Fonda, Johnstown & Gloversville Railway, and J. F. Hamilton, New York State Railways, Rochester.

The following resolutions recommending the steps to be taken by the traction companies within the jurisdiction of the commission in the matter of the saving of fuel were adopted:

Whereas, The national and state fuel administrations, through C. Loomis Allen, director of the American Electric Railway Association War Board, have directed the attention of the Public Service Commission and the electric railroads to the necessity of conserving for war purposes during the year 1918 1,000,000 tons of the annual 16,000,000 tons consumption of coal by electric railways, and

Whereas, Approximately 200,000 tons of coal are used annually by the electric railways of the State of New York under the jurisdiction of the Public Service Commission for the Second District, and

Whereas, It is the unanimous opinion of the state and federal fuel administrations, the War Board of the American Electric Railway Association, as well as of the officials and representatives of the various electric railroad companies in the Second Public Service District that one of the most effective means which can be employed in the conservation of energy as requested by the national and state fuel administrations and one which will cause the least inconvenience in proportion to the results to be obtained, is the "staggering" of hours of labor in industrial plants, the employees of which are patrons of electric railroads, and

Whereas, Under the present arrangement of working hours of these employees it is in most cases an impossibility for the companies to furnish a reasonably adequate service during the hours when they desire to travel, and

Whereas, This is so not only by reason of the limited number of cars which companies can furnish but also by reason of track limitations preventing the operation of the necessary cars, and

Whereas, With the suggested change in hours of service it might be possible to utilize one car to three times its present capacity, and

Whereas, It is believed that the increased convenience to the employees of these plants by the change in working hours would more than offset any inconvenience which might result, and

Whereas, It is further believed that practical results can best be obtained through the co-operative effort of the Second District Public Service Commission and the employers of labor, now, therefore, be it

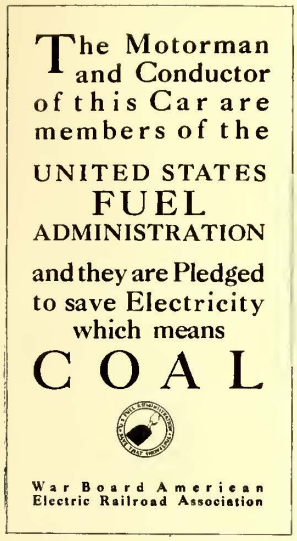
Resolved, That this conference respectfully request the Public Service Commission to give immediate consideration to the possibilities involved in the above suggestions and to take such action as in its judgment may best promise effective co-operation by industrial enterprises in the various cities within its jurisdiction where the project appears to be especially feasible. And be it

Further Resolved, That this conference assure the Public Service Commission of the hearty co-operation of officials of electric railroad companies in the Second Public Service District in its efforts in this matter. And be it

Further Resolved, That each electric railway in the Second District of the State of New York furnish to the Public Service Commission the names of the industries and the approximate number of employees in each where the "staggered" service would be beneficial and effective.

Trainmen's Pledges Are Subject of War Board's Bulletin No. 3

On Dec. 20, 1917, Fuel Administrator H. A. Garfield addressed to the Electric Railway War Board a letter offering to furnish car cards and window posters for use in cars operated by men who have signed conservation pledges. The poster is reproduced on this page, and the car card on page 29 of the present issue. Dr. Garfield's letter forms the basis of the War Board's Bulletin 3, which the association is now distributing. The bulletin also contains the pledge card used by the United Railways & Electric Company, Baltimore, Md. This is substantially the same as the Capital Traction Company card shown on page 1121 of the issue of the ELECTRIC RAILWAY JOURNAL for Dec. 22, 1917.



CAR WINDOW POSTER FURNISHED BY UNITED STATES FUEL ADMINISTRATION

Inclosed with Bulletin 3 is the following suggested form letter to car crews:

Uncle Sam Wants Us to Save Coal

The men in the power house are saving every shovelful of coal they can to help our fighters.

The men in the car houses and shops are doing their share, too.

It is up to every motorman to do his part. Every time you handle the controller wrong, or blow your breaker, or spin your wheels (or skid or flatten them), *you* waste the coal the other fellows are trying to save. Every time you keep the current on unnecessarily and then apply the brakes instead of coasting, *you* waste coal.

Be a coal saver, not a coal waster!

It's up to every conductor to back up the motorman in his efforts to save. See that heat and light are not wasted. Handle your passengers and the bell cord so as to help the motorman. This will enable him to handle controller and brakes most economically. Be careful of your passengers and the car equipment.

Encourage each other—co-operate and help.

Each one of us must fight, if we are to win. Your *fight* is to save and co-operate. *Your* enemy is carelessness and heedlessness.

Get behind our boys, "Over There."

Fare Situation Discussed at New Haven

The meeting of the Connecticut Company section, held on Dec. 20, was largely taken up with statements regarding the pending hearings before the Public Utilities Commission in the matter of higher fares. As allowed under the Connecticut law, the company some weeks ago raised the urban fares on its property to 6 cents, subject to later approval by the commission. The hearings are preparatory to action by the commission. The speakers at the section meeting explained how the data had been prepared for consideration by the commission, and some of the data were cited by way of illustration.

W. J. Flickinzer read the statement which had been presented at the hearing by President L. S. Storrs outlining the causes which had led the company to increase the flat fare to six cents rather than to secure the increase by some other method of fare modification. Mr. Flickinzer also presented to the section a résumé of the circumstances which had led to the formation of the Electric Railway War Board and explained briefly its organization.

Mr. Storrs then gave a picture of the state of the electric railway industry which, while at present discouraging in a way, is at the same time promising. He felt increasingly optimistic regarding the outlook.

The meeting, as usual, was preceded by a dinner, enlivened with orchestral music and singing. The annual election was held also, resulting in the following selections: President, W. P. Bristol, manager Hartford division; vice-president, W. R. Dunham, Jr.; engineer maintenance of way; secretary, W. E. Jones, statistician; treasurer, George M. Cresson, treasurer's office; director for three years, J. M. Hamilton, general agent New Haven division. The section decided to make a feature of the question-box plan in connection with the meeting programs. The membership committee reported a present membership of 249, including eighteen members now with the colors, a slight increase for the year in spite of difficulties incident to the war. W. E. Jones, secretary, stated that the honor roll of the company contains 214 names at present, the total number of employees being roughly 4,000.

Operating Costs Discussed in Portland

G. Sabin Brush, superintendent of the railway department, was the speaker at the meeting of the Cumberland County Power & Light Company section held on Dec. 17. Mr. Brush discussed the circumstances of the company at the present time relative to the high costs of operation. He used charts to compare present prices with those of five years ago and also to show the various items of expense. Judge William Lyons, one of the guests, responded to a request for a short talk and spoke on the war.

A notice was read at the meeting of a correspondence course in practical electricity which is being started in the power and light departments. The meeting was preceded by a dinner from 6 to 8 o'clock, and during the evening the section orchestra rendered several selections, supplemented by piano and cornet solos.

Turkey Raffle at Chicago Meeting

G. H. Pierce, of the electrical department, held the lucky number entitling him to a live 12-lb. turkey at the meeting of the Chicago Elevated Railroads' section on Dec. 18. About 100 members and guests listened to an instructive program, after which they gathered around the refreshment table where apples, doughnuts and cider were served. The service flag of the Elevated roads was displayed for the first time, showing a total of 291 men to be in government service. Recitations and a piano solo constituted the entertainment.

The serious part of the program consisted of a talk on "Accounting," by T. B. MacRae, auditor, and a brief summary of the results already obtained in the use of coasting clocks, by H. A. Johnson, superintendent of shops and equipment. Following Mr. Johnson's talk, A. H. Daus, assistant superintendent of shops and equipment, replied to the inquiry: "Could not the heat generated in motor-starting resistance be utilized for heating motor cars?" This gave rise to a brief discussion, from which it appeared that the question deserved further study.

LETTER TO THE EDITOR

Captain Gonzenbach Favors Light Cars

SOMEWHERE IN FRANCE, Dec. 15, 1917.

TO THE EDITORS:

Way over here in France I have come across copies of the ELECTRIC RAILWAY JOURNAL. I found them in the tent of one of our officers. The contents are interesting reading to me, and strange, too. It looks as if the electric railway industry in the States is hitching up its trousers and rolling up its sleeves for a new grip on itself. It seems mighty good to see "the paper" full of arguments for light cars, one-man operation and re-engineering, to one who has for years argued these points till he was blue in the face.

Some of the same engineers who are now strong for all these things did not hesitate a few years ago to brand any one a "crank" who dared to prefer the dinky light cars of our early years to the young Pullmans we so fondly and blithely ordered from the always obliging car builders; and I would mention some boards of directors who smiled tolerantly when some non-conformist manager or engineer impudently suggested dumping the juggernauts on the scrap heap and starting all over again. That would have required lots of new capital, and still does, but I suspect that the money could more easily have been raised a few years ago than under present conditions of the money market, and particularly the public-utility market. Ho-hum, the world do move!

I am sitting in a tent and can hear the guns exchanging hate as I write.

ERNEST GONZENBACH,
Captain, E. O. R. C.

Some Efforts in the Line of Conservation

Coal Shortage Is Stimulating Service Economies—Reports from Several Sections of the Country Are Given

THE conservation movement is gaining headway as indicated by the activities of railway managers in all parts of the country. A few of the most significant occurrences of the past few days are summarized below:

FUEL ECONOMY COMMITTEE APPOINTED IN INDIANA

Evans Woollen, federal fuel administrator for the State of Indiana, has appointed C. L. Henry, president Indianapolis & Cincinnati Traction Company; Robert I. Todd, president Terre Haute, Indianapolis & Eastern Traction Company; S. W. Greenland, general manager Fort Wayne & Northern Indiana Traction Company; C. N. Wilcoxon, president Chicago, Lake Shore & South Bend Railway, and F. J. Haas, general manager Evansville Public Utilities Company, as a committee on fuel economy by electric railways.

This committee held a meeting with Mr. Woollen on Dec. 28 to discuss ways and means of effecting fuel economy within the State. At a later meeting Mr. Henry was appointed chairman, and H. H. Lloyd, Terre Haute, Indianapolis & Eastern Traction Company, was named as secretary. Suggestions were made to the fuel administrator as to several questions which should be considered in fuel economy, such as the adoption of the skip stop, the elimination of all cars and trains unnecessary for public convenience, economy in the heating and lighting of cars and stations; the shutting down of the smaller, uneconomically operated power stations, current to be supplied from the larger generating stations.

OHIO INTERURBAN RAILWAYS ARE SUSPENDING "LIMITED" SERVICE

Interurban railways entering Cleveland, Ohio, are preparing to reduce passenger service by the suspension of as many limited cars as possible. It has been predicted that this will take place on all railways in the State, as the government has requested curtailment of service as a means of conserving coal. Limited cars are classed as luxuries and the government authorities expect traveling to be done on the local cars. Limited cars between Cleveland and Wooster on the Cleveland, Southwestern & Columbus were taken off on Dec. 28. The service between Cleveland and Bucyrus will not be changed for the present. On Jan. 1 all but two limited cars were taken off the Cleveland, Painesville & Eastern, five cars being taken out of service.

Several limited cars have been taken off the Lake Shore Electric also, but the important through service to Toledo and Detroit will be continued.

ECONOMIES AT ST. LOUIS AND EAST ST. LOUIS

In response to requests received by the United Railways asking that conservation measures be enforced President McCulloch stated as follows: "We are making every effort to comply with the request of the government but are not able to save much coal at present. We are trying to eliminate waste by keeping the boilers in the power houses perfectly clean, etc. The supply of coal used in the cars has not been cut down. We are also trying to refrain from buying any but necessary supplies. This part of the conservation program has been easier for us to follow and already we have made a noticeable difference in the amount of material shipped to us."

Last week D. E. Parsons, general manager East St. Louis & Suburban Railway, announced that cars would be taken off some lines and the heating of the cars would be reduced. Service will probably be reduced on the State Street and Cleveland Avenue lines. Stockyards cars will not be run over the Eads Bridge to St. Louis and the lone car of the Jones' Park line will no longer be operated. The Stockyards cars will be run to Third Street and Broadway. Transfers will be issued good on cars going over the river.

I. T. S. CONSIDERING INCREASED HEADWAY

The Illinois Traction System may annul certain trains on a number of divisions of the road. A two-hour headway at certain hours of the day instead of hourly service is under consideration. Some of the early morning cars could also be dispensed with as they are poorly patronized, especially in certain seasons of the year.

The Chicago (Ill.) Surface Lines service flag contains 542 stars. It was hung out of the window of President Busby's office on Christmas day for the first time.

CONSTRUCTION, MAINTENANCE AND EQUIPMENT

Engineers, Master Mechanics and Others Who Have Developed Economical Practices, or Who Have Worth-While Ideas Are Invited to Tell Readers of the Journal About Them in This Department

Dispatching Trucks and Work Trains

New York State Railways Have Developed a Simple but Effective Plan for Increasing Useful Mileage

BY C. L. CADLE
Chief Engineer New York State Railways, Rochester Lines

THE same principles that are effective and necessary in train and power load dispatching can be applied also to the assignment of duty to truck and work train crews. The way in which this work is handled by the New York State Railways, Rochester lines, is as follows:

The writer is responsible for the proper utilization of all repair trucks and work trains on the Rochester lines, and deputizes to a special telephone operator the authority necessary for the dispatching work in detail. This operator does not devote all of his time to dispatching, but he makes this his first duty and familiarizes himself with the whereabouts of all transporting equipment for which he is responsible. The dispatcher's task is to see that supplies are delivered when and where needed, that freight is promptly removed from railroad stations or delivered thereto, that rubbish is removed from streets at the proper time, etc. This involves a general knowledge of the requirements of all departments having materials to be moved.

Each day the dispatcher gets from the roadmaster and the paving foreman lists of materials which will be needed, and where and when these are to be placed. The purchasing department furnishes him with the facts regarding freight at the railroad stations. The building department also specifies its requirements. With all of this information before him the dispatcher makes out a program for the day. He notifies each crew where it is to begin work and from what point he shall be called for further instructions. Each evening provision is made for moving work gangs to new jobs so that they will know where to report in the morning.

The company has four line trucks assigned regularly to cover respectively four sections of the city. These are used for routine repair work and are called upon to cover all emergency conditions, such as "trolley wires down," "cars off the track," "vehicles blocking traffic," etc. In addition, there are four service trucks engaged in the other duties mentioned above. All of these come under the dispatcher's authority, as well as two or three, and sometimes four, work trains.

For emergency operation the line trucks are called through the telephones which the company has placed at a number of important points, and we also take advantage of the friendliness of the public. When a truck goes out in the morning the crew advises the dispatcher of its prospective location. As soon as it arrives there, if there is not a company telephone in reach, the driver arranges with the proprietor of a near-by store to call him to the telephone in case the dispatcher wants him. Seldom is a merchant unwilling to accommodate us in this respect. The driver notifies the dispatcher of the merchant's telephone number. In an emergency the latter calls two trucks at once by means of those numbers, or on the company's telephones, the first one answering being sent to the seat of trouble and the other being told to continue working.

NEW YORK STATE RAILWAYS
DAILY REPORT OF MOTOR TRUCK OPERATION

REMARKS	TRUCK NO.	FROM	TO	TIME CALL REC'D	TIME GETTING TRUCK	TEL. NO.	REMARKS	TRUCK NO.	FROM	TO	TIME	REMARKS	TRUCK NO.

PART OF FORM USED IN RECORDING TRUCK AND WORK TRAIN MOVEMENTS. ACTUAL SIZE OF SHEET, 31 IN. WIDE, 12 IN. LONG. REPRODUCTION IS ABOUT TWO-FIFTHS SIZE

All movements of trucks and trains are recorded on a large form which is constantly spread before the dispatcher. A part of this is reproduced herewith. Thus a complete record is made almost automatically, which in itself is an important part of the scheme. This record furnishes a commentary upon the autographic mileage records made by the trucks and also furnishes data for settling disputes as to performance.

Experience at Rochester with the central control scheme has shown that it is quite possible to secure cooperation once its advantages are understood. Tact and patience are virtues required by the dispatcher, but it is easy to convince the men that their interests are being safeguarded rather than their rights invaded by the plan. The dispatcher is especially effective in sending trucks to the spot for emergency repairs, for he knows where all of them are at any moment and, in a pinch, can send to any point the first truck which he can reach regardless of its natural district boundaries.

Asphalt Plant Used Also for Car Sand Drying to Gain All-Year Use

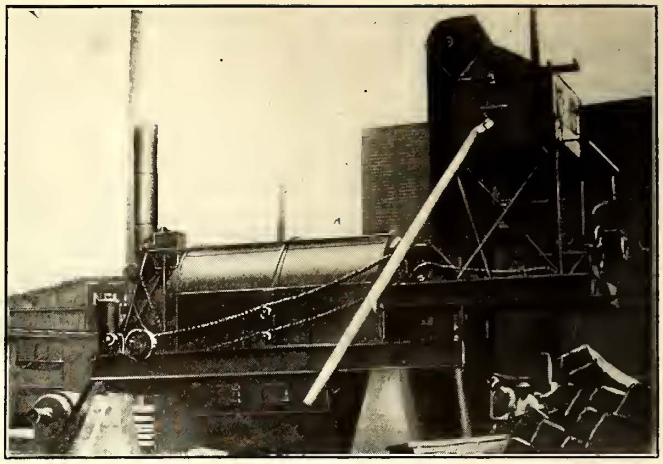
Installation of Asphalt Mixer Saves Considerable Expense on Both Asphalt and Sand Handling—Labor Saved Will Pay for Plant the First Year

By A. E. Harvey
Superintendent of Way and Structures Kansas City (Mo.) Railways

BY working out a scheme for utilizing an asphalt mixer plant as a car sand dryer during the winter months and in non-construction periods in the summer, and thus keeping the investment working profitably practically all the year, we have been able to justify the expenditure for installing a Hetherington & Berner asphalt plant in our Southwest Boulevard material yard. An arrangement of the plant to allow the use of hoisting machines already in service in the storage yard in conjunction with the plant has also contributed materially to producing such savings in the provision of both sand and asphalt as practically to pay for the plant the first year. Our average requirements are about 5000 sq. yd. of asphalt per month during the summer, and 20,000 cu. yd. of sand per year for use in the cars. Where twenty-five men were formerly required to prepare our asphalt when panning it by hand we are now able to handle this work with five men. A noticeable labor saving in connection with the sand drying has also been realized, since we formerly dried the sand in stoves at the division carhouses, and some of it in the asphalt pans at the storage yard.

A compact arrangement of asphalt plant, derrick and sand bins has made it possible to run all materials through the asphalt plant without handling any of them by hand, except for the rolling of the asphalt cans up over the heating kettles. These kettles, as well as the revolving cylinders in which the sand and grit for mixture with the asphalt are heated, are fired with oil sprayed through the burners by means of steam from a small boiler. The entire plant is motor-driven. After being properly heated in the kettles, the asphalt is pumped out of these receptacles up into a receiving bucket hung on a monorail, which extends over the mixer. A motor-driven centrifugal pump is used for this purpose and the asphalt is constantly circulated through steam-jacketed piping and a by-pass valve at the outlet to the bucket, so that it will not become congealed. The sand and grit for the mix is taken from a pile at the rear of the machine and carried by means of a bucket conveyor up into the revolving cylinders concealed under the large drum hood seen in the picture. After being heated sufficiently here the sand is elevated from the dump from these cylinders by means of another bucket conveyor up into the screen chamber, where it is separated into two sizes and discharged into the sand hoppers beneath. From these it is drawn by gravity into the mixer in measured quantities, while the asphalt is poured into the mixer simultaneously from the bucket on the monorail seen at the front of the plant. After suitable mixing the paving material is discharged by gravity into wagons below.

When using the plant as a sand dryer for car use, the sand passes through the plant in the same manner as in preparing paving material except that it is discharged from the sand bunkers by gravity into sand bins conveniently located, instead of into the mixer. All sand for both purposes is unloaded from the cars in which it is brought to the yard by means of a grab bucket and motor-driven stiff-leg derrick adjacent to the plant. This derrick is also used for various other purposes in the yard, so that it is kept in service a large part of the time. The capacity of the asphalt plant when drying sand for use in the cars is about 100 cu. yd. a day. This amount is in excess of the needs of the railway, so that an accumulation of sand is readily obtained, making it possible to utilize the plant for the purpose for which it was originally designed without causing a shortage of sand for car use. The storage bins are so located that the sand may be handled entirely by mechanical means from the cars in which it arrives at the yard, through the plant, and from the storage bins into the work cars for distribution to the various division carhouses.

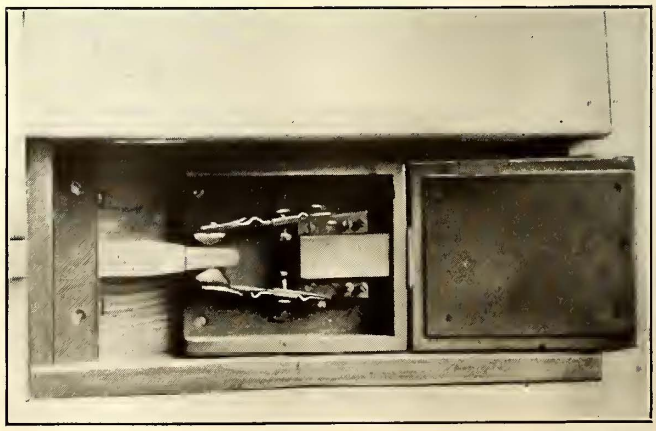


KANSAS CITY RAILWAYS ASPHALT MIXING AND SAND DRYING PLANT

The asphalt plant, without the derrick, which was already a part of the yard equipment, was installed in the yard on concrete piers at a cost of approximately $10,000. The saving in labor the first year will practically pay for the plant.

Electrical Interlock for Use with Folding Car Steps

A NUMBER of cars of the International Railway in Buffalo, N. Y., have been fitted with a home-made electrical interlock like that shown in the accompanying photograph. It consists of a pair of standard



ELECTRICAL INTERLOCK FOR USE WITH FOLDING STEP

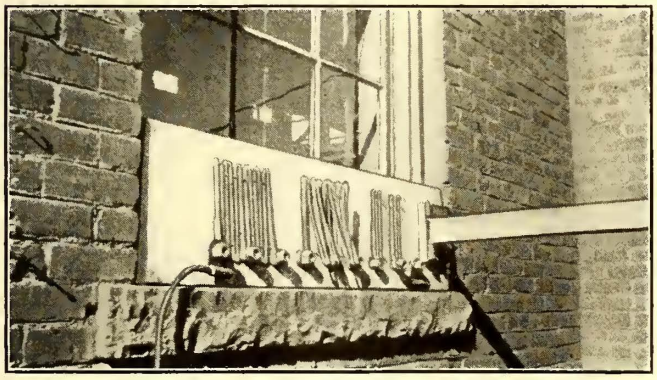
controller fingers supported on brass blocks which in turn are mounted on a block of wood. The brass blocks form the terminals of a loop from the resistor circuit of the control system. Brass stops are mounted as shown to permit adjustment of the spring tension by means of the set screws. The contact fingers are bridged by means of a brass, wedge-shaped contact block mounted on the end of a wooden rod which is retracted whenever the step is down.

The contactor is inclosed in a wooden box, 8 in. long and 7 in. wide, lined with asbestos board. This is surrounded by another box 20 in. long, 9½ in. wide, 5½ in. deep, with cover, in one end of which is the guide for the step rod.

Reclaiming Warped Resistance Grids

By W. H. McAloney
Superintendent of Rolling Stock Denver (Col.) Tramway

MANY resistance grids which are broken or badly warped can be reclaimed to make savings which represent quite a considerable proportion of the cost of new grids. On our system the broken grids are reclaimed by welding, which is a rather simple process. We have also devised a scheme for reclaiming warped grids by heating them with current and holding them in proper position while they cool.



SCHEME FOR HOLDING GRIDS IN SHAPE WHILE COOLING

The rig fixed up for doing this work is shown in the accompanying illustration. A piece of ½-in. transite board, 13 in. wide and 48 in. long, reinforced on the back with a ¼-in. iron plate, is equipped with ¾-in. bolts properly spaced so that three grids can be bolted on the board at one time. The proper spacing between adjacent segments of the grids is maintained by inserting No. 8-32 machine screws as spacers. These project through the transite and into a ½-in. fiber strip on the back, which is used in order to make the threads hold.

An arm made of ½-in. x 3-in. transite, 36 in. long, is hinged at one end of the board and clamped down at the other, thereby holding the grids firmly against the board. Electrical connection is made by means of copper connecting strips on the back of the board. A current of about 250 amp. is maintained for approximately thirty seconds through the three grids in series. This brings the grids to a red heat, and as they are held firmly in position while they cool off they remain permanently in a plane.

In the illustration, the middle grid is warped, typical of the condition before reclaiming, while the one at the left shows the result of this reclaiming process. The cost of doing this work, including energy and labor, amounts to only 3 or 4 cents, as against a present net cost of 14 cents to 28 cents for a new grid, depending on the size.

Developments in Electrical Apparatus During 1917

Development Work Has Suffered Owing to Congestion of Orders for Standard Apparatus

THE Westinghouse Electric & Manufacturing Company has prepared a comprehensive review of the manufacturing and engineering situation in this field during the last year. From this review the following paragraphs have been abstracted.

Power Generation and Distribution

The demand for underfeed stokers has been greater than was anticipated, most of the stokers for new plants being for use with relatively large boiler units. The 1200-hp. to 1400-hp. sizes are popular. In a plant at Windsor, W. Va., which will be described in a later issue of the Electric Railway Journal, stokers of this type have been installed to evaporate 100,000 lb. of water each per hour from 100 deg. feed-water temperature to steam at 250 lb. gage pressure, superheated to 250 deg. For two hours these stokers can cause an evaporation of 120,000 lb. per hour. The company finds a demand for the Roney stokers which is still ahead of available production. Most of these, however, are for small industrial plants.

In generating equipment the most notable feature has been the increasing use of hydroelectric power, stimulated by the high cost of coal. During the year the Montana Power Company has installed four 12,000-kva. vertical units at Holter, Mont., very largely to supply power for the Chicago, Milwaukee & St. Paul electrification. The high cost of materials, labor, etc., has also stimulated the use of synchronous condensers for power factor correction and voltage regulation. This it has done because the installation of such apparatus saves an increase in transmission line copper, or allows additional load to be taken on a given line.

The outstanding feature of the switchboard business has been the continued purchase of switch gear of great initial and ultimate capacity. A number of 150,000-volt outdoor oil circuit breakers of rupturing capacity far in advance of anything heretofore within the limits of high-voltage breakers have been completed. These breakers have round instead of elliptical tanks, domed instead of almost flat tops, and are of rolled steel construction.

Among other developments worthy of mention are the frame-mounted, indoor and outdoor high-powered steel tub 73,000-volt breaker, the combination 37,500-volt and 132,000-volt outdoor single-pole disconnecting switches and choke coils all on a common base, and the 66,000-volt post-type bus supports and disconnecting switches. There has also been developed a very compact drum type of circuit breaker controller. A number of outdoor switch houses have been installed to control circuits up to 6600 and 11,000 volts, a considerable increase in voltage over previous practice. The Westinghouse Company has also developed a control equipment for automatic rotary converter substations.

For the protection of apparatus on railway cars further developments have been made in the use of condensers by surrounding them with molded insulating cases impervious to moisture. The capacity has been increased to 1 microfarad in all forms of arresters (for pole mounting as well as car mounting) giving a static discharge capacity said to be sufficient to take care of the worst conditions found in practice.

During the year the company has added to its line of motors a new type, No. 577, having a rating of 200 hp. at 600 volts. This motor is especially suited for heavy subway service and is a striking contrast to the "Wee" motor. The H.S. and H.S.D. types of control have been combined into a one-piece outfit for economy of space and simplicity of wiring and mounting.

Regeneration has been extended to ordinary interurban applications, especially in locomotive service, and it is expected that this development will rapidly expand.

Steam Railroad Electrification

The past year has seen considerable detail development and improvement in apparatus pertaining to electrification of steam railroads. The company has developed a very powerful split-phase locomotive which weighs 250 tons complete, has a horsepower capacity of 4800 and a maximum tractive effort of 130,000 lb., all concentrated in one single cab unit. The locomotive contains a synchronous phase converter by means of which 100 per cent power factor can be obtained. This eliminates some of the line losses encountered with the induction type of phase converters.

The high-voltage direct-current system has also received attention and a high-powered passenger locomotive was designed. This will be rated at 4000 hp. and the starting tractive effort will be 112,000 lb. The total weight will be 266 tons. This engine will also be a single cab unit.

Cooling Water for Power Plant Purposes*

New Type of Adjustable Spray Head—Nozzles Should Be Kept as Low as Possible—Efficiency Increases with Increase in Pressure and Decrease in Capacity

EXPERIMENTS to ascertain the conditions governing the cooling of water by means of spray ponds, involving the efficiency of the cooling process under varying conditions of pressure at the spray nozzles, temperature of water to be cooled, power applied to the pump, and height of sprays above the pond, have been conducted by the department of engineering of The Johns Hopkins University. The pond used was 35 ft. in diameter and 4 ft. deep and the water was ordinarily sprayed through one spray head, or nozzle. A motor-driven centrifugal pump with 4-in. suction and discharge was used to send the water through the condenser tube to the spray head. The pressure of the spray head was in all cases measured by means of a mercury column connected to the entrance of the spraying device. Wind velocity was measured on a standard anemometer and the humidity by means of a wet-and-dry-bulb sling psychrometer. The amount of water circulated was measured over a 10-in. weir, fitted with a micrometer hook gage. About 600 tests were made.

The adjustable spray head used in most of the tests consisted of a cast-iron supporting base containing the water-entry opening, and carrying a 3¼-in. outside diameter bronze tube in which was cut a spiral opening of coarse pitch. This opening was cut with a tool placed at an angle of about 60 deg., with the axis of the tube so that the water was thrown up at this angle. The spiral tube was held between the base and a cap which fitted the top by means of a central bronze stem. This passed down to a close clearance bushing in the base. The stem was movable and operated through a bell-crank and an extended vertical arm, giving accurate control of the position of the stem. The result of the motion was to either increase or decrease the fineness of the film of water as it left the spray head. When the head was in operation, the water was discharged in a continuous sheet in a direction which inclined upward, due to the angle of the spiral opening. As the water film spread, it became thinner on account of its increase in diameter until a point was reached where the surface tension was overcome, and the sheet of water broke into a uniformly fine spray, a mist or a large number of small drops, depending upon the size of opening to which the spray had been adjusted. This principle of spraying a liquid as a result of the spreading of a film of water until it breaks into mists, or spray, or fine drops, is particularly applicable to low-pressure work. The pressures used in the experiments described are relatively low, being in general from 5 in. to 8 in. of mercury.

It was desired to ascertain, among other things, the effect of placing a wire fly-screen cylinder about the spray head, and many of the tests were so made. Under some conditions this screen seemed to improve the efficiency, but in general it was not found to be necessary.

The efficiency of a cooling pond or tower may be expressed as a ratio between the cooling actually produced and that which would have resulted from cooling the water down to the dew-point or wet-bulb temperature. A perfect spray cooling device would be one capable of subdividing the water so that evaporation would take place at the dew-point and to an extent such as to lower the pressure of the remaining liquid spray to that temperature.

Experiments were made at three initial temperatures, namely, 98, 105 and 125 deg. Fahr., adjusting the spray head to suit the weather conditions. The results show that the efficiency increases with an increase in pressure, and with a decrease in capacity, and that the increase in efficiency is slightly less for temperatures of 105 and 125 deg. than for a temperature of 98 deg.

Tests made to obtain the efficiencies with water falling upon the bare cement bottom of the pond as compared with those resulting when the pond contained its normal amount of water were rather surprising in their results, showing efficiencies of from 15 to 20 per cent less for the former. If a bare pond would serve as well as one containing water, the construction of the pond could be cheapened since less weight would come upon the foundation and less material would be required for the pond as a whole.

The average evaporation may probably be taken at about 2¼ per cent. This will, of course, vary with

*Abstract of paper delivered before annual meeting of American Society of Mechanical Engineers, by Carl C. Thomas.

weather conditions, initial temperature of water, pressure at the nozzle, and humidity. A large number of tests made with water at high and low initial temperatures indicated that 2 to 2½ per cent per hour represents fairly well the average loss of water, but that it may be as low as one-half of 1 per cent and in windy weather as high as 10 per cent.

The power required to circulate the water was determined by experiments made on a 40-ft. x 60-ft. pond equipped with two sets of nozzles. One set consisted of forty-two non-adjustable, spiral-core nozzles and the other set of twelve adjustable spray heads. The power appears to be practically independent of the type of spraying device used. The cooling seems to be principally dependent upon the energy put into forcing the water through some suitable spraying device, and, given the requisite energy, a great variety of forms of nozzles would yield about equally good results. The adjustable spray head has many operating advantages, some of which are the ease with which the heads can be kept clean, and the possibility of regulation of the spray to suit weather conditions and to minimize loss of water in windy weather. Each head will handle from 150 to 250 gal. per minute, making the cost of piping small, and will take care of the condensing water for a 50 to 75-kw. plant.

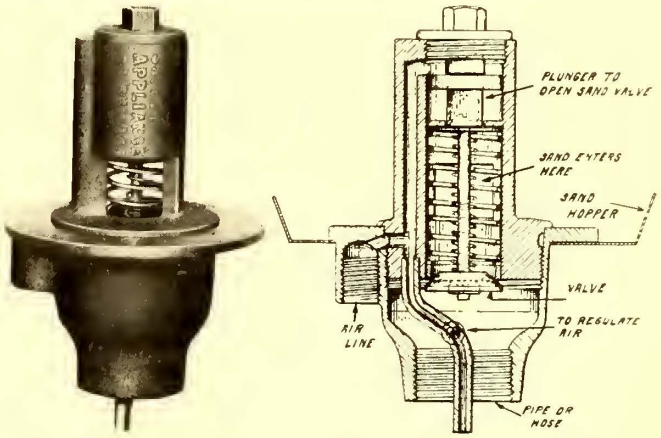
The height of spray nozzles above the surface of the pond has an important effect upon the cooling of the water. Experiments made in a small pond and in three larger installations have shown that the nozzles should be kept as low as possible. In the experimental pond heights from 8 ft. down to 3 ft. have been used and in larger ponds from 6 ft. down to 3 ft. A loss of several degrees results from placing the nozzle high above the pond due to the fact that a given pump placed in a certain relation to the surface of the pond will deliver a smaller amount of water to a high level than to a low level, and this smaller amount will leave the condenser at a higher temperature than would the larger amount of water. Also, with a given amount of power at the pump, less energy will be available for breaking up the water if the nozzle is placed high than if it is placed low, and it appears that minute subdivision of the water is more important than is a long path through the air.

With a given adjustable spray head, as the spiral opening is made wider the degree of atomization and resulting cooling are reduced. This is advantageous in that in windy weather very good cooling can be obtained when spraying a very large amount of water per nozzle and loss of water due to windage can thus be greatly reduced. Very good cooling effects are frequently obtained in very humid and even in rainy weather. Also the cooling effect seems to bear no direct relation to humidity, but to depend largely upon conduction of heat from the air, and it varies directly with the fineness of subdivision of the water particles.

The New York State Railways, Syracuse, N. Y., is rearranging the lighting on fifteen of its interurban cars, a row of ten 94-watt tungsten lamps being placed along the center line of the ceiling, seven lamps in the main compartment and three in the smoking compartment. The result is a very satisfactory distribution of light. On the platforms 23-watt Mazda lamps will be used in series with the gage lamps.

New Sander Designed to Prevent Causes of Stoppage

THE effect of atmospheric conditions upon track sand, one of the common causes of stoppage in sanders, has been overcome in the Reliance sander produced by Holden & White, Inc., Chicago, by placing a valve at the bottom of the sand chamber to prevent contact of the atmosphere with the sand. This sander is installed in the usual manner at the bottom of the sand hopper and is operated by the motorman with the ordinary sander valve. With this device, when air is admitted a small plunger is forced downward, opening a valve at the base of the sand chamber and allowing the sand to drop by gravity into the pipe leading to the track. Air is admitted simultaneously to the main pipe or hose, serving to force the sand to the track. As air pressure is not applied directly to the sand in the sand chamber, there is no tendency to produce a sand blast, and since contact with the air and atmosphere is prevented, the sand remains perfectly dry.



SANDER DESIGNED TO PREVENT EFFECT OF AIR IN CAUSING SAND TO CLOG

The Reliance sander is designed to deliver any amount of sand up to 22 lb. per minute, and it is claimed it will force the sand around bends in the pipe. Installations of the device have been made by the Chicago, North Shore & Milwaukee Railroad, the Michigan Railway, the Milwaukee Electric Railway & Light Company, the Chicago & West Towns and other railways, and from the experience of these roads it is understood that it has proved satisfactory in handling wet sand and that no trouble has been had from clogging. The sander is made of bronze and malleable iron, and weighs 2 lb. It is easy to install and can be used on a car where the sand hopper is not placed over the wheels.

Storage Rack for Wooden Car-Repair Parts

IN the shops of the New York State Railways, Syracuse, N. Y., a series of wall racks have been installed in the erecting shop for the storage of standard wooden pieces required in car repairs.

This procedure has resulted in great saving of time in making such repairs, as the foreman is able to determine at a glance whether a reasonable stock of each piece is on hand and thus keep the stock up to requirements. Proper labeling of the sections of the racks makes possible the selection of the proper piece for a given repair on any type of car by workmen who may

be unfamiliar with the details of the car construction. The racks are arranged for vertical storage of pieces to economize space and prevent warping.

Retaining a Record of Transfers

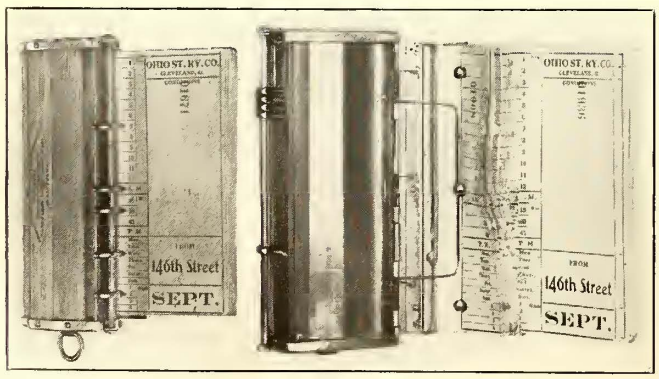
Adaptation of Cash Fare Receipt Box to Transfers Gives Very Simple and Inexpensive System of Checking Back—Large Part of Waste Eliminated

THE Macdonald Ticket & Ticket Box Company, Cleveland, Ohio, has brought out an adaptation of its well-known cash fare receipt box for use in issuing transfers on city lines. The arrangement consists of one of the standard holders in which the printed transfer slips are inserted and which is equipped with five movable pointers determining the hour, minute, day of the week, week of the month and whether issued in the morning or afternoon. On the printed transfer are included the name of the company at the top, a space in which special conditions of transfer may be printed, the name of the car line from which the transfer is issued and the name of the month. A serial number in red is also printed on each transfer.

In issuing transfers the conductor simply has to set the pointers and tear off the printed slip. This leaves a stub giving a duplicate record of the transfer issued, which is retained in the folder and turned in by trips at the end of the run. A slight pressure on the back of the holder draws the points of paper left under the pointers when a transfer is torn off, back into the holder, thus retaining the record and clearing the cutters for the next transfer. Since the hour pointer is moved but once an hour, the day-of-the-week pointer but once a day, and the week-of-the-month pointer but once a week, it leaves only the minute pointer as an active one which the conductor must watch.

It is claimed that this form of transfer prevents illegal transfer sale or "trading," since the time indicated on the audit stub retained in the holder must correspond to the running schedule time. In order either to sell or trade transfers, it is necessary to date the transfer issued in advance, and, of course, if the stubs or transfers issued were all in advance of the regular schedule time, it would give ample evidence of manipulation.

Another advantage claimed for the transfer is that all the information which the receiving conductor requires is to be found in a single line on the left edge of the paper. In view of the fact that the device has but one really active pointer, it is said that it may be



TRANSFER BOX AS IT APPEARS IN USE AND OPENED UP

SIMPLE OPERATION FOR CONDUCTOR TO ISSUE DUPLEX TRANSFERS

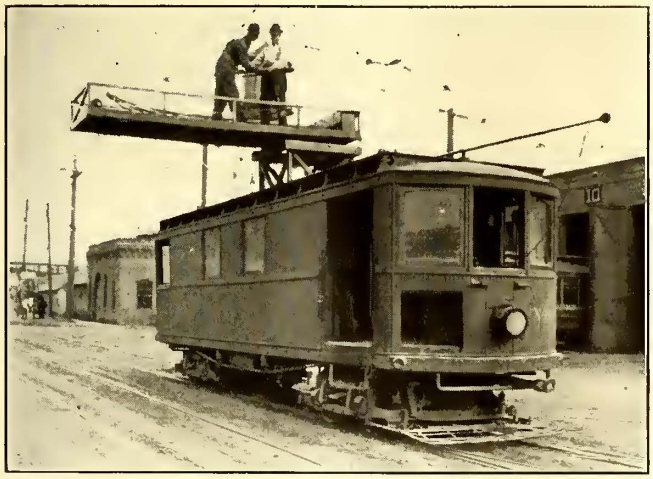
operated with a speed equal to a one-punch transfer. With transfers which have the date printed on, the wastage is naturally considerable on account of the impossibility of estimating closely the requirements of any particular day. Under this Macdonald scheme only the month is printed in, thus saving a large part of the wastage, since it is possible to estimate much more closely the requirements throughout a month than the daily consumption. This scheme also eliminates the loss where transfers have only the day of the month printed and the unused transfers are returned for use the corresponding date on the next month, thus involving a cost of filing and a loss due to passengers retaining their unused transfers for thirty, sixty or ninety days, or until such time as they can be used.

The principal value of this system of transfers, however, lies in the possibility it gives to the auditing department to check up on a suspected conductor's work at a cost only a small part of that involved in checking under ordinary systems. For example, under present conditions it is usually necessary to gather all the transfers collected and returned for the day. Then the opening and closing numbers for the particular conductor are noted and a search begins. Each transfer issued by this conductor must be segregated, and then filed in numerical order. Then those issued for each trip must again be segregated and the punch marks checked against the running schedule time. In an average city where the number of transfers turned in in a day is around 100,000, it is easily appreciated what magnitude there is to this task, which, of course, multiplies rapidly as the size of the city increases.

Under this record-retaining system of transfers, it is not necessary to segregate the passengers' portions of the transfers, as these are only a duplicate of the audit stubs returned after each trip by the conductors. Thus it is only necessary to collect together the turn-ins from the various trips of the conductor in question for each day to make a complete check. The simplicity of this work practically eliminates the excessive cost of segregation which has prevailed on most properties when it was desired to make a check on the misuse of transfers, thereby making it possible to conduct a much more thorough supervision of the daily income than is now practicable.

Spokane Line Car Has Air-Operated Tower

AN air-operated tower is the feature of the line car operated by the Washington Water Power Company, Spokane, Wash. The raising and lowering mechanism is actuated by an air cylinder, 10 in. in diameter and 7 ft. long, which receives its pressure directly from the air-brake system through control valves located in both ends of the car. The cylinder has by-pass ports to prevent the tower from being raised to too great a



WASHINGTON WATER POWER COMPANY'S LINE CAR WITH AIR-OPERATED TOWER

height. The air pressure will hold the tower with two men working on it for twenty minutes, but chains are used to take the weight off the cylinder if a longer job is to be done.

The working platform of the tower is 14 ft. x 4 ft., and is mounted on roller bearings so that it can be swung around by one man. The roof of the car is decked over with ½-in. planks to form an additional platform so that the crew can work from any point on the car.

More Brains Needed in the Boiler Room

IN response to a request from the Bureau of Mines to a number of prominent fuel engineers for suggestions on coal conservation, Martin A. Rooney of Detroit, Mich., said among other things:

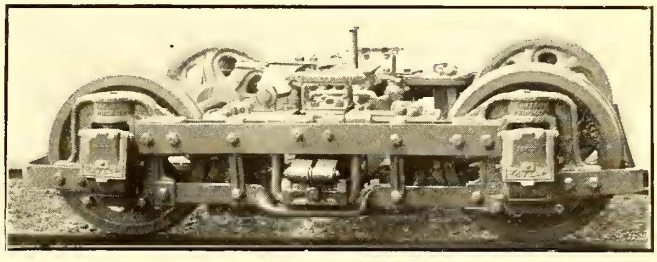
"At best one-fifth of all of our coal is wasted, and it is shamelessly and needlessly wasted. Instruments and machinery for getting out all the heat that there is in the coal are not nearly so complicated or expensive as the cash register used to keep tab on cash receipts in a store, or as the motor truck. Carbon dioxide, temperature and draft are subjects easier to comprehend than bank discount or freight rates.

"The time is coming when the government is going to limit the supply of coal, and fuel will be denied to those who cannot show that it is going to be used efficiently. Let the government show the patriotic coal user how to conserve this most important material. Let us send into our furnace and boiler rooms men who can show our engineers and firemen how to burn their fuel with the least waste, as we have sent them among our fields and orchards to show the farmer how to increase the productivity of the soil."

New Reduced-Height Truck for Low Level Cars

TO meet the growing demand for a truck suitable to be used with the latest types of extremely low level cars, either center- or end-entrance. the Taylor Electric Truck Company, Troy, N. Y., is building a new lightweight truck which has several features especially to commend it for such service. The new truck, called the Taylor R. H. (reduced height) truck, is built along lines similar to the company's L. B. truck and is designed to receive the inside-hung so-called "Baby" or "Wee" motors. Although no part of the truck is closer to the ground than any part of the L. B.-type truck, the height of the center plate has been reduced about 6 in., making possible a very low step from the pavement to the floor of the entrance well. The compact arrangement of all the parts affords ample clearance between the top of the rails or pavement and the lowest part of the truck so that the car will not be stalled by obstructions in the street. This feature, of course, is important in operation in congested districts and especially during the snow season. Safety for high-speed service is obtained by the use of a twisted bottom bar which prevents any portion of the swing bale link or bolster from dropping in case of fracture.

The pedestal is of a new type to receive the same size journal spring over the journal box as that used on the L. B. truck. This spring is designed entirely to absorb the shock due to pounding on rail joints and special work, and thereby to eliminate the objections to the arch-bar type of truck which has only spiral springs for the riding of the car body. By the use of the Taylor continuous one-piece bale hanger the end surging or shucking motion of the truck, which is produced by the sudden stopping or starting of the car, is largely overcome. The bale hanger is supported on U-shaped



VIEW OF NEW REDUCED-HEIGHT TRUCK

hangers placed between the side bars of the main frame of the truck, and full elliptic springs used for the riding of the car produce the same riding qualities as the S. B. and L. B. types.

Special attention has been given to designing the brakes. The live and dead brake levers and brake hangers have ample clearances and are made without offsets to give a straight-line action and thus eliminate the twisting strains when the brakes are applied. The brake is released by adjustable flat brake release springs and the shoes are fitted to wear even with the periphery of the wheel.

This truck is equipped with a Taylor wrought steel bolster, self-lubricating center plates, adjustable side bearings and renewable wearing shims on the pedestals.

Recent Happenings in Great Britain

Scarcity of Materials and Labor Leads Board of Trade to Appoint a Committee to Deal With Shortages—Government Tramway Direction Likely

(*From Our Regular Correspondent*)

It is officially announced that, in view of the difficulty of meeting the demands for various materials and for labor required for the maintenance and renewal of the permanent way and rolling stock of the tramway undertakings in Great Britain, the Board of Trade is appointing a committee to consider the needs of these undertakings, so that the necessary steps may be taken to supply, as far as possible, such needs, even at some temporary sacrifice by less essential undertakings.

How Members Will Be Appointed.—The Municipal Tramways Association and the Tramways & Light Railways Association have been invited to nominate members of the committee, and the board has asked the London County Council to allow A. L. C. Fell, the manager of the Council tramways, to serve on it. This request has been granted. James Devonshire has been invited to be chairman of the committee. The London County Council, however, has announced its disapproval of that appointment. It considers the selection of an interested chairman to be unfortunate. It is also understood that J. B. Hamilton, general manager of the Leeds tramways, will serve on the committee. He will probably abandon the Admiralty work with which he has been connected for the last year or two. J. M. McElroy, general manager of the Manchester Tramways, will also serve on the board. He will probably have to abandon the other Government work in which he has been engaged for some time.

Severe Shortage of Material.—The principal difficulty in the way of the maintenance of efficient tramway facilities throughout the country is the lack of material for repairs and renewal. A general rearrangement and redistribution of rolling stock and other plant has become necessary in order to maintain adequate traveling facilities in areas and districts where large numbers of people are engaged on work of national importance in connection with the war.

Government Direction Likely.—The matter has been under the consideration of the Board of Trade and the Ministry of Munitions, and these Government departments have consulted representatives of the various tramway organizations. The result of the deliberations is understood to be that the Government proposes to assume direction of all the tramways, which will be run, as the railways are now run, principally in the national interest. The pooling of resources will permit special facilities to be provided in selected districts. The actual working of the systems will be left in the hands of the present officials, but the board will have the power to order curtailment or rearrangement of services or redistribution of plant and appliances where required.

Cars and Materials to Be Concentrated.—It is understood that it will be the policy of the new board to concentrate available rolling stock and materials in the districts where the continuance of a frequent service of cars is essential. To do this it will probably be necessary to curtail the service on other routes to a considerable extent, even in districts where the volume of traffic at present may be both heavy and profitable. The expectation is that residential districts will suffer except in cases where they are served by the same cars that run to munition areas.

Adequate Power Supply Needed

The Lord Provost of Glasgow and W. W. Lackie, the general manager and engineer of the Corporation Electricity Department, have given evidence in London before the committee on electric power supplies of the Board of Trade. That committee was appointed to consider what steps should be taken to ensure an adequate and economical supply of electrical power for all classes of consumers in the United Kingdom, particularly industries which depend on a cheap supply of power for their development. Recently the Town Council agreed to authorize the witnesses to state that if it was ultimately determined to divide the country into areas for the purpose of generating electricity, and an area was created for Glasgow and the Clyde and places adjacent, the Corporation was prepared to become the generating authority for such area, provided the terms and conditions upon which it was required to do so would not be detrimental to the city and its existing electrical undertaking.

Additional War Bonus Awarded

The committee on production has awarded an additional war bonus of 4s. a week, payable at the rate of 8d. a day, to the drivers and conductors, male and female, of the London & Provincial Union of Licensed Vehicle Workers. The committee has also granted an advance of 4s. a week in the wages of all drivers and conductors and the inside staffs of the Metropolitan Electric Tramways, Ltd., the South Metropolitan Electric Tramways & Lighting Company, Ltd., and the London United Tramways, Ltd.

Croydon Goes Behind

The Croydon tramways and electricity undertakings, which in the past have relieved the rates considerably, show deficits of £1,633 and £1,690 respectively on last year's working. War allowances to tramway employees in the forces absorbed £5,824.

Need for Higher Fares

The London United Tramways has intimated to the districts through which its lines pass that it is going to apply to Parliament for an Act asking to be relieved from the restrictions imposed on the company with regard to fares, so that it can raise them, and also for power to abandon some portions of its lines in Middlesex and Surrey.

Transfer Changes Beneficial

The highways committee of the London County Council, reporting on fare changes and transfer facilities on the tramways, says that as a result of altered arrangements brought into operation early in October, facilities afforded to passengers in 1915 have been restored, but on a more extensive basis. The alteration has been effected with the primary object of recovering the necessary degree of control over the traffic. One important effect of the alteration has been a considerable reduction in the number of sections on the tickets. The committee adds that it is satisfactory to note that the alteration is having the effect of improving the carrying capacity of the tramways by acceleration of the service.

220 Women Drivers in Glasgow

More than sixteen municipal tramway undertakings throughout the country employ women drivers. Glasgow has 220 of them. The highways committee of the London County Council, which has collected the facts, is shortly to consider a proposal to use women on the front platform. Women conductors have been employed for some time. The new Board of Trade committee has been asked to consider the feasibility of using the trams for carrying parcels, as in Bradford, and, to some extent, Leeds, the Potteries, and other places, and perhaps even for the carriage of mail bags.

Advance Asked in Newcastle

At a meeting of the tramway committee of the Newcastle Corporation a deputation of tramway workers, headed by the president of the Newcastle branch of the Tramway & Vehicle Workers' Union, waited on the committee in respect of an application for an advance of 5s. a week for motormen and conductors; 2s. 6d. a week for women conductors and cleaners, and 2s. 6d. a week for lads of eighteen and under working as conductors. The application was referred to a sub-committee for consideration.

Many Other Pressing Problems.—The tramways committee is faced with many problems of importance at the present time. Pressure is continually being brought to bear upon the management for an increased service of cars for workmen, a great proportion of whom live far from their work. Another problem the management has to deal with is the difficulty of maintaining a regular service of cars in the winter time, when driving is always more difficult.

A. C. S.

News of the Electric Railways

TRAFFIC AND TRANSPORTATION

FINANCIAL AND CORPORATE · PERSONAL MENTION · CONSTRUCTION NEWS

Toledo Report Will Be Made to New Mayor

New Ordinance and Report in Type Awaiting Final Amendment and Signature of Mr. Doherty

The final report of the Street Railway Commission of Toledo, Ohio, will be made to Mayor Cornell Schreiber, successor of Charles M. Milroy. This was indicated by a note written to Mayor Milroy on Dec. 27, in which it was claimed that Henry L. Doherty had sought to reopen some of the features of the agreement which had been made between him and the commission. The note is as follows:

"The Toledo Street Railway Commission had hoped and expected to make a report to you, as Mayor, including an ordinance agreed upon by both parties after long negotiation with Henry L. Doherty.

"The agreement between Mr. Doherty and the commission was reached on Oct. 13, 1917, and the ordinance and a report addressed to you were ordered printed and were given to the printer at once.

"For weeks the ordinance and report have been in type awaiting Mr. Doherty's signature. Just recently Mr. Doherty has sought to reopen negotiations by objecting to some of the provisions to which he had already agreed.

"This has delayed our report and necessitates further postponement, and the making of a final report to your successor, who will have to deal with the street railway situation.

"The commission desires to thank you sincerely for your uniform courtesy and ready disposition to help in every way."

The members of the Toledo commission are: Johnson Thurston, president; E. P. Usher, Nat C. Wright and N. D. Cochran.

PERSONNEL OF ORIGINAL COMMISSION

Originally this commission, appointed soon after Mr. Milroy took his seat two years ago, was a committee, consisting of Carl Spitzer, James Thompson, Henry L. Doherty, Edward Usher, Johnson Thurston, N. D. Cochran, Nat C. Wright, R. C. Patterson and the Mayor himself. Mr. Cochran refused to sit with the committee as long as Mr. Doherty was a member, so Mr. Doherty withdrew. Then a sub-committee, consisting of Messrs. Cochran, Wright, Thurston and Usher, was named. When the sub-committee reported a community of interest plan, it was proposed that a street railway commission be established. Messrs. Spitzer, Thompson and Patterson thereupon resigned, leaving the sub-committee as the commission.

The Toledo *Times* contends that the members of the original committee and of the commission were named while Mayor Milroy was still a private citizen and that neither has a legal standing. If this is correct, it cannot bind the city to any action that may have been taken or may be taken in the future. This paper asks who is going to pay the expenses of the commission and what is proposed to be done about it.

MAYOR SCHREIBER WILL DECIDE

Since the whole matter now goes over to Cornell Schreiber, whose term began the first of the year, he will have the task of straightening out the muddle in which the street railway question and the community plan are involved. As city solicitor some years ago, Mr. Schreiber had considerable experience in street railway matters. What his attitude toward the community plan may be is not known, but his friends assert that he will take a reasonable and proper course in his efforts to secure a settlement.

MR. DOHERTY SEEKS REVISION

At a conference recently it seems that Henry L. Doherty asked for a revision of some of the technical features of the condemnation clause in the proposed community plan, and that the request was refused. Johnson Thurston is said to be responsible for the course matters took, and Mr. Doherty declared that unless he changes his attitude and his tactics there is little hope of a peaceful settlement.

Mr. Doherty has asked for a conference with the entire commission, which now consists of the four men named and Mayor Milroy.

Recently the Toledo *Times* reprinted from the New York *Sun* the article on the community plan to which reference is made on page 56 in this issue.

Eighty-two Miles of Rapid Transit Lines

The Year 1917 Represented the Largest Single Increase in New Rapid Transit Facilities in New York Since 1904, When First Subway Was Opened

Many of the new rapid transit lines of the dual rapid transit system in New York not yet in service will be placed in operation during 1918. It is believed that unless undue delays occur in the delivery of materials, it will be possible to have upwards of 85 per cent of the total track mileage of the new lines of the system in operation by Dec. 31, 1918. Most of the remaining lines will probably be ready for service by mid-summer of 1919 or shortly after. This forecast is based on the theory that contractors will be able to obtain the requisite materials and labor to complete the work approximately within estimated periods.

Contracts already awarded for city-owned lines of the dual system, including those completed, now aggregate more than $200,000,000, in addition to real estate purchases amounting to $15,000,000. Exclusive of their own purchases of real estate, the two operating companies, the Interborough Rapid Transit Company and the New York Municipal Railway Corporation, have entered into contracts or agreements for construction of company-owned lines and for equipment on both city-owned and company-owned lines, involving a total of almost $200,000,000 more.

The year 1916 represented the highest point in construction work under dual system contracts, both the number of contractors and the working forces engaged during 1917 being substantially less than in previous years. Numbers will continue to decrease in the future. Only five general construction contracts remain to be let, out of the approximately ninety such contracts for new lines in the dual system. Practically all will be let during the next six or eight months, together with most of the remaining station finish, track installation and minor contracts.

The year 1917 represented the largest single increase in new rapid transit facilities provided for the traveling public of New York in any one twelve-month since the opening of the first subway in 1904. The lines or portions of lines placed in service in 1917 and to be placed in service early in 1918 aggregate approximately 82 track-miles, added to the track mileage of other new lines of the dual system previously placed in service, a total is had of 174 track-miles out of the grand total of 345 track-miles of new lines in the dual system. It is estimated that by the end of 1918 more than 300 track-miles will be in operation, leaving about 40 track-miles to be completed and placed in service in 1919 or thereafter.

It is expected that during 1918 both the Lexington and Seventh Avenue

lines will be in operation, including all of the Jerome Avenue branch and a part of the Pelham Bay Park branch of the Lexington Avenue line; that the Eastern Parkway line in Brooklyn and the Nostrand Avenue line in the same borough will also be in service, with the Webster Avenue Extension of the Third Avenue elevated railroad and the 162nd Street extension of the Ninth Avenue elevated line. All of the above lines are for operation by the Interborough Rapid Transit Company. Of the lines for operation by the Brooklyn Rapid Transit subsidiary, the New York Consolidated Railroad, it is expected that the following will be placed in operation during 1918: The Broadway subway from Fourteenth Street to Forty-second Street for express service, and from Rector Street to Forty-second Street for local service, part of the Culver Rapid Transit Railroad, the remainder of the Jamaica Avenue line, the Montague Street Tunnel line, the Brighton Beach line connection, the East New York improvement and the Coney Island terminal.

City an Obstructionist

Dilatory Tactics of Buffalo City Council Prevent International Railway From Carrying Out Commission Recommendations

Unable to secure the co-operation of the municipal authorities, the International Railway, Buffalo, N. Y., has been prevented from making the improvements to its city lines which were recommended in the recent report of Charles R. Barnes, electric railway inspector for the Public Service Commission of the Second District. In consequence the daily newspapers have criticized the company's service severely, and the Buffalo *Times* has started an agitation for municipal ownership. Members of the City Council have pledged themselves to investigate the possibilities of taking over the railway properties within the city. The new Mayor was elected upon a platform of electric railway service reforms.

Aroused by the demands made by various commercial organizations which have allied themselves with the critics of the company, the Public Service Commission sent a communication to the City Council asking why action had not been taken on the requests of the railway for permission to lay additional tracks in the congested sections of the Main Street district. The company had previously filed applications with the City Council for permission to lay a single-track loop around the Soldiers' and Sailors' Monument in Lafayette Square so as to relieve the Washington Street congestion, and request was also made for permission to enlarge the safety zone in Shelton Square so as to allow three cars to be loaded at one time instead of two cars as under present conditions. The company also sought permission to construct a steel shelter house for the convenience of its passengers at Shelton Square. All of these applications have merely been "received and filed" by the municipal authorities.

In addition to hindering the company from making these necessary improvements to its service so as to facilitate the movement of traffic through congested centers, the municipal authorities did not co-operate with the company when it was making vigorous efforts to clear its tracks of snow after the severe snowstorm three weeks ago. This storm crippled the movement of cars on all lines, and when the city refused to aid the company in cleaning the streets, the company's tracks were blocked with vehicles which caused the bunching of cars.

When the Public Service Commission received the reply of the City Council regarding the delay in considering the requests of the railway, the commission announced a conference to be held in Buffalo between members of the City Council, officials of the International Railway and two members of the commission. On the day of the conference, none of the members of the City Council was present and the city was not represented. E. G. Connette, president of the railway, and Thomas Penney, vice-president and general counsel, attended and discussed the traffic problem with members of the commission.

Supplemental Report by the Commission

Charles R. Barnes, inspector of the commission, was instructed to make an additional survey of traffic conditions, and this supplemental report will be made to the commission at Albany. After the conference with members of the Public Service Commission, President Connette made a statement to the newspapers in regard to the inability to maintain service on most of its lines during the week following the snowstorm. He said that the cars became crippled faster than the shops could repair them. Car door mechanism became disarranged in a large number of cars, air pipe lines froze and motors became crippled. He also placed a large part of the blame upon the "track hog," and he urged the police department to arrest all vehicle drivers who intentionally block the tracks.

Some of the Work Under Way

Answering the criticism regarding the company's alleged inability to handle the employees of the large war plants in the Elmwood-Hertel section, President Connette called attention to the fact that the company had awarded contracts for the erection of a modern passenger loading terminal on property adjoining the plant of the Pierce-Arrow Motor Car Corporation in Elmwood Avenue. The blizzard and heavy fall of snow delayed building operations on the foundation and track work, but Mr. Connette said that work was now progressing rapidly. He also pointed out that the company was working almost night and day trying to complete the North Elmwood Avenue double-track extension to the plants of the Curtiss Aeroplane Company, and other large war industries in this rapidly growing section. It is expected that this line will be completed and placed in operation within the next thirty days.

The Lafayette Square loop which the International Railway seeks to construct would probably halve the Washington Street congestion. The Broadway and probably the Sycamore Street lines, two of the heaviest patronized arteries to the east side, would make this loop and avoid the downtown congestion. The enlarged safety zone in Shelton Square would permit the loading of twice the present number of cars at one time at this point. The Niagara and the Grant Street lines make this loop their downtown terminus. It is also proposed to cut the long cross-town lines in two. The west side lines which continue out toward the east side city line pass through a congested section, and delays in this section caused the bunching of cars along the entire route. It is also proposed to reroute other lines so as to make quicker time between downtown outlying districts.

In replying to criticism of the company E. J. Dickson, vice-president, in a public statement placed full responsibility for delays and bunching of cars during the storm on Dec. 9 and 10 upon the track hog. Mr. Dickson said:

"During the storm thirty-two cars at one station were put out of commission by air pipes freezing. Because of the extraordinary exertion of the motors of the snow-fighting equipment these machines must have constant attention at the carhouses. A large proportion of the men at work in the shops and carhouses are diverted from passenger car maintenance to snow equipment maintenance. Also during the storm the mechanism of passenger cars develop defects which ordinarily would not occur. The operating mechanism of steps and doors is damaged, leads and contacts are broken and frequently air brakes are rendered inoperative because of the collection of snow and ice."

The statement also called attention to the fact that seventy-five men employed at one carhouse quit work when the storm started and that the company experienced the same shortage of help as other industries in western New York.

In replying to the criticism against lack of equipment, Mr. Dickson called attention to the fact that the company was unable to get delivery on 50 per cent of its new cars, orders for which were placed a year ago. The company has also placed orders for additional snow-fighting equipment which has not yet been received. Flat cars have been equipped with steel plows to aid in keeping the lines clear of snow.

Philadelphia Lease Measure Passed

Proposed Contract for Operation of New High-Speed Lines by the Philadelphia Rapid Transit Passed by One Branch of Councils

The Common Council of Philadelphia, Pa., on Dec. 31, by a vote of sixty-three to eight, passed the measure providing for the lease of the new high-speed rapid transit lines to the Philadelphia Rapid Transit Company, after it had been amended. The bill was to be acted upon on Jan. 3 by Select Council, and indications were that it would pass that body with little opposition.

The only opposition voiced in the Common Council came from Councilman Meckert of the Twenty-third Ward and Councilman Conn of the Eighth Ward. Mr. Meckert opposed the passage of the bill because of war conditions, and Mr. Conn moved that the entire matter be postponed until an opinion could be obtained from Mr. Connelly, the city solicitor.

Mr. Conn said that the people should have the expert opinion of the city solicitor, in addition to the "various verbal opinions of the special counsel who has been retained by the Mayor."

Amendments Offered

After Clerk Felton had read the first section of the bill Mr. Gaffney, chairman of the finance committee, offered amendments which made the supervising board a body of three instead of two members, but eliminated previous requirements that they all be engineers. Under the provisions of the lease the city's representative will be the director of city transit. His salary will be fixed by Councils. The company's representative will be appointed by the Philadelphia Rapid Transit Company and his salary will be fixed and paid by the company. The third member, who will serve as chairman, will be chosen by the Mayor and the president of the Philadelphia Rapid Transit Company. The amendments make the board a "supervising board" instead of a "supervising board of engineers."

Passage of Measure Urged

In urging the passage of the measure Mr. Gaffney said:

"All the objections advanced by Mr. Conn and Mr. Meckert were threshed out thoroughly at the various committee meetings. The city solicitor has no objection to the passage of the lease. I see no reason why there should be any further delay. I think the lease should be approved right now. The question is not of abnormal or normal times. It is: Is this the best lease that can be obtained for the people? I tell you, with all the candor I possess, that you couldn't find better servants for the people than Doctor Lewis, adviser to the Mayor, and Director of City Transit Twining have been. If the matter is postponed the lease will simply be thrown back into the political field to be kicked about by both factions."

The chamber then voted down Mr. Conn's motion for postponement and the final vote was taken.

Mr. Lamberton, who had come to be regarded as the leader of the opposition, made a speech in favor of the arrangement.

St. Louis Sleeping

Writer Points Out Wherein City Has Failed to Make Most Out of Opportunities as an Interurban Center

An article by Hugh L. Wood on the front page of the St. Louis *Republic* for Dec. 29 calls attention to the need of St. Louis encouraging the building and extension of electric railway transportation from Illinois, Indiana, Kentucky, Ohio, and even Wisconsin and Michigan into that city. The article urges the building of an immense union passenger and freight station on Gratiot Street, between Twelfth and Fourteenth Streets. This property is now vacant, but Mr. Wood sees no obstacle to its purchase by the city and lease under favorable terms for a long tenure to the several interurban lines using the station. He said the Free Bridge should be opened to passenger, express and freight service.

The Links That Are Needed

Mr. Wood urged the connecting of St. Louis by electric railway with Terre Haute, Indianapolis, Fort Wayne, Louisville, Cincinnati, Dayton, Columbus, Cleveland, Toledo, Detroit and other cities and towns. Three links would have to be built, all of them comparatively short. They are: A link between the Illinois Traction System at Ridge Farm, Ill., and the Terre Haute, Indianapolis & Eastern Traction Company at Paris, Ill.; a connection between the Illinois Traction System at Danville, Ill., and the Fort Wayne & Northern Indiana Traction Company and the Terre Haute, Indianapolis & Eastern Traction Company at LaFayette, Ind., and a connection between the Illinois Traction System at Danville, Ill., and the Terre Haute, Indianapolis & Eastern Traction Company and the Indianapolis & Northwestern Traction Company at Crawfordsville, Ind.

Fuel Board Takes a Hand

Becomes a Player in the Detroit Railway Game and Has the Call With a Strong Hand

The Federal Fuel Administration has taken a hand in the electric railway situation in Detroit, Mich. As a result of an order issued by the Wayne County fuel administration the Detroit United Railway on Dec. 23 re-established skip-stop and rerouting operation, which the City Council had ordered discontinued two weeks before as a reprisal measure because of higher fares. The fuel board over-rode the Council even though that body had adopted a resolution warning the fuel board to "keep its hands off" the car question. The fuel board declared that skip stops and rerouting were necessary to conserve coal. It was figured that by a return to their use from 50 to 75 tons a day would be saved.

Whereas formerly the Detroit United Railway had permission from the Council to operate skip stops on only eleven lines the fuel board order commands the company to extend this plan to every line in the city.

The action of the government is a move that the city hall politicians are unprepared to meet. The general public enthusiastically welcomed the return to skip stops and rerouting. Some of the Aldermen are considering further reprisals against the company. These may take the form of ordering the company to keep interurban, freight and construction cars off the city streets.

Illumination Decreased

The order by the fuel board to the company also requested that artificial illumination of the cars be reduced 50 per cent. This has also been done.

Sir Albert Quoted

The New York *Times* for Jan. 4 contained a cable dispatch from London by its correspondent, Charles H. Grasty, who interviewed Sir Albert Stanley, president of the British Board of Trade. Sir Albert was quoted as saying that he regarded it as very desirable for the government to take the coal mines in with the railroads and co-ordinate and work them together. It was possible to save much mileage by bringing the source of production and the point of consumption as near together as possible. Both the railroads and the coal mines were under the Board of Trade in England and co-ordination was simple. The interview will prove of particular interest to Americans in view of Mr. Stanley's long association with electric railways in this country.

Preliminary Subway Survey

Cleveland Council Will Be Asked for an Appropriation of $50,000

At a meeting of the Subway Commission of Cleveland, Ohio, on Dec. 28, it was decided to ask the Council for an appropriation of $50,000 to cover preliminary engineering, legal and other expenses while an investigation is being made. A preliminary survey will be made. City Engineer Hoffman and Bridge Engineer Richards will act in an advisory capacity until a permanent engineer can be selected. Former Appellate Judge Walter D. Meals and former Municipal Judge Pierre White will be asked to act as special legal advisers under the supervision of City Law Director FitzGerald.

W. R. Hopkins, president of the Cleveland Rapid Transit Railway; O. P. Van Sweringen of the Cleveland & Youngstown Railway, and other men who have been connected with subway enterprises, will be called into consultation with the commission and joint meetings with the City Planning Com-

mission will be held in order to insure co-ordination between the two bodies.

Attorney William T. Redmond has been selected as secretary of the commission at a salary of $3,000 a year.

U. S. Wants Men with Engineering Experience

The Army and Navy staff departments continue to demand men of engineering experience, especially in industrial lines. At present the outlook is that this demand will continue throughout the period of the war.

In calling attention to this, the United States Public Service Reserve, Washington, D. C., where records of men willing to serve when called will be kept on file, points out that a man of engineering experience has a rare combination of opportunities open to him which are not available to the average patriotic American, as follows:

1. To serve the country in his most effective capacity.
2. To keep in touch with his own profession, with the result that his patriotic service will not have caused him to become rusty by the time peace returns.
3. To become a commissioned officer and receive much better pay than the average man who has wholly subordinated personal interests and now works for the national good.
4. To perform his service usually without leaving the United States.

New City Officers' Plans

Mayor Hylan of New York and his incoming Board of Estimate have decided to ask the Legislature for sixteen specific laws, through which to fulfill the pre-election pledges made by the Democratic candidates. The program includes the following:

Legislation necessary to empower the city of New York to acquire and operate all public utilities.

The election of the Public Service Commission. The commission for the first district, which includes all of the greater city, to be composed of five commissioners, one chosen by the voters of each borough, thereby making that body responsive to the public.

Increase of the city's share of the new corporation franchise tax established by the Legislature in 1917 to 50 per cent instead of 25 per cent, as at present.

Bills to carry out these ideas probably will be introduced into the Legislature at once by Senators Robert F. Wagner and James A. Foley.

Subways for Tokio

Greater Tokio, according to the *Far Eastern Review*, Shanghai, will be surrounded with subway lines when the following plans are carried out: The Ikegami Electric Railway, capitalized at 400,000 yen, will connect Amori Station on the Railway Board Line to the Meguro terminus of the street car line, covering 7 miles. The 5-mile line between Kameido and Matsuemura, starting from the Kinshibori terminus of the city train line, will be completed at the end of June. Other proposed lines are one along the River Edo, between Matsuemura and Shinkawaguchi; the extension of the Oji Electric Railway line from Otsuka to Shinjuku via Zoshigaya; and a line from Shinjuku to Horinouchi via Nakauo.

Bus Injunction Hearing Adjourned

Argument on the application of Henry H. Klein, a taxpayer, for an order restraining the Mayor and the Board of Estimate & Apportionment of New York from holding a hearing upon the application of the Fifth Avenue Coach Company for an omnibus franchise, was adjourned by Justice Platzek of the Supreme Court until Jan. 4. The adjournment was asked for by counsel representing all parties.

News Notes

Daily Paper Describes Toledo Settlement Plan.—The community plan of ownership for the settlement of the Toledo franchise deadlock was described in the magazine section of the New York *Sunday Sun* for Dec. 23. It was a very interesting account of the negotiations, heightened in its value by quotations direct from H. L. Doherty, chairman of the board of the Toledo Railways & Light Company. The article was signed by Harry Esty Dounce. It was accompanied by a portrait of Mr. Doherty.

Representative of the Department of Labor at Toledo.—In reply to the appeal of the motormen and conductors of the Toledo Railways & Light Company, Toledo, Ohio, the Federal Department of Labor has sent A. L. Faulkner, special agent, to Toledo to investigate the claims of the men that they are unable to live on the wages they are receiving. Some time ago they made a demand upon the company for an increase, although their present contract does not expire until April, 1919. Henry L. Doherty, in a conference with their representatives, declared that the wage scale could not be increased unless the rate of fare was increased at the same time.

Arbitration Award Made in Wilmington.—The committee of citizens of Wilmington, N. C., which was formed as a board of arbitration to act upon the complaints of the men and the Tidewater Power Company, operating the local electric railway in Wilmington, has filed its report, which allows an increase of 1 cent an hour to the motormen and conductors. The men in Wilmington went on strike on July 4, 1916, and returned to work on July 12, that year, in accordance with the terms of an agreement reached through the efforts of a citizens' committee. Before returning to work, each man signed an agreement to abide by the conditions of the settlement. The strike was reviewed in the ELECTRIC RAILWAY JOURNAL for July 29, 1916, page 202.

Association Meeting Program

Northern White Cedar Association

The twenty-second annual meeting of the Northern White Cedar Association will be held at the Hotel Radisson, Minneapolis, Minn., on Jan. 22 and 23.

National Foreign Trade Council

James A. Farrell, chairman of the National Foreign Trade Council, has issued the formal call for the Fifth National Foreign Trade Convention to meet at the Gibson Hotel, Cincinnati, Ohio, on Feb. 7, 8 and 9, 1918. The theme of the convention will be "The Part of Foreign Trade in Winning the War."

Approximately one-half of the time of the convention will be given to the presentation of prepared papers and reports dealing with one or another of the numerous phases of this great convention theme. The remainder will be devoted to group sessions for the intensive discussion of single problems under the leadership of specially qualified experts.

CONSULS TO ATTEND

The Secretary of State will assign to the convention several Consuls General and Consuls from Europe, Latin America and the Far East, who are expected in the United States on leave at the time of the convention. These officials, several of whom have been in the consular service for many years, will be accessible to delegates for the purpose of personal conversation or for informal conference with groups of delegates.

In addition the Secretary of Commerce will assign to Cincinnati during the convention officials and experts of the Bureau of Foreign and Domestic Commerce, who will be available for individual consultation.

COLLECTION OF SAMPLES

Among the special features of the convention will be a large collection of samples assembled by the Bureau of Foreign and Domestic Commerce from all parts of the world, vividly showing the character of products marketed by other nations. The Pan-American Union will have representatives at the convention to supply information regarding the Pan-American friendship in commerce, and a number of gentlemen, long experienced in foreign trade, will be present to give particular advice to delegates on the details of foreign trade.

Financial and Corporate

Dallas Railway Reports

Balance of $39,384 Shown for the First Month of Operation Under the New Service-at-Cost Franchise

The net earnings of the Dallas (Tex.) Railway, the electric railways consolidated under the Strickland-Hobson management, for October, 1917, the first month the lines were operated under the service-at-cost franchise, were $66,191, according to the monthly report, filed with the Supervisor of Public Utilities by the company. Various deductions, aggregating $26,807, are applied to the different reserve funds, leaving the company a balance of $39,384 as a return upon the property value allowed by the franchise. This gives earnings of approximately 6 per cent on the agreed valuation. The franchise permits the company to show a return of 7 per cent before fares are automatically reduced.

REPORT SUMMARIZED

A summary of the report, prepared in the office of the Supervisor of Public Utilities, is as follows:

Gross Earnings—	October 1917	October 1916	Dec.
Railway	$139,101	$154,943	$6,842
Interurban term.	9,952	8,930	*1,021
Total gross earnings	$149,054	$154,874	$5,820
Operating Exp's—			
Railway	$78,627	$98,813	$20,185
Interurban term.	4,235	4,454	218
Total operating expenses	$82,863	$103,267	$20,403
Net earnings from operation	$66,191	$51,607	*$14,583

*Increase.

These differences, it is said, are in large part due to the fact that under the method of accounting required by the franchise, an amount of $12,260 for maintenance during October, 1917, has been charged to the "repair, maintenance and depreciation reserve" account, whereas the expenditures for this purpose in 1916 were charged to operating expenses.

Short Topeka Line Abandoned

State Commission Agrees to Discontinuance of 1½ Miles of Track

The Public Utilities Commission of Kansas has granted the Topeka Railway permission to remove the old track running southeast to old Vinewood Park. The line from California Avenue in Highland Park will be torn up and the rails will be used in other extensions the company may make in the future. In all about 1½ miles of track with side tracks at old Vinewood will be taken up.

Dan Patch Reorganization

If the Contemplated Plan of Reorganization Is Not Successful the Property Will Be Dismantled and Junked

With the purchase of the Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company's cut-off from Auto Junction to Luce Line Terminal by C. T. Jaffray and associates under foreclosure, noted in the ELECTRIC RAILWAY JOURNAL for Dec. 22, page 1136, plans were set in motion for reconstruction of the road from Minneapolis to Northfield and Faribault at a cost of $750,000. Mr. Jaffray said:

"If our plans are met by investors, the road will be electrified for both freight and passenger traffic to Faribault. This would mean the bringing to Minneapolis of most of the business from the rich districts near Northfield, Faribault, Rochester and Mankato. Much of this trade now goes to St. Paul. C. T. Bratnober, receiver for the property during pendency of cases involving the status of the line, will have charge of the attempt to reorganize. If the plan for reorganization is not successful the property will be dismantled and sold for junk."

The sale of the cut-off was conducted by Howard S. Abbott, master in chancery. The only bid made was by the committee representing the holders of the collateral notes against the road. The purchasers under the court order have the right to scrap this 14 mile section, but operation has not yet been suspended.

Pittsburgh Interest Arranged

Philadelphia Company Arranges for the Payment of Interest on Bonds of Underlying Companies of Pittsburgh Railways

J. H. Reed, president of the Philadelphia Company, Pittsburgh, Pa., which controls the Pittsburgh Railways, has issued the following statement:

"The Philadelphia Company has, in the past, loaned large sums of money to the Pittsburgh Railways to enable it to continue its operations, and is now a creditor of the railway for a very large amount. The Philadelphia Company directors refuse to make any further loans to the railway, but in order to avoid hardship to security holders whose interest will come due on Jan. 1, 1918, the Philadelphia Company announces that, as the Pittsburgh Railways will not be able to pay the interest due on Jan. 1, 1918, upon bonds of the underlying companies in the Pittsburgh Railways system it has arranged with the Farmers Deposit Company, Pittsburgh, to purchase the coupons representing the said interest, when properly presented to it by the holders, with the certificates of ownership attached which are required by the Federal income tax law."

The companies named were as follows: Central Traction Company, Duquesne Traction Company, Federal Street & Pleasant Valley Passenger Railway (general mortgage), Federal Street & Pleasant Valley Passenger Railway (consolidated mortgage), Pitcairn & Wilmerding Street Railway, Pittsburgh, Canonsburg & Washington Railway, Pittsburgh, Crafton & Mansfield Street Railway, Pittsburgh Incline Plane Company, Pittsburgh & West End Passenger Railway, Second Avenue Traction Company, United Traction Company, Washington & Canonsburg Railway, West End Traction Company, West Liberty Street Railway, West Liberty & Suburban Street Railway.

Canadian Issues Under Regulation

New Financial Offerings Must Have Certificate of Approval from Finance Minister

Under the authority of the war measures act the Union government has passed an order-in-council by which new issues of bonds in Canada, whether by any provincial, colonial or foreign government, municipality, commission, local government, institution, corporation or incorporated company, can only be made or sold with the approval of the Minister of Finance by his certificate in writing.

The order equally applies to any offering of shares, whether preferred or common, of any incorporated company, from this time onward. Provision is made whereby any issue or sale in contravention of the prohibition may be restrained. Heavy penalties are provided for violation of the regulation.

The regulation is similar to that which has been in force in Great Britain and has the same object of conserving the financial resources of the country for war purposes.

Public Represented on Board

Alfred M. Lyon, Newtonville, Mass., has been selected by a committee representing the Newton Board of Trade and all the village improvement societies in the city as their representative on the board of directors of the Middlesex & Boston Street Railway, Newtonville, Mass. This action is on the suggestion of James L. Richards, president of the railway. The appointment of a representative of the people to the board is in connection with the concerted protest of the public against a further increase of fares. Mr. Richards told the committee that in placing a representative in the councils of the road intimate knowledge of its workings and needs could be gained. Mr. Lyon is a lawyer and school board member.

Financial News Notes

Lancaster Company Increases Its Stock.—The Lancaster County Railway & Light Company, Lancaster, Pa., has increased its authorized capital stock from $2,500,000, of which $1,000,000 is 5 per cent cumulative preferred, to $3,750,000.

Lorain Bonds to Be Extended.—The Ohio Public Utilities Commission has authorized the Lorain Street Railroad, controlled by the Lake Shore Electric Railway, to extend for two years the $200,000 of 6 per cent notes maturing this month.

Common Stock Dividend Reduced.—The directors of the Philadelphia Company on Dec. 17 declared a quarterly dividend of 1½ per cent on the common stock. This is one-fourth of 1 per cent less than the company has paid for a number of years.

Charlottesville Preferred and Common Dividends.—The Charlottesville & Albemarle Railway, Charlottesville, Va., has declared a semi-annual dividend of 3½ per cent on its preferred stock, making 7 per cent for the year, and 2 per cent on its common stock, making 4½ per cent for the year.

New Stock for Public Service Railway.—A decision has been rendered by the State Board of Public Utility Commissioners of New Jersey approving the application of the Public Service Railway, Newark, N. J., for authority to issue $1,250,000 of its capital stock. The company is controlled by the Public Service Corporation of New Jersey.

Successor to Snake Line Seeks to Issue Stock.—Officials of the Swansea & Seekonk Street Railway, Swansea Centre, Mass., the successor to the Providence & Fall River Street Railway after the property of the latter had been sold for junk, appeared before the Massachusetts Public Service Commission recently and petitioned for approval of an issue of $100,000 in stock.

May Prove His Claim.—The Supreme Court of Illinois has denied a petition for a rehearing prayed by the Woodstock & Sycamore Traction Company, Genoa, Ill., in its defense against John Seymour, one of the original organizers of the road. Mr. Seymour now has the opportunity to prove his claim of $40,000 against the company.

Action on Boston Suburban Dividend Deferred.—The trustees of the Boston (Mass.) Suburban Electric Companies took no action on Dec. 28 on the preferred stock dividend, due this month. Two payments of 50 cents each were made in January and April, 1917. In 1916 and 1915 $3 was paid. The preferred stock is entitled to 4 per cent per annum, which is cumulative.

Make Your Claim.—J. Moss Ives, receiver for the Danbury & Bethel Street Railway, Danbury, Conn., is giving notice to the creditors of the company that the Superior Court in and for the county of Fairfield has ordered and adjudged that four months from Dec. 14, 1917, be limited for the presentation of claims against the railway and that all claims not presented within the time limit will be thereafter barred.

Dunkirk Railway Seeks Service Reduction and Higher Fares.—Efforts are being made by the receiver for the Dunkirk (N. Y.) Street Railway to sell the property. The company has an application pending before the Public Service Commission of the Second District of New York for permission to abandon part of its line. An application has also been made for permission to increase the rate of fare within the city from 5 cents to 6 cents.

Another Road in Danger of Being Scrapped.—Gustave Benjamin, Buffalo, N. Y., has bought the property of the New York & Pennsylvania Railroad, operating between Canisteo, N. Y., and Shinglehouse, Pa. The amount involved was approximately $350,000. Unless sufficient funds can be raised along the line to keep the property in operation, Mr. Benjamin will junk the road. Commercial organizations in the towns along the railroad are reported to be considering the organization of a company to electrify the line.

Mortgage for $5,000,000 Recorded.—The Springfield Street Railway has filed in the registry of deeds at Springfield, Mass., a mortgage for $5,000,000 in favor of the Old Colony Trust Company, Boston, Mass., for refunding purposes. In November, 1917, the company was authorized to issue at this time not to exceed $3,275,000 of mortgage bonds, payable twenty years from date and bearing interest at 6 per cent. The proceeds of bonds amounting to $2,305,000 will be applied exclusively to the payment, refunding or retiring of bonds issued by that company by reason of its purchase of other railway properties.

Abandonment of the Cincinnati-Bethel Line Proposed.—C. M. Leslie and Charles Thrasher, receivers of the Interurban Railway & Terminal Company, Cincinnati, Ohio, plan to apply to the Ohio Public Utilities Commission for authority to abandon the branch between Cincinnati and Bethel. At the same time application for permission to increase the rates of fare on the Rapid and Eastern divisions will be made. Some time ago Judge Cushing of the Common Pleas Court authorized the receivers to abandon the Bethel branch, but the Appellate Court decided that they had no authority to take this step. Since that time a new law has gone into effect on this point, and, with the authority of Judge Cushing, they will take the matter to the Public Utilities Commission.

Electric Railway Monthly Earnings

CAPE BRETON ELECTRIC COMPANY, LTD., SYDNEY, N. S.

Period			Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m.,	Oct.,	'17	$43,397	*$28,169	$15,228	$6,551	$8,677
1 "	"	'16	36,466	*18,205	18,261	6,568	11,693
12 "	"	'17	450,537	*284,065	166,472	78,684	87,788
12 "	"	'16	387,757	*227,251	160,506	78,470	82,036

CITIES SERVICE COMPANY, NEW YORK, N. Y.

1m.,	Nov.,	'17	$1,732,412	$30,050	$1,702,362	$209	$1,702,153
1 "	"	'16	1,328,388	20,021	1,308,367	244	1,308,123
12 "	"	'17	19,110,628	347,281	18,763,347	2,948	18,760,399
12 "	"	'16	9,071,718	236,868	8,834,850	299,480	8,535,370

COLUMBUS (GA.) ELECTRIC COMPANY

1m.,	Oct.,	'17	$104,130	*$36,447	$67,683	$31,593	$36,090
1 "	"	'16	84,786	*30,405	54,381	28,572	25,809
12 "	"	'17	1,057,281	*402,868	654,413	$52,640	301,773
12 "	"	'16	847,466	*343,413	504,054	343,884	160,170

HUDSON & MANHATTAN RAILROAD, NEW YORK, N. Y.

1m.,	Nov.,	'17	$538,572	*$270,131	$268,441	$217,983	$50,458
1 "	"	'16	512,904	*224,107	288,797	215,702	73,095
5 "	"	'17	2,572,504	*1,260,851	1,311,653	1,088,924	222,729
5 "	"	'16	2,397,008	*1,084,185	1,312,823	1,075,132	237,691

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

1m.,	Nov.,	'17	$3,454,687	*$1,900,069	$1,554,618	$1,097,265	‡$685,035
1 "	"	'16	3,451,756	*1,575,179	1,876,577	1,005,553	‡$934,262
5 "	"	'17	15,928,087	*9,018,680	6,909,407	5,380,053	‡$2,765,798
5 "	"	'16	15,388,778	*7,437,878	7,950,900	4,974,641	‡$3,261,804

JACKSONVILLE (FLA.) TRACTION COMPANY

1m.,	Oct.,	'17	$59,743	*$42,606	$17,137	$15,819	$1,318
1 "	"	'16	49,646	*34,930	14,716	15,437	†721
12 "	"	'17	678,268	*455,967	222,301	188,242	34,059
12 "	"	'16	619,387	*422,793	196,594	182,308	14,286

NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO

1m.,	Nov.,	'17	$533,250	$375,467	$157,783	$80,318	$77,464
1 "	"	'16	458,668	238,697	219,971	106,149	113,822
11 "	"	'17	5,814,817	3,648,752	2,166,065	859,140	1,306,925
11 "	"	'16	4,689,676	2,389,776	2,299,900	1,038,490	1,261,410

PENSACOLA (FLA.) ELECTRIC COMPANY

1m.,	Oct.,	'17	$25,807	*$15,592	$10,215	$7,808	$2,407
1 "	"	'16	21,439	*12,319	9,120	7,714	1,406
12 "	"	'17	331,242	*193,106	138,136	93,405	44,731
12 "	"	'16	279,557	*154,398	125,159	91,217	33,942

REPUBLIC RAILWAY & LIGHT COMPANY, YOUNGSTOWN, OHIO

1m.,	Nov.,	'17	$464,296	*$327,584	$136,712	$90,184	‡$54,033
1 "	"	'16	344,942	*196,083	148,859	70,848	‡78,260
12 "	"	'17	4,770,074	*3,203,779	1,566,295	995,388	‡632,980
12 "	"	'16	3,935,073	*2,271,569	1,663,504	816,605	‡862,798

TWIN CITY RAPID TRANSIT COMPANY, MINNEAPOLIS, MINN.

1m.,	Nov.,	'17	$807,839	$553,543	$254,296	$164,511	$89,785
1 "	"	'16	848,497	521,767	326,730	137,676	189,054
11 "	"	'17	9,345,633	6,250,474	3,095,159	1,691,344	1,403,815
11 "	"	'16	9,290,401	5,727,440	3,562,961	1,572,554	1,990,407

*Includes taxes. ‡Includes non-operating income.
§Includes accruals, under rapid transit contracts with city, payable from future earnings.

Traffic and Transportation

Commission Upheld in Indianapolis Fare Case

Circuit Court Decides Against Indianapolis Traction & Terminal Company in Its Effort to Compel Public Service Commission to Assume Jurisdiction in Rate Case

Judge Lewis B. Ewbank in the Circuit Court, Marion County, on Jan. 2 handed down a decision finding that the Public Service Commission ruled correctly in declining to accept jurisdiction in the case of the petition of Indianapolis Traction & Terminal Company for a 5-cent fare. The decision of court is summed up as follows:

Decision Summed Up

The city franchise of the Indianapolis Traction & Terminal Company—"relator"—fixing the rates of fares on street cars in the city of Indianapolis is a binding contract which excludes all jurisdiction of the Public Service Commission to increase or otherwise modify or change such rates while that contract remains in force. The only consent which the state has given or undertaken to give for any release or modification of any of the terms of that franchise contract was by the voluntary surrender of the franchise "prior to July 1, 1917." It was not so surrendered. Whether its surrender would have released the relator from its obligation to the city and its inhabitants to maintain the franchise rates of fares is not before the court and is not decided. The state legislature has no constitutional power to authorize the Public Service Commission to relieve the traction company "relator" of any part of the obligations of the franchise contract or otherwise to modify that contract so long as the contract has not been surrendered, forfeited, or otherwise terminated. A mandamus will not issue to require the Public Service Commission to entertain in a petition for an increase of passenger fares on an electric railway where it affirmatively appears that, because of a binding franchise contract fixing the rates of fares for the remaining fifteen years of a term for which the contract was entered into by express legislative authority, the commission has not power to grant any relief.

Trial of the Case

Arguments were heard before Judge Lewis B. Ewbank on Dec. 26, 27 and 28 in behalf of the petition of the company, to compel the commission to take jurisdiction and investigate the company's request for an increase in rates of fare to straight 5 cents. The commission had ruled several days previously that it was without jurisdiction because the Indianapolis franchise was granted under specific delegated authority by the Legislative act of 1899 and because the company did not surrender its franchise before July 1 of this year and accept an indeterminate permit.

The company was represented by Ferdinand Winter and W. H. Latta. The attorneys who appeared against the petition were W. Masson, M. H. Miller and Assistant Attorney-General Lesh.

The Company Presents Its Side

Mr. Winter's theory of the case was that the State had full power over franchises, that a city was merely the agent of the State, and that whenever the State, the principal, decided to modify a contract it could do so provided the other party, the public utility corporation, consented. He submitted that there were only two parties to a utility franchise contract, the utility corporation and the State, so that if the two parties to the contract agreed there was no objection in law and there was no impairment of the obligations of a contract, which the attorneys for the Public Service Commission had emphasized in their arguments. Mr. Winter further submitted that the Legislature had conferred full rate-making power on the Public Service Commission, and that if the commission chose to do so it could change any utility franchise rate, with the consent of the public utility corporation, because the commission would be exercising the State power over franchises, which Mr. Winter repeatedly asserted was complete.

In referring to arguments of attorneys for the other side and commenting on the court decisions, they had cited in support of the proposition that a State might delegate express authority under which a contract could be made, which the State itself could not modify, Mr. Winter submitted that all such decisions arose out of a state of facts in which the public utility corporation itself was contending that subsequent action by the Legislature would impair the obligations of its contracts. He said: "Every case on which they rely for authority is where the controversy arose between the State or city on the one side, and the public utility corporation on the other."

Will H. Latta, for the company, said the intention of the State in the act of 1913, creating the Public Service Commission, was to exert all the power it has. He said he went a little beyond Mr. Winter in the belief that in the 1913 law the Legislature gave to every public service corporation just, reasonable and sufficient rates. The law added burdens to such corporations, and at the same time it provided that compensation should be adequate for the increased burdens. He believed that the commission could put any burdens on a public utility corporation it saw fit, but the rates had to be sufficient to carry those burdens. The law of 1913, he argued, was a guarantee of adequate rates.

Mark Miller made the first of the closing arguments. He thought it was not reasonable to assume that the Legislature had created a commission with power to change a contract only adversely to the city.

Chicago Elevated Fare Announcement

President Budd Intimates Chicago Elevated Railroads Favor Zone System for Future Use

Britton I. Budd, president of the Chicago (Ill.) Elevated Railroads, announced on Dec. 30 that the application of the company to the Public Utilities Commission of Illinois for permission to charge a higher rate of fare and probably the right to carry package freight would be filed early in January. Higher operating costs is the reason given. It is likely that the zone district will be the basis for the proposed increased rate.

Expenses Up

The *Elevated News*, issued monthly by the railway, outlines the roads' position in the December issue as follows:

"The roads want their patrons to know the facts. Every economy possible is being practised, but the revenue is insufficient. Everything which the road has to buy has gone up in price. The increase in wages alone in the last three years amounts to more than $1,000,000 a year. The pay roll for October last shows an increase of $87,-101 over the pay roll for October, 1914. That is at the rate of $1,045,220 a year.

"Through routing and free transfer privileges have increased the length of the haul on the elevated roads until it is now 6½ miles, twice what it was five years ago. The people want to get out of the congested districts. Each year they move farther out, but they still continue to pay the same little old nickel which did service in the horse-car days.

Nickel Has Shrunk

"That nickel isn't nearly as big in purchasing power as it was in the horse-car days, either. If you think it is, try it on the baker for a loaf of bread, or on the milk man for a quart of milk, or on the grocer for a pound of sugar. They won't take it. But the elevated roads have to take it. Don't you think that is just a little unreasonable?"

On the proposed freight privilege is this sentence:

"Hundreds of commodities now shipped as package freight over the steam roads, congesting terminals and utilizing equipment, can be handled by electric lines, can be handled at hours when their equipment is otherwise idle."

Wages Dependent on Fares

Pittsburgh Railways Announces That Increase is Dependent on the Company Securing Six-Cent Fare

The Pittsburgh (Pa.) Railways, as noted briefly in the ELECTRIC RAILWAY JOURNAL of Dec. 29, page 1175, announced on Dec. 21 an immediate increase of 2½ cents an hour in the wages of its trainmen. At the same time the company said that a further advance of 2½ cents an hour would be made if the request of the company to the Public Service Commission for an advance in fares was allowed. A statement which was issued by the company follows:

COMPANY STATEMENT

"As a result of numerous conferences between representatives of the city of Pittsburgh and representatives of motormen and conductors and officials of the Pittsburgh Railways, a tentative arrangement for the temporary restoration of rush-hour tripper and trailer service has been made, effective tomorrow morning.

"In order to accomplish this without further delay, the Pittsburgh Railways agreed temporarily to advance the wages of the motormen and conductors 2½ cents an hour to facilitate the improvement of the rush-hour service pending the filing with the Public Service Commission of a new schedule advancing the present rate of fare to 5½ cents when tickets are used, and to 6 cents when cash fare is paid. As soon as this increased fare goes into effect the advance in wages of the motormen and conductors will be made 5 cents an hour. This will amount to several hundred thousand dollars a year. As a result of this increase the motormen and conductors agreed to operate the rush-hour trippers and trailers, which they have refused to operate for the past nine weeks.

"The advance in wages is given despite the fact that the wage agreement with the motormen and conductors, made in May, 1916, for the existing wages, does not expire until April 30, 1918."

THE NEW WAGE SCALE

The 2½-cent increase is operative until Feb. 1, when, if the increased fare the company asks is allowed by the Public Service Commission, the increase in wages will become 5 cents an hour for every man, or a minimum of 32 and a maximum of 40 cents an hour. On a nine-hour day, which is the average day, the motormen and conductors would, after Feb. 1, receive from a minimum of $2.86 to $3.60 a day. With the increase which has just been granted in effect the wage scale is as follows: First six months' service, 29½ cents an hour, instead of 27 cents, the present minimum; second six months, 31½ instead of 29 cents; second year, 33½ instead of 31 cents; third year, 35½ instead of 33 cents; fourth year, 36½ instead of 34 cents; fifth year of service and thereafter, 37½ instead of 35 cents.

The City Council by unanimous vote has directed C. K. Robinson, assistant city solicitor, to oppose the proposed new tariff before the Public Service Commission. Under the Pennsylvania public service corporations law public notice of a change in tariffs by a public utility corporation must be made thirty days in advance of the new tariff taking effect.

Asked for Bread and Got a Stone

The railway manager who asks his patrons for advice is indeed a brave man. But temerity among managers is not dead, although there has been more than enough in recent years to kill it. One brave manager who recently threw discretion to the winds and asked for advice received this caustic reply:

"The notices you have pasted in the cars asking the help and criticism of the public might be passed as a joke or 'bull' if they were not in fact an insult on injury.

"When you have done 50 per cent of what you or your office boy knows should be done, the efficiency of the service will be materially increased and suggestions from patrons might then be appropriate.

"Possibly you want the patrons to run the business while you devote your time to increasing fares and reducing taxes.

"It is difficult to imagine what more the patrons can do, unless we ride the roof or brake beams and send our money by mail. We wait and wait for cars (?).

"Sometimes one comes along and we crowd in till it is difficult to breathe. As a rule there would not be half straps enough to hang on if all straps were there, but many are absent and others broken."

I. U. T. Fare Increase Allowed

Indiana Commission Grants Main Requests of Indiana Union Traction Company for Fare Increases

The Public Service Commission of Indiana on Dec. 28 handed down its decision on the petition of the Union Traction Company for increased rates of fare.

THE NEW RATES

The commission permitted the company to increase its rate for mileage books on its lines to 2 cents a mile; to increase its rates for commutation tickets to 1½ cents a mile from 1¼ cents, the former mark, and to increase the rate for school passengers on its lines to 1 1/5 cents a mile.

The round-trip fare between Indianapolis and Fort Benjamin Harrison will be increased to 35 cents, and the single fare between the military reservation and the city will be 25 cents. The fare between Indianapolis and Lawrence, under the new order, will be 35 cents for the round trip daily and 25 cents for the single fare between those points.

NEW RATES FROM JAN. 1

Abolishment of the sale of six tickets for a quarter was authorized on the urban lines of the company in Anderson, Marion, Muncie and Elwood, where hereafter a straight 5-cent fare will be in effect. The new rates were to become effective Jan. 1, 1918, provided the company filed new tariffs, covering such advances, by that date.

PART OF DECISION HELD UP

The commission held up its decision in the part of the petition that asked authority to increase the minimum interurban fare of the company from 5 cents to 10 cents, after the members tentatively had agreed that the body would deny the right to increase the minimum under existing statute prohibitions, although at least some members believed that the minimum should be increased. This matter, the underlying legal theory of which will figure also in rate increase petitions from other interurban systems, to be heard by the commission early in January, probably will be decided later.

OPINION BY COMMISSIONER CORR

After a legal discussion regarding the commission's powers in the deciding of the part of the petition referring to the Broad Ripple increase, the opinion, which was written by Edwin Corr, of the commission, says:

"Applying to this statute the well-established rule of interpretation, that the mention of one thing is the exclusion of the others, this commission is forced to the conclusion that the provisions of this franchise contract are void which undertake to fix rates for service outside the town of Broad Ripple. The town of Broad Ripple had authority to regulate and fix rates within said town, but it had not power to fix rates between Broad Ripple and Indianapolis."

The commission further stated that a 5-cent fare between Broad Ripple and Indianapolis was a very low one and that the commission had been disposed to increase this fare were it not convinced from evidence introduced that the company at this time was not providing adequate service between Indianapolis and Broad Ripple. The commission intimated, however, that if the company will improve its service it will entertain an application for an increase of the fare on the Broad Ripple line.

In discussing the increased revenue to the company from the fare increases granted the commission's order said:

"The increase in fares and charges which this commission will allow, as indicated above, based upon receipts

for the first ten months of 1917, and an estimate for the last two months of that year, it is estimated, will produce an increased revenue of approximately $101,833."

The hearings before the commission in this case were reviewed in the ELECTRIC RAILWAY JOURNAL of Dec. 22 and 29.

Inquiry into Kansas City Service

The Public Service Commission of Missouri has announced that it will conduct an investigation into the service of the Kansas City Railways. The hearings are to begin on Jan. 9. The service engineers of the commission are in Kansas City conducting preliminary investigations before the hearings proper are begun. In making this announcement the commission said:

"The commission will proceed on its own motion to investigate fully the service rendered. Notice is hereby given that a proceeding of inquiry and investigation be and is hereby instituted by the commission on its own motion to determine the character of the service rendered by the Kansas City Railways."

ACTING PRESIDENT READY AND WILLING

Clyde Taylor, acting president of the company, says:

"The Kansas City Railways will welcome an investigation by the commission and will co-operate with that body and furnish it the fullest information upon any subject. Coal, labor shortage, limitation of power due to long delays in deliveries of electrical machinery, tremendous increased cost of operation, and other factors, and the relation of these to service can be investigated by the commission which is fully equipped for such work. It is the desire of the officials of the company to render the best possible service in these abnormal times and if the commission can find ways in which that can be done it will be rendering a necessary service."

Curtailed Service Protested

Representative of City of Seattle Suggests Use of Women on Cars as One Way Out

In registering a complaint against curtailed service on the railway lines of the Puget Sound Traction, Light & Power Company in Seattle, Wash., A. L. Valentine, Superintendent of Public Utilities, recommended to that company that women be used as conductors. Mr. Valentine said:

"While I appreciate the fact that you are having trouble in obtaining operators for your cars, the transportation situation is so acute that I am going to suggest that you endeavor to obtain women conductors in an effort to relieve conditions which are rapidly growing worse."

According to Mr. Valentine, the company is called upon to transport more passengers each day than ever before, and to aggravate this condition there is a shortage of from one to eight crews on every line almost every day. In registering his complaint Mr. Valentine accompanied his letter with records of car checks made by inspectors of his department on Dec. 19.

A. W. Leonard, president of the company, said:

"We are making every effort to obtain sufficient men to maintain adequate service on all our lines, and while we are adding men daily, many of the lines are being operated frequently on curtailed schedules, because of a lack of operators. It may be necessary as a war measure to employ women as conductors, in order to release men for other work. No steps to that end have yet been taken."

Forum and His Little Brother

The United Railways & Electric Company, Baltimore, Md., through *Forum* and his little brother, *Trolley News*, the first published by the company in the interest of the employees and the second in the interest of the public, is extending holiday greetings to patrons and friends in the form of a card 6 in. wide by 3½ in. high done in colors. The card, about two-thirds the original size, is shown in the accompanying engraving.

HOLIDAY GREETING OF THE COMPANY AT BALTIMORE

Transit Facilities Poor

Admiral Bowles Complains About Lack of Accommodation for Shipyard Employees

Admiral Bowles, head of the construction department of the Emergency Fleet Corporation, before the Senate committee conducting the shipping inquiry, asked on Dec. 28 for authority to commandeer houses, street cars and ferry boats, and to declare war zones about certain shipyards in order to clean them up and make them habitable for shipyard employees. He explained that his program contemplated requiring electric railways to operate special cars to carry the workmen to and from work. He said:

"It is almost impossible to keep men when they have to hang on a street car for an hour or two in order to get to work and then to get home in the evening."

He said that by commandeering transportation facilities of this kind the force of workmen could be increased by providing a greater living area. Two cases, which Admiral Bowles said were typical, were cited by him.

Appeal to Shop Early

By Josh Wink in "The American"

Shop early and often,
If so you incline,
O pitying women,
But please draw the line
At riding in hours
When workers must rush,
And so keep the traffic
From being a crush.

So you'll conserve fuel,
And you'll conserve space,
You'll, too, conserve labor,
And if by your grace
These do double duty
Thus economized,
You're doing a service
To be highly prized.

So, ladies, shop early,
For leisure is yours,
The hours restricted
To others restores
Your consideration;
Then go home and knit
Content with your conscience
For doing your bit.

According to J. F. Strickland, president of the Texas Electric Railway, Dallas, Tex., it appears most likely in the present government emergency that the transportation of freight will be centered in the steam lines and that the interurban electric lines will be designed as passenger carriers where steam and electrics serve the same territory.

Another Pennsylvania Fare Increase.—The Shamokin & Mount Carmel Transit Company, Mount Carmel, Pa., operating between Shamokin and Ashland, will increase its rates from 5 to 6 cents per zone on Jan. 15, and will withdraw from sale the three-for-a-quarter tickets which have been in use between Ashland and Centralia.

No Expert for St. Louis.—The ordinance providing for an appropriation of $5,000 for hiring an expert to advise the public utilities committee of the Board of Aldermen of St. Louis, Mo., in connection with the preparation of a new franchise ordinance for the United Railways Company was killed in the Board of Estimate and Apportionment.

Legislators Will Not Be Favored.—The Kentucky Traction & Terminal Company, Lexington, Ky., has declined to quote reduced rates between Frankfort and Lexington to persons who, during the session of the coming Legislature at Frankfort, wish to make their headquarters at Lexington. The Louisville & Nashville Railroad and Chesapeake & Ohio Railroad will issue commutation tickets.

Paper for San Diego Railway Patrons.—The San Diego (Cal.) Electric Railway, beginning Jan. 1, 1918, will issue a monthly pamphlet for the purpose of acquainting the public with the aims of the company regarding service, improvements, changes and happenings affecting electric railway operation in San Diego. The pamphlet will be placed in boxes in the cars and will be mailed to persons desiring it. Ernest L. Phillips is advertising manager of the company.

I. T. S. Christmas Greeting.—What should serve as a worth-while reminder of the satisfactory service and amiable relations which have existed during the year is contained in the Christmas greeting sent out by the Illinois Traction System, which was engraved on an attractive card and read as follows: "We feel that the year 1917 should not pass without some expression of gratification over the cordial relations existing between us, and we desire to convey the season's best wishes for a Merry Christmas and a Prosperous New Year. *Signed,* ILLINOIS TRACTION SYSTEM (MCKINLEY LINES)."

Jitney Bonding Company Quits.—The Golden State Indemnity Company of California is retiring from the field. The company was headed by Andrew J. Gallagher, one of the supervisors of San Francisco and enjoyed virtually a monopoly of the jitney bus insurance business. The reason announced for the retirement is the inability to raise $75,000 additional capital by Jan. 10 which the company would require if it were to continue in business under recently enacted laws. It is announced that the Western Indemnity Company will take over the unexpired policies of the retiring company, but that hereafter the insurance rate will be $12.50 per month instead of the $8 previously in

Personal Mention

C. G. Ballentyne has resigned as general manager, purchasing agent and claim agent of the Honolulu Rapid Transit & Land Company, Honolulu, Hawaii.

Howard E. Jaeger has recently been advanced to the position of purchasing agent for the Oakland, Antioch & Eastern Railway at Oakland, Cal., succeeding Ernest E. Haquette, resigned.

W. M. Bird, formerly assistant superintendent of transportation of the Tampa (Fla.) Electric Company, has been appointed superintendent of transportation to succeed G. A. Webb.

B. H. Meyer, appointed to the Interstate Commerce Commission from Wisconsin, has been nominated by President Wilson for reappointment for the seven-year term expiring on Dec. 31, 1924.

G. A. Webb, formerly superintendent of transportation of the Tampa (Fla.) Electric Company, has been appointed traffic manager of the company. Mr. Webb has been with the company for about twenty-five years in various capacities.

E. A. Merrill has been appointed chief engineer of the power station of the Galesburg Railway, Lighting & Power Company, Galesburg, Ill., controlled by the Illinois Traction Company, to succeed L. N. Jenkins, resigned. Mr. Merrill was formerly connected with the Underfeed Stoker Company, Chicago, Ill.

R. E. Kelly has been made general agent of the Pacific Electric Railway, Los Angeles, Cal. Mr. Kelly began service with the Pacific Electric Railway in 1901 as a conductor. At the time of his appointment as general agent he was general agent of the eastern division with headquarters at San Bernardino.

Foster Hannaford, for two years superintendent of the St. Paul lines of the Twin City Rapid Transit Company, has been appointed general manager of the company, the duties of which office have been carried on for six years by President Horace Lowry. Mr. Hannaford was born in St. Paul. He is a son of J. M. Hannaford, president of the Northern Pacific Railway.

William Siebert, superintendent of surface railroad transportation of the Brooklyn (N. Y.) Rapid Transit Company, has been elected a director of the Nassau Electric Railroad; Brooklyn, Queens County & Suburban Railway, and the DeKalb Avenue & North Beach Railroad Company, all subsidiaries of the Brooklyn Rapid Transit Company, to succeed Slaughter W. Huff, now president of the Third Avenue Railroad, New York.

Van Dusen Rickert severed his connection on Dec. 31 with the Eastern Pennsylvania Railways, Pottsville, Pa. Early in October Mr. Rickert resigned as assistant general manager and assistant secretary and treasurer of the Eastern Pennsylvania Railways and assistant general manager and secretary and treasurer of the Eastern Pennsylvania Light, Heat & Power Company. At that time Mr. Rickert agreed to remain at Pottsville until a new general manager was appointed.

Charles Remelius has resigned from the Peter Smith Heater Company, Detroit, Mich., to become assistant master mechanic of the New York State Railways at Rochester. Mr. Remelius has had a long experience with electric railways in mechanical work, having been connected with the Cleveland (Ohio) Railway, Detroit (Mich.) United Railway; Indianapolis Traction & Terminal Company, Indianapolis, Ind.; St. Louis (Mo.) Transit Company; Brooklyn (N. Y.) Rapid Transit Company, and the Public Service Railway, Newark, N. J.

F. J. H. Kracke has been appointed by Governor Whitman of New York to the Public Service Commission of the First District to succeed Col. William Hayward. He is to serve until the return of Col. Hayward from military duty. Mr. Kracke is one of the principal Republican leaders of Brooklyn. He has held the post of Commissioner of Plant and Structures, formerly Bridge Commissioner, in the Mitchel administration, and before that was Naval Officer of the Port of New York from 1906 to 1913. Mr. Kracke managed Governor Whitman's campaign in 1916.

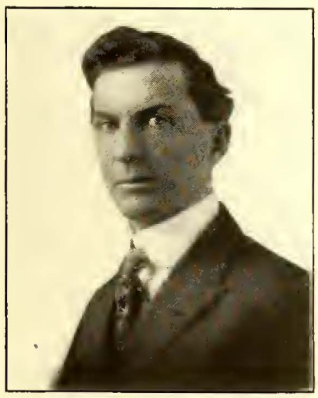
W. T. Waters, former advertising manager of the Georgia Railway & Power Company, Atlanta, Ga., and editor of *Here We Are,* published by that company, is a first lieutenant in the Field Artillery and is stationed at Fort Logan, Houston, Tex. Mr. Waters entered the officers' training camp at Fort Oglethorpe three months ago, after many weeks of hard work on the draft exemption board. He was graduated far up in the A list of first lieutenants. Mrs. Waters, who held her husband's place as advertising manager during his absence in camp, will continue in that capacity.

Charles Bulkley Hubbell has been appointed by Governor Whitman of New York to the Public Service Commission of the First District to succeed H. W. Hodge. He is to serve until the return of Mr. Hodge from military duty. Mr. Hubbell was chairman of three subway commissions by appointment of the Appellate Division. He was the last president of the board of education before consolidation and the first president of the new board of the greater city, and is still chairman of the board of trustees of Hunter College and the College of the City of New York. He has been active in the alumni affairs of Williams College.

W. O. Minard has been appointed electrical engineer of the Rutland Railway, Light & Power Company and the Western Vermont Power & Light Company, Rutland, Vt. Mr. Minard entered the employ of the companies in Rutland about eight years ago as a lineman, in which capacity he worked for three years. He then resigned to become chief electrician of the Consolidated Light & Power Company, Whitehall, N. Y. After a year with this company, he returned to Rutland as electrician and substation repair man for the Western Vermont Power & Light Company and the Rutland Railway, Light & Power Company.

Stuart H. Patterson, who has been appointed comptroller of the Guaranty Trust Company, New York, a newly created office, has been connected with the American Water Works & Electric Company, as vice-president and treasurer, since its organization, in April, 1914. Mr. Patterson was born in New York City on Feb. 12, 1871, and on Jan. 1, 1887, he began his business career as an office boy in a wholesale dry goods house. In 1891 he went to Seattle, Wash., and learned some of the practical side of the electrical business. Mr. Patterson returned to New York in January, 1894, to join his father in the accounting business. He became a certified public accountant in 1896. Nine years later Mr. Patterson withdrew from the accounting firm of Patterson, Teele & Dennis to become associated with a bond house. In January, 1912, he became associated with the Guaranty Trust Company in an advisory capacity.

Fred Boeken has been appointed superintendent of the Municipal Railway, San Francisco, Cal., to succeed the late Thomas A. Cashin. Mr. Boeken has been assistant superintendent of the Municipal Railway since 1912. His



FRED BOEKEN

first railway experience began in San Francisco as a gripman on the old Market Street Cable Railway. Later he became inspector with the Geary Street, Park & Ocean Railroad, and in 1906 was made assistant superintendent of that company. This position he held until the line was taken over as part of the municipal system of San Francisco in 1912. He was then appointed assistant to Mr. Cashin. Included in the Municipal Railway are 45 miles of line over which more than 190 cars are operated.

J. B. Stewart, Jr., whose promotion from the position of assistant to the general manager to assistant general manager of the Mahoning & Shenango Railway & Light Company, Youngstown, Ohio, was noted in the ELECTRIC RAILWAY JOURNAL of Dec. 22, has been

J. B. STEWART, JR.

with the company since 1913, when he became safety and efficiency engineer and superintendent of freight. Subsequently he was appointed superintendent of equipment and traffic and then was made assistant to Richard T. Sullivan, general manager. Mr. Stewart was graduated from the high school at Newton, Mass., and the Massachusetts Institute of Technology. His first employment in the electric railway field was with the Middlesex & Boston Street Railway, Newtonville, Mass., as an engineer, whence he went to Erie, Pa., as assistant to the general manager of the Buffalo & Lake Erie Traction Company. In 1910 he was engaged in the construction of the Corning division of the Elmira, Corning & Waverly Railroad, Waverly, N. Y., and two years later became park manager and acted as assistant to the traffic manager of the Lehigh Valley Transit Company, Allentown, Pa.

George A. Mills has been appointed electrical engineer of the Winnipeg (Man.) Electric Railway and subsidiary companies. Mr. Mills entered the engineering field after graduation from Iowa State College in 1909. The next fourteen months he spent with the Allis-Chalmers Manufacturing Company at its Bullock works, as an electrical apprentice. In 1910 Mr. Mills became a member of the instructing staff of the University of Pennsylvania, where he remained one year. In June, 1911, he became connected with the Waterloo, Cedar Falls & Northern Railway, Waterloo, Iowa, as electrical engineer, for which he had charge of the electric design and construction of the Cedar Rapids extension. He also was active in rebuilding the power station and other lines of this company.

Obituary

George E. Baker, chief mechanical expert of the Eastern district of the Westinghouse Traction Brake Company, died on Dec. 26 after an operation. For a number of years he suffered very severely from rheumatism, but never lost his courage or cheerfulness. Mr. Baker was born in New Albany, Ind., in 1865, and after serving his apprenticeship became an expert machinist. Twenty-five years ago he entered the employ of the Gennett Air Brake Company, Chicago, the first to specialize in electric railway air brakes, and continued in that line, joining the Westinghouse Company in 1901. Mr. Baker was widely known as dean of traction railway brake experts and was highly esteemed by all for his comprehensive understanding of his business and his unfailing kindliness. He is survived by his widow and daughter.

Frank M. Mousseau, head bookkeeper in the auditing department of the Twin City Rapid Transit Company, Minneapolis, Minn., died suddenly on Dec. 27. Mr. Mousseau was born in 1873 and entered railway work in Minneapolis as a water boy when the first lines were being built. For several years he was a station timekeeper and for fifteen years had been in the auditing department. His father, Mitchell Mousseau, was in the employ of the company for thirty-three years. He was one of the first superintendents in Minneapolis. An uncle, Henry Mousseau, forty years with the company, was the first horsecar driver in Minneapolis. One brother has worked for the company twenty years and another five years. Horace Lowry, president of the company, said that he felt the Mousseau family were one of the rocks on which the company had been built, typifying as they did a fine loyalty and unswerving devotion to duty under all circumstances.

William H. Goble died suddenly on Dec. 25 while making a brief visit at the home of his youth in London, Ont. Mr. Goble left the farm in Canada in the earliest days of electrification of street railways and joined the car-equipping forces of the Thomson-Houston Company, working in Brooklyn and Baltimore. In 1893 he was employed in Brooklyn, serving as foreman of various surface and elevated shops until 1901, when he became a member of the Christensen Engineering Company's field force. He remained with the company and its successors, the National Brake & Electric Company, as sales engineer of its Philadelphia district until that company was taken over by the Westinghouse Traction Brake Company, and continued with them as mechanical expert and salesman in his old territory until his death. Beloved by all for his great-heartedness, he and George E. Baker, his friend of many years, will be sadly missed by all who knew them. Mr. Goble is survived by his widow.

Construction News

Construction News Notes are classified under each heading alphabetically by States. An asterisk (*) indicates a project not previously reported.

Franchises

Jacksonville, Fla.—The County Commissioners have granted the Jacksonville Traction Company permission to construct a line from Ortega to Camp Joseph E. Johnston.

Cedar Rapids, Iowa.—The Board of Railroad Commissioners has granted the Iowa Railway & Light Company a franchise to construct and operate an electric transmission line along certain roads in Benton County for the transmission of electricity for lamps, heaters and motors.

Track and Roadway

Pacific Electric Railway, Los Angeles, Cal.—This company is double-tracking its line between Baldwin Park and Hayes Station.

Municipal Railways, San Francisco, Cal.—M. M. O'Shaughnessy, city engineer, has awarded contracts for the ties, steel rails and other material required for the construction of the Parkside extension of the Twin Peaks tunnel system. Delivery will be made about Jan. 31 and it is expected that actual construction will be begun early in February. The line will be about 1 mile long and will extend from the west portal of the tunnel to Twentieth and Taraval Streets.

Southern Pacific Railway, San Francisco, Cal.—Plans have been prepared by Alameda County and the Southern Pacific Railway for the erection of a bascule bridge over the inner harbor of Oakland.

Colorado Springs & Interurban Railway, Colorado Springs, Col.—This company reports that during 1918 it will build 1 mile of new track and will reconstruct 4 miles of track.

Murphysboro & Southern Illinois Railway, Murphysboro, Ill.—Application has been filed by the Murphysboro & Southern Illinois Railway with the Public Utilities Commission of Illinois for permission to issue $63,000 capital stock and $250,000 in bonds. The company is building a line between Murphysboro and Carbondale and the new capital is desired to extend the line from Carbondale to Carterville or to Herrin. A. B. Minton, Murphysboro, president. [June 23, '17.]

Sioux City (Iowa) Service Company.—This company reports that it will reconstruct 2½ miles of track in 1918.

Wichita-Walnut Valley Interurban Railway, Wichita, Kan.—A contract has been awarded by the Wichita-Walnut Valley Interurban Railway to the Scott Construction Company, St. Louis, for the construction of its proposed line from Wichita to El Dorado and Augusta. It is probable that the line will leave the city east on Twenty-first Street to Andover, where a terminal will be built; thence one branch will lead to El Dorado and the other to Augusta. The El Dorado line will be built via Andover, Benton and Towanda. This part of the line will then be built to Augusta, connecting the two large oil fields. As soon as the road from Wichita to El Dorado and Augusta is completed work on the construction of a line from Augusta to Douglass and Winfield will be begun. Charles Payne, secretary. [Dec. 8, '17.]

South Covington & Cincinnati Street Railway, Covington, Ky.—During 1918 this company will rebuild 2.4 miles of track.

***New Orleans, La.**—An interurban railway from New Orleans, La., to Mobile, Ala., is in prospect if the Mississippi Legislature sanctions a bill that has been drafted and is ready for submission at the approaching session. The bill as it will be introduced proposes the authorization and empowerment of municipalities in Mississippi to own, construct and operate electric railways. The measure would authorize cities and towns to take over the Gulfport & Mississippi Coast Traction Company operating between Biloxi and Pass Christian at a fair valuation and extend it from New Orleans to the Gulf city. The bill is now in the hands of Mayor George M. Foot of Gulfport and will be presented early in the approaching session and rushed for passage. The purpose of the bill is to enable cities and towns in the State to combine and co-operate with each other in the ownership, construction and operation of the electric interurban railways. Supporters of the bill believe that, if passed, it will result in the construction of several interurban railway systems in Mississippi, especially in the sections where cities and towns are situated close to others, thus making interurban lines profitable.

Southern Traction & Utilities Company, Thibodaux, La.—It is reported that the Southern Traction & Utilities Company will construct the proposed line from Donaldsonville to Lockport, along the Bayou Lafourche, 56 miles. C. C. Barton, Albemarle, is president of the company, and others interested are Albert Boudreaux and L. C. Roger, Thibodaux; Walter Ohlmeyer, Plattenville; Dr. A. J. Price of the Lagarde Planting Company; Henry LeBlanc, Painscoutville, and Harold Raymond, New Orleans. Practically all the necessary right-of-way has been obtained. Subscriptions to $100,000 of the total capital stock of $500,000 are sought from the people along the line, subscriptions for the other $400,000 being assured as soon as the necessary indorsement of the population to be served is obtained. [Nov. 17, '17.]

Bay State Street Railway, Boston, Mass.—The new line extending on Quincy Street to the Fore River Shipbuilding Corporation has been opened for traffic. Washington Street, widened from 40 ft. to 66 ft. for a distance of 2 miles, now has double tracks, which connect with the double-tracked system in Hancock Street and run through Cleverly Court to the Fore River yard. The government will pay $300,000 of the cost of $350,000 and Quincy will pay the balance for land taking.

Boston (Mass.) Elevated Railway.—The government has nearly completed the big Victory Bridge over the Neponset River. When the work is completed the Boston Elevated Railway will operate cars direct to the Squantum works of the Fore River Shipbuilding Corporation.

Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company, Minneapolis, Minn.—Plans for the reconstruction of the Minneapolis, St. Paul, Rochester & Dubuque Electric Traction Company's line from the Minneapolis terminal at Seventh Street and Third Avenue, N., to Northfield and Faribault, at a cost of approximately $750,000 have been announced by C. T. Jaffray, president of the First & Security National Bank. C. T. Bratnober, who was receiver for the line, is in charge of the new plan. Mr. Jaffray and his associates on Dec. 19 bought that part of the line extending from a point near the Minnesota River to a junction with the Luce line near Glenwood Park for $100,000. If the plan goes through it will mean that the road will be electrified for freight and heavy traffic as well as for passenger travel, and Minneapolis will then have a heavy electric line direct into the heart of southern Minnesota.

St. Cloud (Minn.) Public Service Company.—This company reports that it will build 1 mile of new track during 1918.

St. Louis, Mo.—The Municipal Bridge Commission has decided that the proposed rental of 1 cent per passenger carried by interurban cars for the use of the free bridge and municipal loop shall be eliminated and it will recommend to the Board of Aldermen that the city build a loop and maintain the bridge and loop tracks for one year without charge to street cars, to encourage interurban development.

Interborough Rapid Transit Company, New York, N. Y.—Announcement has been made by the Public Service Commission for the First District of New York that it is hoped to have the Lexington Avenue subway and the Seventh Avenue subway in full operation, in connection with the first subway, as soon after the first of

April as is possible. In the meantime, according to Frank Hedley, vice-president and general manager of the Interborough Rapid Transit Company, which will operate these lines, the earliest date at which partial operation may be expected is on or about March 1. The company plans to operate an alternate service of elevated and subway trains over both the Astoria and Corona extensions, beginning some time between Jan. 1 and Jan. 15. The date on which this service will begin depends upon the completion of work on some safety switches now being installed at the plaza in Long Island City.

Piedmont & Northern Railway, Charlotte, N. C.—An order has been placed by the Piedmont & Northern Railway with the Union Switch & Signal Company, Swissvale, Pa., for two small temporary interlockings at the entrances to the national cantonment at Camp Greene, Charlotte. Each plant includes a three-lever dwarf machine, and the signal indications will be controlled primarily by knife switches and selected over-circuit controllers on the levers of the machine.

Portsmouth Street Railroad & Light Company, Portsmouth, Ohio.—During 1918 this company will build 2 miles of new track between Portsmouth and Union Mills.

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—James Anderson, manager of the Sandwich, Windsor & Amherstburg Railway, has announced that from $50,000 to $75,000 will be spent in the betterment of electric railway service in Windsor, providing the city will allow the company to construct the Ferry Avenue loop, which caused litigation extending over two years and resulted in the company being told by the courts that it could not build a loop without the consent of the ratepayers. The company's plan is to install a double curve at Sandwich Street and Ouellette Avenue, which would obviate the necessity of running belt line cars on the wrong side of Ouellette Avenue. Double tracks will also be laid on Ouellette Avenue from Park Street to Wyandotte Street. The proposal will be submitted to the Ontario Municipal & Railway Board, which will either order the work done or send recommendations to the City Council.

Montgomery Transit Company, Norristown, Pa.—A report from the Montgomery Transit Company states that during 1918 it will place in service 16.3 miles of new track, consisting of an extension from Harleysville to East Greenville, 12 miles, and from Harleysville to Souderton, 4.3 miles. The company will reconstruct 10 miles of track.

Johnstown-Somerset Traction Company, Somerset, Pa.—This company, which is constructing a line from Johnstown to Jerome, 10 miles, reports that it will probably build a 6-mile extension to Boswell.

Sioux Falls (S. D.) Traction Company.—About 1 mile of track will be rebuilt by the Sioux Falls Traction Company in 1918.

Dallas (Tex.) Railway Company.—Street car terminals will be constructed by the Dallas Railway at Fair Park to care for the heavy traffic incident to the Texas State Fair, formal approval of the plans of the company having been given by the Fair Park directors, the city park board, the supervisor of public utilities and the city commissioners. The company will construct a storage track along the Second Avenue side of Gaston Park and will also build a double-track line on Second Avenue to be a part of the Second Avenue extension. A crossover will be built through Gaston Park from Second Avenue to Exposition Avenue to take care of cars from the storage track to the loading station. The loading station will be entered through pay-as-you-enter gates, which will greatly facilitate the handling of large crowds. In return for these privileges, the Dallas Railway will deed to the City of Dallas the 30-ft. roadway extending from Gaston Park and Parry Avenue, known as Exposition Avenue, title to which is held in fee by the company.

Southwestern Traction Company, Temple, Tex.—The property of the Southwestern Traction Company, which operates a line between Belton and Temple, has been sold under order of the United States Court to F. W. Downs, Temple. It is stated that the company will be reorganized and important improvements made to the property.

Seattle, Wash.—The Puget Sound Traction, Light & Power Company recently made application to the City Council of Seattle for a franchise for a line to extend across the new steel bridge spanning the Salmon Bay Waterway at Fifteenth Avenue, N. W., and a second application for the right to discontinue service on the streets leading to the temporary bridge at Fourteenth Avenue, N. W., reached by the company over private right-of-way. The application for the bridge franchise was referred to the utilities and franchise committees. The bill granting the company operating rights on the second temporary bridge across the west waterway at West Spokane Street was passed by the Council. This right is to be enforced until a permanent bridge across the waterway is constructed, when the company will operate under a franchise granted many years ago by King County, before the annexation of that territory to the city of Seattle.

Seattle (Wash.) Municipal Railway.—The Street Department of the city of Seattle, Charles R. Case, Superintendent, has completed the grading for the Ballard extension of Division A of the Seattle Municipal Railway to the connection with the Loyal Heights Street Railway at Twenty-third Avenue Northwest, and West Sixty-seventh Street, and has laid the track within one block of the Loyal Heights line. However, delay in getting the material for crossovers will prevent operation of the line until the middle of January. The utilities and street department recently inventoried the property of the Loyal Heights Railway, and made a report to the Board of Public Works. The purchase and transfer of the property to the city has been authorized as soon as the corporation counsel passes upon a satisfactory title. Acceptance of the Loyal Heights line by the city of Seattle will make it possible for the residents of that district lying along the Loyal Heights line from Market Street to the city limits at Thirty-second Avenue, N. W., and West Eighty-fifth Street, to reach downtown without a transfer, with but one fare.

Monongahela Valley Traction Company, Fairmont, W. Va.—This company reports that it will construct 4 miles of new track in the city of Fairmont and will rebuild 1 mile of track during 1918.

Shops and Buildings

Saginaw-Bay City Railway, Saginaw, Mich.—Fire recently destroyed a large section of the carhouse and thirty-five cars of the Saginaw-Bay City Railway.

Power Houses and Substations

Alabama Power Company, Anniston, Ala.—It is reported that the Alabama Power Company plans extensive improvements and additions to its Warrior River electric plant to provide power for the operation of the new cyanamid plant now in course of construction for the Government. The work is estimated to cost about $3,000,000.

Chicago, Milwaukee & St. Paul Railway, Chicago, Ill.—Plans have been prepared by the Chicago, Milwaukee & St. Paul Railway for the construction of a substation at Renton, together with three bungalows.

Burlington Railway & Light Company, Burlington, Iowa.—The erection of a transmission line from Burlington to Mediapolis, Morning Sun, Wapello and Winfield is contemplated by the Burlington Railway & Light Company. The company has asked the City Council of Morning Sun for a franchise to furnish electricity to that city.

Public Service Railway, Newark, N. J.—The Board of Public Utility Commissioners of New Jersey has approved the application of the Public Service Railway for permission to issue $1,250,000 of its capital stock at par to be used for extensions to its plant.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—The engineering department of the Puget Sound Traction, Light & Power Company is completing the installation of an additional penstock at the White River hydroelectric plant, which is about three-fourths completed. Foundations for the 16,000-kva. generator and water wheel have been placed. The plant when completed will cost about $750,000.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS

FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES · MARKET QUOTATIONS · BUSINESS ANNOUNCEMENTS

Market Conditions of 1917 in Review

Industry Reaches Lower Limit of Purchasing Ability, While Prices Showed a Marked Upward Tendency—Brighter Outlook for the New Year

Within the year just closed manufacturers and supply men generally experienced the least electric railway buying of any year during the past decade. Fare increases and better rates for money were held to be necessary to equipment expenditures. The former was slow and the latter did not materialize.

Less rolling stock was ordered during 1917 than in 1916 by some 38 per cent. The mileage of new electric railway trackage was less than in 1916 by a little over 40 per cent. Since so many other items depend on these two and since 1916 was also a particularly bad year, it can easily be appreciated to what extent the railway supply market has suffered. Many manufacturers in this line have been forced to take government munition contracts in order to keep their plants going.

Where the manufacturers had other than street railway business to depend on an excellent business was handled.

Electrical Trade $750,000,000

Starting with a heritage from the previous year of a quarter of a billion of dollars of unfilled orders, the electrical manufacturing industry in 1917 far exceeded the record set in 1916 both in buildings and bookings. Although the country was engaged in war nine out of the twelve months of the year, the industry has shown on the whole no diminution of output but rather a very considerable increase. Careful and conservative estimates place the 1917 billings of electrical manufacturers in the near neighborhood of $750,000,000, while unfilled orders at the close of the year were certainly not less than $300,000,000. Thus the 1917 electrical manufacturing industry can be said to have passed the billion dollar mark.

Turbine production for 1917 was early sold out, and by the first of June, 1918 and 1919 production for large sizes had been booked, with orders running in 1920. The largest single order on record, 200,000 kw. in turbines, was placed in May.

Transformers and motors in large sizes were particularly hard to obtain after the middle of the year. Production has been booked far ahead. In the early fall it was estimated that manufacturers were 150,000 motors (of all kinds) behind orders.

The second-hand market flourished as never before during the year. High prices prevailed. Dealers found it very difficult to secure equipment. Much of this equipment was ordered only until such time as new goods could be delivered. In this way some machines were sold and resold many times in the year.

One-Man Cars Popular

In strictly electric railway material certain products did show a stimulus of sales. One-man cars, while by no means a new idea, grew considerably in popularity. They seemed to fit in well with economy of operation plans. Besides the sale of pay-as-you-pass cars grew considerably. Other equipment designed for repair work was in greater demand than ever before. Conditions were favorable to the sale of new fare collection devices in which there was particular progress.

Prices, except for certain raw materials, had an upward tendency throughout the year, but not to such a marked degree as in 1916. Glass and porcelain products increased, as did many other staples. As the year closed announcement was made of the first increase in the price of incandescent lamps. On the other hand, certain products, including wire, were lower in price as the year came to a close. Rails advanced considerably during the year, as did practically all car, track and line hardware.

Metal Prices Lower

In the raw-materials market the government price-fixing program, which found expression in September in lowering the price of copper and steel products, has been the dominating factor. Metal prices, except for tin and nickel, were much lower in December than in January. Following is a comparison of metal prices in New York during the first and last weeks of the year:

	Jan. 3, 1917	Dec. 24, 1917
	£ s d	£ s d
Copper:		
London, standard spot	113 10 0	110 0 0
Prime Lake	29.00 to 29.50*	Govt. price 23.50
Electrolytic	28.00 to 29.00*	Govt. price 23.50
Casting	27.00 to 28.00*	Govt. price 23.50
Wire base	36.00 to 38.00	27.00*
Lead, trust price	7.50	6.25
Nickel, ingot	50.00	50.00
Sheet zinc, f.o.b. smelter	21.00	19.00
Spelter, spot	9.67½ to 9.92½	7.67½
Tin, Straits	42.75*	85.00‡
Aluminum, 98 to 99 per cent	55.00 to 58.00*	34.00 to 36.00
Heavy copper and wire	24.00 to 25.00*	22.00 to 22.50
Brass, heavy	14.50 to 15.50*	14.00 to 15.00
Brass, light	10.50 to 11.00*	9.50 to 10.50
Lead, heavy	6.50 to 6.62½*	5.75 to 5.87½
Zinc, old scrap	6.00 to 6.25*	5.00 to 5.50

*Nominal. †None offering.

Two of the greatest difficulties that the trade has had to contend with during the past year have been labor shortage and transportation congestion. Both have handicapped production and deliveries. In the manufacturing industry there were fewer strikes and less serious ones than during 1916. Labor, however, was still roving. There was a serious shortage throughout the year in mechanics and similar skilled labor and in unskilled labor. Of the other large class of labor, however, statistics show a growing percentage of unemployed. After the war broke out the labor situation became worse. First, the army and navy took a large percentage of the male labor in the manufacturing industry, and second, the government, through cantonment construction and the shipyards, put a severe strain on labor by offering an opportunity to earn the largest wages on record in the United States for that kind of labor. In addition, the female labor supply apparently became less.

A large amount of female labor is employed in electrical manufacturing, and the scarcity has hampered production considerably. Higher wages were paid during the year and high-cost-of-living bonuses were given by manufacturers rather generally.

The only ray of hope in the labor market came in the winter months early in the year, when the closing of plants that had completed war contracts for Russia and other warring nations released large numbers of skilled workmen. The entrance of the United States into the war, however, made the demand for this kind of labor more acute than ever.

On Sept. 1 the child-labor law guarantee was demanded of dealers as well as manufacturers.

Transportation Difficulties

Transportation congestion as the year opened was very bad, growing worse until the Eastern seaboard in March was in an almost hopeless condition. This was a great handicap to

both buyers and sellers in deliveries already very long. Embargoes were placed on freight for export shipment and a lot of other material eastward bound. The lack of tonnage for export caused docks and warehouses to be filled to capacity, rendering the removal of goods still more difficult. During the summer months, however, the shortage in freight cars was decreased by about a third, but by September it was worse than ever. The transportation situation became still more serious until the government, feeling that private operation could not solve the problem, even with transportation priority orders, stepped in a few days prior to the end of the year and took over the control of all roads under Secretary McAdoo.

STANDARDIZATION

Standardization was urged during the year by both purchasing agents and supply men. A large amount of thought has been given to this subject in past years, but owing to the discontinuance of convention work by the American Electric Railway Engineering Association, no actual progress during the year, so far as the formal adoption of standards is concerned, can be reported. Informally, however, perhaps more progress in car standards was made during 1917 than in any previous year, because of the general acceptance by one-man safety car users of the Birney design.

The outlook for the new year, however, is considerably brighter. Prices, generally, seem to have gone about as high as they will go. Buying is expected to increase considerably. Roads have deferred purchases to the extent where they must of necessity be made soon.

Condition of Copper Wire Supply and Demand

Anticipated That the New Government Price on Copper Will Not Affect Price of Wire

Following the conference of the Board of War Industries with the producers of copper Dec. 14, it was surmised that a change in the price established several months ago might follow. As yet no change has occurred, and there is a division of opinion among authorities on the subject whether a revision will be made Jan. 1. One of the best informed experts is of the opinion that if a new price is announced it will be a higher one. Should this be so it will not affect the market on wire. Base remains at 32 cents to 34 cents.

There is a large demand for armored cable on order of the government for the submarines, and therefore it can only be promptly and efficiently met by the manufacturers direct. Code wire used in building construction, which is almost negligible, is also selling heavily for governmental work. Hard-drawn wire for leading-in wire and copper-clad for telephone and regular signal wire are being called for. Copper-clad is being used more than hard-drawn. Underground cable, made of oiled cambric and lead-covered—power cables and feeders—is also in special demand, with heavy sales reported.

Deliveries are spoken of as fairly satisfactory, code going out of stock in large quantities. On steel-tape cable shipments can be made in from six to eight weeks, provided that the steel can be had. No positive promises can be made on these goods, delays being occasioned by the quantity and size designated. Primary hands are under the impression that not much wire is in the jobbers' stocks or with the distributing houses. It is believed that the copper situation is not so trying as it threatened to be a few weeks back. One jobber said that wire had loosened up and dropped a few points in price, and that deliveries were almost normal.

Supply Men Expect Freer Buying

Retrenchment Policy Has Been in Effect So Long That the Need for New Equipment Becomes More Urgent Daily

For a long period the accessories and supplies people have looked forward to a time when the railways would again be in the market. This state of affairs has not materialized, though there are indications of better buying than has been noted. The improvement, slight as it is, brings the thought to the front that it will be of a progressive nature, gaining momentum as it develops. That the railway companies have curtailed orders for new rolling stock, track maintenance and equipment in general to almost the vanishing point, is more than a twice-told tale. So far has this retrenching policy been carried, say the sales agents, that more than a few roads are now most inadequately supplied with equipment.

The supply branch of the trade is firmly of the opinion that purchases on a considerable scale must soon begin again. This thought has for its basis three conditions. The first is the largely increased traffic which most roads are reporting. The second is that a purchase not made is simply a purchase delayed and that in the meantime both track and cars are wearing out. In the third place, the supply men hope and believe that in general the pending applications for increased fare will be granted. This will mean that the roads will have the money, or the credit, which they have long needed to buy new equipment. Of course, prices are now high, but that is necessarily not a deterrent to purchases if there is no immediate prospect that the prices will go lower. There does not seem to be any immediate prospect of this.

Western companies are buying more freely of rolling stock than the Eastern roads. A "break" is looked for, and on this account, as much as anything else, an effort is being made to keep prices at the present level. The argument advanced is if the railways are not buying now, a further advance in price would certainly not be an inducement to bring them into the market.

Manufacturers Working Closer to Government

Possibility Exists, Should Volume of Orders Greatly Increase, of Allocating Work According to Factory Conditions

By working closer to the government through the electrical division of the War Industries Board the electrical manufacturers have been better able to know the government's needs and to take care of them. At present the manufacturers will receive lists of government requirements daily. However, should the demand become large in volume, it is contemplated that weekly allocations of orders shall be made.

Similar action was taken earlier in the year on a number of electrical supplies by manufacturers' committees. The results accomplished were much more satisfactory to the government and to the manufacturers than the previous method of awarding government contracts. Now there is a possibility of extending this plan to the entire industry. Through this procedure the government can obtain its requirements in the minimum time and at the minimum cost. Furthermore, no manufacturer is unduly loaded up with government work.

To buyers other than the government the results are desirable, for deliveries, while longer perhaps throughout the entire field, are nevertheless surer.

The demand for electrical goods for war purposes is increasing. Still, there appears to be an electrical manufacturing capacity in excess of direct government needs. Manufacturers are being asked by the War Industries Board whether the indirect demands from secondary sources will absorb the available capacity.

Freight Handling Opening Up on Pacific Coast

Smaller Roads Expected to Purchase Special Equipment Before Long

The steadily increasing possibilities in the freight business have opened up a profitable field for the electric railways of the Pacific Coast which has materially improved the outlook. It is as yet too early to expect orders for special equipment for freight purposes but at the present rate of freight business increase this can be expected from the smaller roads before long. The Pacific Electric Railway in southern California territory has developed the largest volume of freight business and the shops of this company have been busily at work on freight-handling rolling stock. Some smaller lines have practically all the freight business they can handle. This has developed still more rapidly since the gondola car embargo went into effect, particularly in agricultural districts. The heavy crops that have been gathered in most all lines this year are helping materially to swell the freight traffic.

Rolling Stock

New Jersey and Pennsylvania Traction Company, Trenton, N. J., is reported as contemplating buying some new cars. It has already inquired for part of the equipment.

Saginaw-Bay City Railway, Saginaw, Mich., by fire had destroyed thirty-five cars together with a large section of the carhouse. The loss is placed at $200,000. Street car traffic was paralyzed for several hours following the fire.

Southern Public Utilities Company, Charlotte, N. C., and the Montgomery Light & Traction Company, Montgomery, Ala., have recently changed a number of their open-end cars to the prepayment type. The work was done in the shops of Perley A. Thomas, High Point, N. C.

Tacoma Railway & Power Company, Tacoma, Wash., is reported as having purchased ten motor cars, costing $3,000 each, f.o.b. Tacoma. The cars have 57 hp. each and will seat fifty-two passengers. Additional cars of the same type will be acquired for the Tacoma Municipal Railway, known as the "Tideflats" line.

Moscow (Russia) Tramway Company, through an agent now in New York, N. Y., is negotiating for brakes with the Westinghouse Traction Brake Company, Pittsburgh, Pa., for fifty motor cars. The cars are to be built by a Japanese company at Darien, South Manchuria, China, the agent here only placing orders for trucks, motors and air-brakes.

Cleveland (Ohio) Railway is reported as having bought twenty-five new all-steel cars, costing $8,000 each. They weigh 31,900 lb. as against the 45,000 lb. of the half-steel, half-wood cars now in use. The cars of the new rolling stock are 50 ft. long, seating fifty-three persons, with front entrance and side exit. Larger and plainer signs are also fixtures. The purchase was authorized by the City Council some time ago. These are the first all-steel cars to be introduced in Cleveland.

Union Railway, New York, N. Y., which operates in the Borough of the Bronx, and is controlled by the Third Avenue Railway Company, in order to comply with the recommendation of the Public Service Commission of the First District, is reported as being obliged to build its own snowplows. The commission suggested light new efficient plows be provided by the company, to properly combat the winter storms, but as the snowplow manufacturers are in no position to make early, let alone immediate, delivery, it is obliged to construct, out of rolling stock on hand, plows that will answer the purpose temporarily.

New Advertising Literature

Poole Engineering & Machine Company, Baltimore, Md.: The company is distributing its bulletin No. 100, descriptive of its turbo gear.

Walter A. Zelnicker Supply Company, St. Louis, Mo.: Bulletin No. 232 lists the company's latest offerings of engines, boilers and general supplies.

De La Vergne Machine Company, New York, N. Y.: Large practical calendar for 1918, has accompanying illustrations of the company's products, arranged in striking form.

Titanium Bronze Company, Inc., Niagara Falls, N. Y.: A pamphlet, "Phosphor Bronze Castings," describing and illustrating its products in this line and its experience in the compounding of brass and bronze alloys.

Rubber Insulated Metal Corporation, Plainfield, N. J.: Illustrated four-page circular, dealing with the company's Rimco rubber insulated pliers, which it states were tested and passed for 10,000 volts by the Electrical Testing Laboratories of New York, N. Y.

Youngstown Sheet & Tube Company, Youngstown, Ohio: The company is distributing a very attractive calendar for 1918. It is featured by twelve large two-color illustrations of as many different operations in the manufacture of iron and steel. The plates were made from photographs taken in the works of the company and are both handsome and instructive. The calendar will be sent to any address on receipt of 4 cents in stamps to pay cost of mailing.

Trade Notes

Perley A. Thomas, formerly chief engineer of the Southern Car Company, has now established a business for himself in High Point, N. C. Mr. Thomas has had many years experience in car work of all kinds.

Ridgway Dynamo & Engine Company, Ridgway, Pa., announces the appointment of the Blake Electric Manufacturing Company, No. 1 Rowe's Wharf, Boston, as its sales representative for the New England states.

Blaw-Knox Company has closed its Philadelphia office for the present and Mr. Pulis, who has been in charge, is transferred to its San Francisco office, to take the place of Mr. Burrows, who is going into the service of the government.

W. C. Carter has been placed in charge of the sales office at Grand Rapids, Mich., of the Westinghouse Electric & Manufacturing Company for the handling of western Michigan business. This office is under direction of the company's Detroit office.

Brown Company, Portland, Me., formerly the Berlin Mills Company, has acquired the property and business of the Burgess Sulphite Fiber Company. The new company will be carried on under the same control and management as heretofore, dealing in, among other things, a line of fiber conduit.

Electric Storage Battery Company, Philadelphia, Pa., has recently completed an eight-story reinforced concrete building. The buildings contain more than 20 acres of floor space. The yard space covers an area of 4 acres. and tracks from two railroad lines run directly into the yards of the works.

W. G. Lawrence has opened an office in the Spitzer Building, Toledo, Ohio, to engage in electrical engineering, and will make a specialty of power plant designing, steel lighting and supervision of construction and electrical installations. One of the associates of Mr. Lawrence is H. A. Seward, who recently came to Toledo from Chicago to join this firm. Mr. Lawrence, also a Chicago engineer, established himself in Toledo several years ago.

RAILWAY MATERIAL PRICES

	Dec. 24	Jan. 3
Rubber-covered wire base, New York, cents lb.	32.34	30
Wire, weatherproof, cents per lb., New York.	34¼-38	34¼-38
Wire, weatherproof, cents per lb., Chicago...	38-38.35	38-38.35
Rails, heavy, Bessemer, Pittsburgh.....	$38.00	$38.00
Rails, heavy, O. H. Pittsburgh, per gross ton.	$40.00	$40.00
Wire nails, Pittsburgh, per 100 lb.....	$3.50	$3.50
Railroad spikes, 9/16 in., Pittsburgh, per 100 lb	$3.90	$3.90
Steel bars, Pittsburgh, per 100 lb.....	$4.50	$5.00
Sheet iron, black (24 gage), Pittsburgh, 100 lb.	$5.80	$5.80
Sheet iron, galv. (24 gage), Pittsburgh, 100 lb.	$4.85	$4.85
Galvanized barbed wire, Pittsburgh, cents lb..	$4.35	$4.35
Galvanized wire, ordinary, Pittsburgh, cents lb.	$3.95	$3.95
Cement (carload lots), New York, per bbl..	$2.22	$2.22
Cement (carload lots), Chicago, per bbl.....	$2.31	$2.31
Cement (carload lots), Seattle, per bbl.....	$2.65	$2.65
Linseed oil (raw, 5 bbl. lots), New York, gal.	$1.26	$1.26
Linseed oil (boiled, 5 bbl. lots), New York, gal.	$1.27	$1.27
White lead (700 lb. keg), New York, cents gal.	10	10
Turpentine (bbl. lots), New York, cents gal..	47½	48½

*Nominal.

NEW YORK METAL MARKET PRICES

	Dec. 24	Jan. 3
Copper, ingot	23½	23½
Lead, cents per lb.....	6½	6½
Nickel, cents per lb.....	50	50
Spelter, cents per lb.....	6.35	7.82½-7.92½
Tin, Straits, cents per lb.....	*85.50	*85.50
Aluminum, 98 to 99 per cent, cents per lb....	36	36

OLD METAL PRICES—NEW YORK

	Dec. 24	Jan. 3
Heavy copper, cents per lb.....	22	22
Light copper, cents per lb.....	19½	19½
Red brass, cents per lb.....	17½	17½
Yellow brass, cents per lb.....	14¼	14¼
Lead, heavy, cents per lb.....	5¾	6.00
Zinc, cents per lb.....	5	5½
Steel car axles, Chicago, per net ton.....	$44.00	$42.42
Old car wheels, Chicago, per gross ton.....	$34.00	$35.00
Steel rails (scrap), Chicago, per gross ton..	$34.50	$33.00
Steel rails (relaying), Chicago, per gross ton.	$55.00	$55.00
Machine shop turnings, Chicago, per net ton..	$17.25	$17.50