

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Sell More Transportation on Its Quality

WE HEARD an official of an automobile manufacturing company say the other day that he never went to his office in his auto in the morning, "for," he said, "I think too much of my morning newspaper; I go on the street car." Here is a man who enjoys his breakfast with his wife and family without a newspaper barricade to separate them and then takes advantage of one of the good features of street car riding to learn the morning's news. It's an old story to electric railway men, but how much are we doing to tell such stories to the public to whom we want to sell our rides? Why not sell more goods on their quality?

If a grocer or other local merchant wants to maintain his trade in the face of new competition, mail order inroads and of individuals supplying their own needs in various ways, he brushes up his wares and tells the public why he is still prepared to give them the best service and what the good qualities of his wares are.

Of course, we admit your rejoinder that the electric railway is a public utility and on a different basis. But there are many features of other businesses which can well be put to greater use in the electric railway business, and selling rides on quality is one of them. The little newspaper story above is an example of one advantage of electric railway rides which cannot be enjoyed in the average jitney or motor bus or private automobile.

The Significance of Electrification

LAST June the JOURNAL published an article by E. G. Buckland, vice-president of the New York, New Haven & Hartford Railroad, under the above title. This week we publish abstracts of some of the principal addresses scheduled to be presented at the joint meeting of Mechanical and Electrical Engineers in New York on Friday, Oct. 22, as announced in detail last week. It is both interesting and instructive to note that in the article by the railroad executive and in the papers by mechanical and electrical engineers the leading theme is not the mechanism which is to be used to haul trains or produce train-miles so much as it is the comparative effectiveness of the service to be performed by the two agencies. What the public is interested in, and therefore what the railroads are interested in providing, is transportation service. Broadly considered, the public is interested in coal conservation as such, but most concretely is the public interested in the transportation service rendered and the cost of the service. As pointed out by Mr. Buckland, the terminal advantages in large cities are a part of both the service rendered and of economy.

But here, with engineers discussing the steam versus the electric locomotive, while each advocate of his own agency is proud of and dwells upon the efficiency and power consumption, the weights, the tracking qualities,

the speeds, etc., they all rest their case and their own decision on the service ultimately rendered by the entire system. That the electric locomotive as such has reached a stage of most practical development is not disputed. That the steam locomotive has increased its dependability and efficiency and is, as a machine, almost perfection is also evident, and this fact should be recognized by the proponents of its electric rival. But certainly, under many modern transportation conditions, the electric locomotive shows a necessary field for itself in which the steam locomotive is already a hopeless competitor, and must soon be displaced entirely. As a result of the consideration of this subject in the joint meetings there should be developed a much clearer conception of the fields of the two systems under present conditions and also what factors will determine, under future conditions, when the electric locomotive is to displace the steam.

An Idea, and a Personality

THOSE who were fortunate enough to hear Martin Schreiber, chief engineer of the Public Service Railway of New Jersey and manager of its Southern Division, give his address on training electric railway personnel at Atlantic City could not help catching the enthusiasm of the speaker for his subject and his evident desire and ability to put his ideas into practice. The JOURNAL is printing an extended abstract of his address this week, but printed words are somewhat dead. Some will say, as some have said, that these ideas are not new, that they, the speakers, have been practicing along such lines for some time. Maybe so—maybe they think so, at least, but mere plans or ideas are one thing and success in using them is another.

The industry is always on the hunt for new ways of solving problems, but it cannot guarantee that a method successful in one place will make good somewhere else. As regards mechanical matters, such as the babbitting of a bearing, a strict following of the procedure of the successful pioneer is likely to be successful. Unfortunately this is not true where the human element is involved. One railway achieves a commendable result with a wage or a merit or a co-operative system, but another, hastening to adopt it, fails to attain similar success. The practice of both railways being alike in all externals and the human nature of the employees being much the same everywhere, shall we not look for the answer in the personalities of the different managers and their aides?

The successful man succeeded only because he believed in his plan so thoroughly that he made all his staff believe in it, too, so that they in turn carried the message to the rank and file. It succeeded because everybody soon learned that the Boss meant just what he said and would not be turned from his

purpose. The plan did not succeed on the second property because the manager gave a smoker to the boys, made a sympathetic address and then left the working out to a lot of "unsold" petty officials.

In other words what is needed for accomplishment is an idea *plus* a personality, a plan coupled with the enthusiasm and ability to put the plan into operation.

No one can have heard Mr. Schreiber without being convinced that he has both these attributes. He also has, clearly formulated, the constructive ideas with reference to railway personnel which should do much to maintain an effective organization with the necessary co-operation between men and management, all of which is needed for the successful operation of a railway property. He makes no claim that these are all new and admits that he learned much of what he now sets forth from the present Lord Ashfield. Certainly every one hopes that Mr. Schreiber will have the fullest opportunity to put these ideas into effective practice at Camden. But, more, it is to be hoped that others in a position to profit by them will see in his ideas and plans suggestions which they can apply, coupled with their own personalities. The industry needs more of such ideas and men.

The Call for Increased Effort All Along the Line

RENEWED energy and a determination to work out their problems to a successful issue should be one of the results of the Atlantic City convention. No one could have attended the meetings there without being strongly impressed with the essential nature of the industry and the solidity of its future. Hard work will be required to solve all the problems, but hard work is no deterrent to a man of courage where there is hope of ultimate success, and in the railway industry there is not only hope now, but the final triumph is practically in sight.

The same resolution to do better work should extend all along the line in every railway organization. In fact, efforts toward higher efficiency and greater production are the order of the day in all industries in this country, and the electric railway field should be no exception. During the war the fall in manufacturing output per man employed was a common complaint, but there were many reasons to account for the demoralization and high turnover which characterized the operating forces of that time. Many employers declared that they could afford the higher wages which they had to pay if only labor would increase its rate of production.

Now the desired increase in efficiency seems to be evident. In a recent inquiry made by the Federal Reserve Bank in New York of thirty-one of the largest corporations in the country, all except nine report improvements in this regard. None of the concerns reported any decrease in efficiency, five reported that there was no change one way or the other and four were unable to draw conclusions from any data at hand. Others quote definite increases, such as one of the large steel corporations quoting 6 per cent, two clothing factories 7 to 8 per cent and other large concerns from 10 to 17 per cent as compared with a year ago. With these figures the turnover of employees is said to be decidedly less than formerly, and more men are looking for work.

Such an increase in efficiency will be one solution and

the most satisfactory all-around solution for the present high wages paid to electric railway employees. For example, if the shop man will do more work in the same time he may extend the period during which the company is warranted in paying war wages in spite of reduced living costs. If the motorman can operate his car so carefully and skillfully as to warrant the management in increasing the schedule speed of the road and if the conductor will co-operate in this effort and stimulate traffic by merchandising methods they will justify the increases which they have received during the past five years.

This is a time when all departments should make a special effort to pull together. There is every reason and every inspiration for such a movement now. Let this be the spirit to animate the entire organization of every electric railway company during the coming year.

Making the Interurban a "Real Railroad"

ACENTRAL station manager, unversed in electric railway matters, was recently invited by the writer to return to Chicago from Milwaukee by way of the North Shore Line instead of the steam road. With some hesitancy at the thought of a 100-mile interurban ride, he was finally persuaded. On the way down, while enjoying an excellent dinner in the dining car, the last of a four-car train, and traveling at 80 miles per hour, he exclaimed: "Why, this isn't an interurban! This is a steam road, but run by electricity."

And so it is. Great things have been done to make the North Shore Line a "real railroad," and it may now be said that it is one of the leading show lines of the country in general physical condition, equipment, service rendered and morale of employees. Its earnings are also satisfactory and improving rapidly, and the people along the line are actually talking about it and boosting it to their friends. This did not happen by chance. It has come from a lot of hard work and the practicing of the principles which were set forth in an article in the Oct. 2 issue by Britton I. Budd. It means that a very unfavorable public reaction toward the road only a few years back has been turned into indorsement through the pursuit of a single purpose—to give good service, with all that that embodies.

The courtesy of the trainmen and their open interest in the road and the punctuality, speed and comfort of the service are things that impress one as he makes a trip over the line. Indeed, it is an inspiration to any one interested in the electric railway industry to take this trip to Milwaukee and return from Chicago over this electric railroad constructed and operated according to heavy traction practice.

The article by Mr. Budd referred to contains numerous suggestions about operating practices that will develop interurban lines into popular railroads. As written, it gives only the meat of a wealth of experience, omitting all the background or substantiating evidence for the conclusions drawn. Yet we know that none of these conclusions is without the backing of proved practice. While Mr. Budd doesn't say so, out of modesty in his accomplishments, all of the things recommended in his article have been done on the line which he directs, and that is why we are glad to give this special emphasis to his contribution solicited for the convention issue.

Way Standards Adopted Last Week an Important Step

ONE of the most far-reaching acts taken by any of the associations last week at Atlantic City was the acceptance by the Engineering Association, among the other recommendations made by the way committee, of its proposed uniform track spirals and curved heads for girder grooved rails. Both of these subjects have been treated extensively in this paper in the past, and action along these lines taken by the Engineering Association last week has been urged in editorials published in previous issues of this paper.

The adoption of a uniform system of track spirals should lead to many economies in the manufacture and maintenance of special trackwork, and the spiral system as presented by the way committee has the advantages of simplicity and adaptability for use in connection with partial renewals. The report emphasized the latter by illustrating the method of adapting the new spiral system to the renewal of a part of an old layout. We feel that the committee is to be congratulated upon its successful efforts to reconcile differences of opinion in regard to this subject which have so long prevailed among manufacturers and railway men. Having adopted the uniform spiral, it now remains for the engineers to see that its use is put into effect as promptly as possible.

The incorporation of a curved head or tread contour upon the standard girder grooved rails is another step in advance which should have a far-reaching effect in securing maintenance economies. The report of the committee treated the subject from every angle, and it will be noted that the committee recommended the adoption of designs for which rolls have already been provided. Meanwhile, it was unnecessary to change any other dimensions of the existing standard girder grooved rails.

The substitution of designs for standard section rails which have a greater demand than those now in the Engineering Manual is another step which is to be commended, and the committee has shown businesslike acumen in recommending the adoption of sections which may be obtained readily from the mills. The advantage of having manufacturers represented upon the committee is clearly shown in the treatment of this subject by the committee.

The committee reported upon an important subject in its discussion of the so-called impression test for girder rails. In line with comments which we have heretofore made, the committee expressed the belief that the impression test does not properly provide a test for brittleness and recommended further investigation with the view of developing some adequate test for brittleness which can be made as readily as the impression test. The matter is important, and we are pleased to note that the committee is alive to that fact. It is to be hoped that this year's committee, in co-operation with the manufacturers, can devise a test which will meet the requirements.

In recommending the new subject of the use of substitute ties, the committee recognizes the fact that such ties are being used to an increasing extent, and we are of the opinion that the 1921 way committee can lead the way in developing information as to the value of existing designs and at the same time it may consider the matter of the design of such ties as engineering structures. There seems to be a distinct field for

substitute ties in street railway tracks and the introduction of the subject is considered very timely.

For those who think that the life of railway physical property is readily determined, we recommend the study of the monograph by Victor Angerer attached to the report as Appendix H. Mr. Angerer gives an able exposition of the many variables which prevent the compilation of data which have any value and covering the life or limits of wear in special trackwork. The committee is fortunate in being able to present such an able treatment of a very difficult subject.

The thoroughness with which the report as a whole was compiled attracted much favorable comment both on the floor at the convention and on the side. In fact, and without any disparagement of any of the many other excellent reports presented at Atlantic City, it is proper to say that this report is a good example of what a convention report should be.

Philadelphia Goes to Seven Cents

ONE cannot avoid recognizing that the industry will attach more than ordinary importance to the latest fare change in Philadelphia, reported in the news columns of this issue. Philadelphia is the one large city in which a private electric railway management has acted on the policy of trying to maintain 5 cents as the initial unit fare. Because the management, under the conditions obtaining in Philadelphia, has been able to retain the 5-cent base for so long and has preached the policy as a good one elsewhere, there has been criticism from other managements which have had Philadelphia "flung in their faces" by their own communities when seeking fare advances to meet ever increasing costs.

Now that Philadelphia is to have a 7-cent fare, with reduced-fare tickets and a continuation of 3-cent exchange tickets, it is only fair that a correct interpretation be placed upon this move. As facts appear, the management, that is, largely, Mr. Mitten, has not abandoned the idea that the retention of the 5-cent minimum fare is still the best policy. The company asked for a 5-cent fare with no transfers whatsoever in the belief that the advantages of the 5-cent fare to the average rider and in attracting the short-haul passenger more than offset the disadvantages to the patron who has to use more than one car. There was no avoiding the fact that in Philadelphia, as elsewhere, costs of operation have risen. When the case came before the Public Service Commission, however, that body differed with the management and decided that with the traffic flow and conditions such as they are the retention of transfer privileges, even with a charge at some points, was more important than the retention of the 5-cent base fare. The arrangement is a temporary one, pending valuation and a final fare adjustment, and of course and rightly, when the final fare system is devised the voice of the management will probably have much influence in connection with the adoption of a permanent system.

What is apparent in the entire case, however, is that electric railway operating costs have gone up and income must go up in proportion. The question in Philadelphia has been as to the best way to increase the income. This has been decided by the Public Service Commission of Pennsylvania to be, for at least the present, a flat increase in the existing fare.

Training of Electric Railway Personnel*

General Principles to Be Followed in Dividing and Deputizing Executive Duties—
Application of These Principles on Public Service Railway
Property at Camden, N. J.

By MARTIN SCHREIBER

Chief Engineer Public Service Railway and Manager
Southern Division, Camden, N. J.

BEFORE taking up the main line of thought which I wish to lay before the delegates to the Atlantic City convention of the American Electric Railway Association, I wish to tell a story which illustrates the principles to be stated afterward. I live in East Orange, N. J., and to the right and left of me live neighbors each blessed, among other good fortunes, with a fine son of athletic tendencies. My right-hand neighbor wished to break his son of over-devotion to athletics and began by assigning for a certain Saturday the task of cutting the grass on the lawn. The purpose of this was to keep him off the baseball field on that day. The boy went to the field and explained the circumstances to his comrades, telling them not to wait for him after a certain hour. The task had been so planned by the father that it was out of the question for the boy to play, and he lost his game. Incidentally the team failed to win the game.

My left-hand neighbor tried somewhat the same tactics but with a different result. His son had the job of cleaning up the leaves, but instead of spending the time raking he brought his football team over to the yard and hurried the job through before the game was called. He explained to his father afterward that even if this had not been possible he had arranged for a substitute.

I tell this story because it seems to me that the second boy showed attributes which are necessary in any individual who is to carry executive responsibility. He did the task assigned to him, but he secured the co-operation of others and they were glad to co-operate with him because it was to their interest to do so. Take another illustration, from the experience of E. H. Harriman. When he reorganized the Southern Pacific it was his ambition to build up the greatest of transportation systems. For this purpose he sought out men who had the power of reflection, of initiative and of growth. He had difficulty in locating such a personnel, but afterward said that he could find in the subsidiary offices of the various companies that had been consolidated many men who were human machines but few that were any more. The story is told of him that, when seeking out people for his organization, he would go through the various offices and when he found a man surrounded with books and papers, too busy to notice what was going on, he would not stop; but when he found a man in a reasonably well-conducted office, apparently in thought, perhaps with his feet on the table, he was sure to give that man most serious consideration.



MARTIN SCHREIBER

Why is it difficult to find the ideal supervising employee? Simply because industry has not developed him. We have spent millions of dollars and much time in developing specifications for material, but little money or time in developing men. Lord Ashfield, or Albert Stanley as we knew him here, is considered one of the biggest transportation men of our time. At fifteen he was working as a switch-boy in the streets of Detroit; at twenty-five he was superintendent of the Detroit United Railway; at twenty-nine he was general superintendent of the Public Service Railway; at thirty-three he was manager and director of the London Underground Lines. Today, Mr. Stanley, barely forty-six years of age, is not only chairman of the board and managing director of the underground lines of London, but is a member of the British House of Lords. In a recent interview published in *System*, he says that "the secret of how to find big men, who I am sure are growing up to fill the big new jobs of the new century, is opportunity, opportunity and again opportunity; opportunity must be thrown at them—opportunity to educate and train themselves." From my observation, there are many officials in industry, including those in the electric railway business, who are engaged in suppressing the powers of reflection, of initiative and of growth in employees. Moreover, many officials think that before a man can become an executive, with responsibilities involving several departments, it is necessary for him to have a long specialized training in each department. By applying ordinary arithmetic it can be seen that following this procedure a man would have to be as old as Methuselah before he gets the executive job. By this time he is so old that he has lost all his enthusiasm.

The truth is that when a man has shown ability to excel in handling one department of the electric railway this is a good sign that he could be an executive for several departments. At least he should be in line for such opportunity. It is not necessary to maintain a man in an executive position because he has been tried out in it, but if a company never tries a man out it will never have available competent men to fill the bigger jobs. Some of us seem to forget that we who have been placed in executive positions had, ourselves, to begin at one time.

LEAVES FROM DAVISON'S EXPERIENCE

H. P. Davison, of the great banking house of J. P. Morgan & Company, was asked what plans and methods he had followed in accomplishing the large undertakings he performed in connection with his firm. His reply was: "If I had any definite plan, the first

*Abstract of paper read at annual convention of American Electric Railway Association, Atlantic City, N. J., Oct. 13, 1920.

was I would try and do my job and the work assigned to me a little better than any one else; second, I always groomed some one else for my job; third, I always studied and trained myself for the duties of the man in the position above me." These are very simple declarations, but they carry with them principles of tremendous importance. How many railways are there that have men groomed and ready to step into any of the supervisory positions in case of vacancies. No doubt in a large percentage of the companies if the manager or a department head or two should drop out there would be something of a panic in the "front office." Now, this should not be the case, but rather the reverse. If the manager or any of the department heads or any man in the employ of the company should leave, this ought to give the other fellows a chance and thereby introduce new blood and enthusiasm into the organization.

An organization that is stagnant and without enthusiasm is defeated at the outset; the whole organization gets into a rut and the men are, more or less, the machines that Mr. Harriman found. Certainly an unenthusiastic organization will never accomplish what Mr. Davison set out to do, to give service a little better than the other fellow. Emerson said in effect that if you manufacture only a mousetrap and make it better than any one else, even though you have a house in the woods, you will always have a trodden path leading to your door.

THE "SERVICE COMMITTEE" IS PROMISING

One of the bugaboos in connection with the railway organization is the securing of teamwork or proper co-ordination. There is much overlap of departments and a tendency for one department to shift responsibility on another. Besides, even where there is loyalty, criticism of the management is often heard. One of the best ways to overcome this difficulty is to insist that the department head take an active part in the management.

On the southern division of the Public Service Railway, at Camden, N. J., we are trying out a new organization plan. Every Friday all department heads gather to lay out the operating policies and work of the railway for the ensuing week. They discuss all questions man-fashion. When anything is decided, every member of this "Service Committee," as it is called, is back of the decision and he is responsible for the outcome. The department heads not only carry out instructions given them, but they help to make the orders. This develops the traits that Mr. Harriman was looking for to run his great transportation system.

RESPONSIBILITY OF DEPARTMENT HEADS

We also insist that every department head be a "real boss" as far as his department is concerned, and he is strictly responsible for the work coming under his jurisdiction. At the same time he thoroughly understands that as a whole the railway is more important than any one department. Besides, he is expected to break in a man under him to assume his position in case of necessity. His cardinal duties are to do his job as well as he can, to train a subordinate to fill his position and to study for advancement. For example, it is up to the manager to "groom" department heads for the position of manager; to the superintendent of equipment to train an assistant for his job, and so on down the line. The ultimate goal of this committee is to

produce the best service we can and to sell it to the public. We want the public to be a willing and pleased purchaser. We hope to have our business relations with our patrons exactly on the same basis as those of the high-class department stores with their patrons. In the last analysis the public must be the final judge of what constitutes a satisfactory service.

PASSING SERVICE DOWN THE LINE

Now the service committee idea is not going to stop at department heads. Each department head is going to inject it into his own department. We believe that this system will produce a different grade of employee from that which we have at present and put a personal touch into transportation business that cannot be had in any other way. For instance, the operating department will be run largely by consultations of the superintendent of transportation, the assistant superintendents, the road officers, the inspectors, the carhouse men and so on. Their meetings will be so arranged that the ordinary routine of business will not be interfered with and all the men that have any supervising work, that is those who have charge of other men, will have an opportunity to take part in these consultations at least once a month. We expect to go further. One of the inspectors on each line will be responsible for that line and he will know its daily receipts and costs. Few facts will be withheld from him and his business will be to make suggestions for improving the service and pleasing the public as well as to do his daily routine work. We shall expect this inspector or road officer to consult with other inspectors, if there are any others on the line, and also to discuss the run receipts and costs with the particular crews involved, seeking from them new ideas for bettering the service and pleasing the patrons. In doing this we shall be developing those important qualities that every employee possesses to greater or less degree and that will keep the enthusiasm of the organization keyed up to the highest pitch. Besides we are selling our service first to the employees before we sell it to the public.

ANOTHER COMPANY SECTION TO BE FORMED

Besides the official education and development of the men which I have described, we propose to institute another company section of the American Electric Railway Association at Camden. Some semi-official organization seems necessary for the rank and file of the organizations, in the meetings of which the entire railway situation can be discussed in open forum. The position of the electric railway business requires that the most accurate and complete information be given to the public in order to secure co-operation between the car riders and the company. Public opinion of the railway in a general way is obtained by the public through contact with the company's employees. Besides this local consideration, the company section has the advantage on account of its affiliation with the national association. Thus the employees secure an idea of what is going on on properties other than the one with which they are identified. Often the employees' attention may be called to some improvement of practice elsewhere, which by slight modification can be adapted to conditions on the local property.

The company section has many other advantages that have been brought out frequently. It has always been a conundrum to me why the usual electric railway manager has not taken more interest in the company

section. I have argued with electric railway officials who cannot see where they are going to get back the money, time and energy that would be required to institute and maintain a section. Almost in the next breath they would complain of poor public relations. How a railway expects to improve public relations without beginning at home and talking to its own men about proper public relations and the real facts about the railway is beyond my comprehension.

THE "RANK AND FILE" OF THE ORGANIZATION

The attitude of the company and its supervisory officials toward the rank and file is one of the most important problems with which we have had to deal. This body of men today is not what it was even five years ago. The requirements of the men are becoming more and more complex. The other day I saw a poster of the United States Army recruiting service. The poster said: "Get a free education; select any one of six countries; select any one of fourteen branches." Many believe that all the men want is more money; this may appear so on the surface, but I do not believe it. Of course, we should pay a living and a reasonable wage, based on what is being paid in like industries elsewhere, but modified to suit local conditions. Our greatest difficulty lies in the fact that many officials entrusted with the charge of men are unfitted for the job.

I believe that proper negotiations with men must in the final analysis be based on one and only one rule, the Golden Rule or the fair deal. To the employer I would say that you will seldom if ever make a mistake in handling a man if you will make an earnest and conscientious effort to find out all the particulars in his case and then put yourself in his place before you make a decision. If you find a dissatisfied man in your organization, do not turn your back on him. Call him in and endeavor to find out the trouble. Probably a personal matter has discouraged the man; in that case try to make a constructive suggestion. The employee may be dissatisfied with his job. Then it is your duty to try and get him other work, maybe in another department. If he is dissatisfied with his pay try to get him more money. This does not necessarily mean an increase in the rate but it may be possible to place him in different work where he will receive more remuneration. It may be necessary to suggest that he do some overtime work, or work on the outside, or again you may have to send him to one of your friends. Do not be afraid to make it a practice to say to every man leaving the service of the company who has not been dishonorably discharged, "If you ever want to come back, we will be glad to do everything we can to place you," for remember that man, even if he is not an employee of the company, may still be a patron of its lines.

True, you may not be able to get a man any more money, but you will find that he has appreciated your efforts and he will make a better and more loyal employee. One of the greatest compliments I ever knew one man to pay another was that of a crook working in a construction gang while I was in Paterson, N. J. After the crook had robbed all of his fellow employees he was apprehended by the police. He admitted he had robbed nearly every one except a certain foreman. That particular foreman, he claimed, he could have robbed many times, but he was the only one in the railway, in his opinion, who had given him, a stranger in a

strange land, a square deal when he most needed it. He said he had worked harder for that foreman than he ever worked in his life and he never would regret it and would have starved rather than take a single cent from him.

CHARLES M. SCHWAB IS A REAL LEADER

One afternoon during the war I had occasion to visit the Submarine Boat Company in Newark, about the time Charles M. Schwab took charge of the Emergency Fleet Corporation. He came into the yard that afternoon and the first thing he did was to remove his coat and roll up his sleeves. He took one of the workmen by the arm and walked up to the platform with him. It just took about a minute for a person to realize that Mr. Schwab was a real leader. He spoke briefly to the men and when he finished there was tremendous applause from the brawny-armed workmen, with nods and smiles of approval from the officers of the boat company. It was evident that they were for him to a man; in short, he had won their confidence.

AN OFFICER OF PERSONNEL

In connection with the Camden organization, we propose to have one man in our organization who will be in charge of employment. He will hire every man who will be required to run the railway, in no matter what department. Before the employee is passed along for instruction or investigation, this superintendent of employment will interview him.

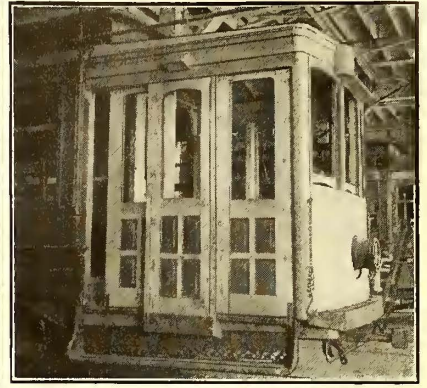
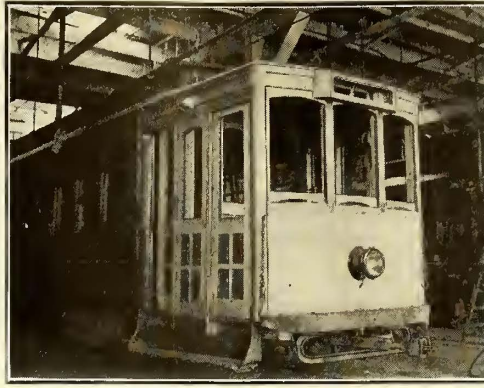
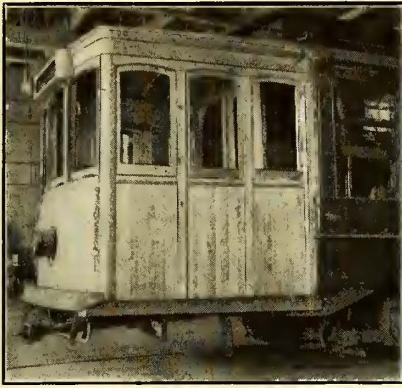
Many employees are ruined when first they apply for work. The first impression that the new man gets of the company is of great importance. The very fact that he is looking for a job indicates that he is not in the best kind of circumstances, hence a sympathetic attitude on the part of the company officials at that time may reach him and may win his favor and loyalty forever. On the other hand, a too critical attitude on the part of the company's representative, which, I fear, is not unusual, may cut him deeply. He accepts employment because of necessity for work.

It will be the business of our superintendent of employment not only to hire, train and follow the employee from the production standpoint, but it will also be his duty to keep in touch with him from a personal standpoint through his career with the company.

Welding Experts Active

THE American Welding Society is doing very effective work through its sectional and general activities. The Chicago section, for example, has just issued a booklet entitled "Keep the Guesswork Out of Welding." Copies of this may be had by addressing the American Welding Society, 608 South Dearborn Street, Chicago, Ill.

The society announces that members of the welding trade in Cleveland are making arrangements to form a section in that city. A meeting to consider the organization of a New York section was held in the Engineering Societies' Building, New York City, on Oct. 14. At this meeting it was decided to organize a New York or metropolitan section, and a nominating committee, a rules committee and a committee on membership and organization were appointed. The next meeting for the formation of this section will be held on Monday, Oct. 25, at 4 p.m.. Every one interested in the various processes of welding is urged to attend.



FRONT VESTIBULE OF CAR RECONSTRUCTED FOR ONE-MAN OPERATION IN SHOPS OF WASHINGTON WATER POWER COMPANY, SPOKANE, WASH.

Shop and Park Notes from Spokane

**Washington Water Power Company Operates One-Man Double-Truck Cars Successfully—
Also Has Natatorium Park, Which Is One of the Few Parks in
the Country That Pays**

SPOKANE, WASH. (pronounced Spo-kan', if you please), is a city well supplied with urban and suburban transportation facilities. The larger part of the urban service is furnished by the Washington Water Power Company, while most of the outlying lines belong to the Spokane & Eastern Railway & Power Company. The latter is part of the "Inland Empire System," which will be discussed in another article. The writer recently had an opportunity to look over the Water Power Company's lines in company with R. A. Willson, general superintendent, and in doing so noted a number of points of interest.

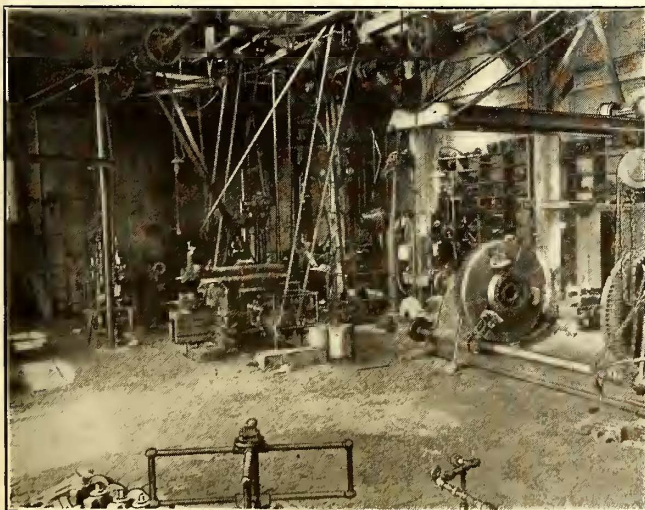
Although the city fare in Spokane is limited to 6 cents, which is entirely inadequate, both of the companies are keeping up an excellent schedule. By the use of one-man cars, rigid economy all along the line, ingenious shop methods, etc., they are able to keep their heads above water. To be sure the Inland Empire has recently passed through a receivership, but as Kipling says, "that is another story."

The logic of the local situation demands a unified

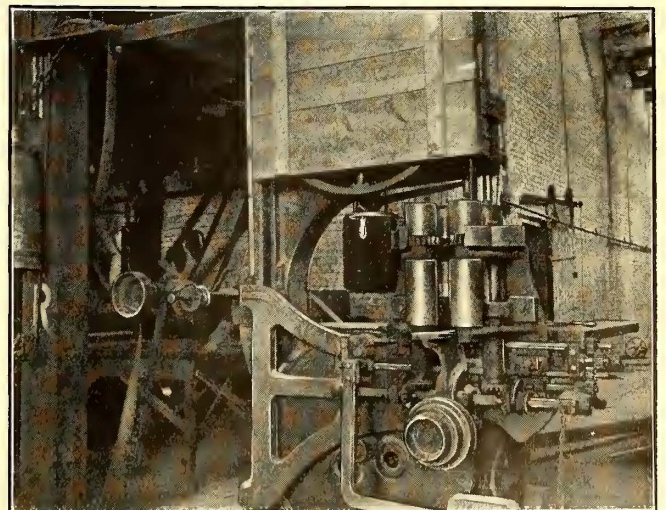
system for the city lines, and as the larger of the two companies, as far as city mileage and cars are concerned, the Water Power Company will presumably operate it. Plans to this end have been under way for years (see *ELECTRIC RAILWAY JOURNAL*, April 26, 1919, page 839), and are still under way. The proposed merger involves many financial and physical difficulties, but these are gradually being overcome. The recent reorganization of the Inland Empire System has made a new plan necessary.

There is a strong local tendency in Spokane to standardization of equipment and methods and the managements show a spirit of active co-operation. For example, at present the Water Power Company is remodeling in its shops a part of the rolling-stock of the Spokane & Eastern, changing over double-truck cars for one-man operation.

The Water Power Company has about 111 miles of single-track, 142 motor passenger cars, ten passenger trailers, three express motor cars, twelve freight and eleven other cars. As the nature of the equipment



CORNER OF MACHINE SHOP, WASHINGTON WATER POWER COMPANY
Note floor paved with sawed-off sections of wood poles.



RE-SAW ATTACHMENT FOR BAND SAW USED IN WOOD MILL OF WASHINGTON WATER POWER COMPANY

indicates, its business is radically different from that of its neighbor. It has an excellent shop, in which, as mentioned above, it is remodeling a number of city cars for the other company. These cars, like those remodeled by the power company for its own lines, are double-truck cars which have been turned end for end, the principal work being the substitution of new front vestibules for the old ones. Several pictures have been reproduced to show the details of this reconstruction.

HOW EQUIPMENT MAINTENANCE COST IS KEPT DOWN

In the company's shops particular attention has been paid to the equipment required for economical maintenance. The machine tool equipment in the company's machine shop is of particular interest. A part of this is shown in an illustration. The several tools are served by means of small gib cranes mounted on pipe standards, so that there is little manual labor required in handling the work. The floor of this shop, by the way, is paved with blocks made by sawing up old transmission line poles. While not as smooth as a floor made of regulation creosoted wood paving blocks, this floor answers its purpose and is very durable.

Another illustration shows a "re-saw" attachment to a band saw which has proved to be a wonderfully useful tool. It consists of a set of rolls surrounding the saw and driven by gearing. The rolls are readily adjustable for different thicknesses of material to be split and the tool has been found invaluable during the car-remodeling régime, which still continues.

LEST WE FORGET NATATORIUM PARK

The Washington Water Power Company is one of the few in the country that is making a park pay. Circumstances are such locally that the public depends largely upon the company's Natatorium Park for its diversion. The park is conducted upon the principle that the numerous amusement features must each bring in a satisfactory return. They are operated either by the railway department or by concessionaires, depending upon the character of the feature. For example, the company operates the "shoot the chutes," the flying swing (the cars of which are provided with motor-driven propellers to simulate airplanes), the natatorium, the dance hall, etc. It lets out the roller coaster concession (the coaster, a new one, being one of the largest in the country), the refreshment sale privilege and some others.

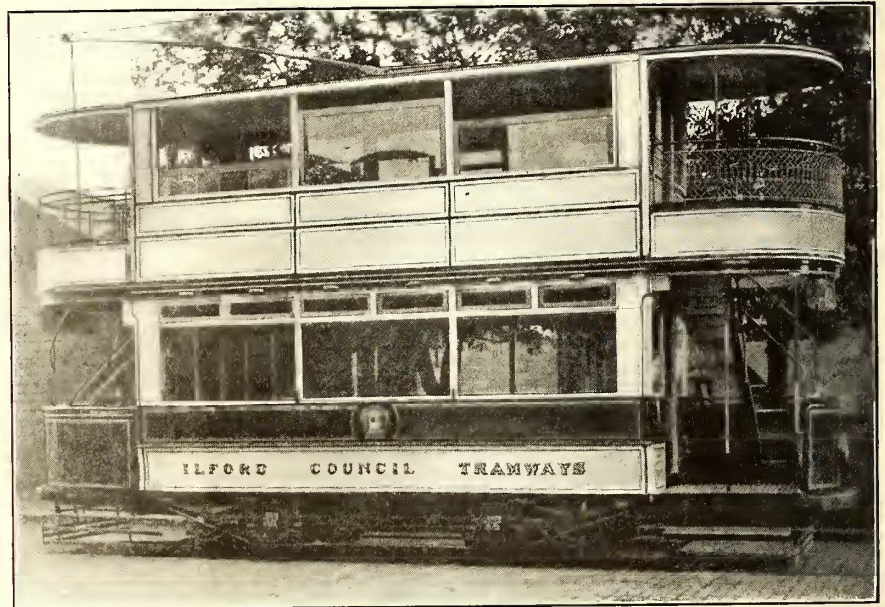
The piece of woodland in which the park is located is in itself a thing of beauty and the company has enhanced its attractiveness by judicious planting. A state fish hatchery is no small attraction in itself. Mr. Willson takes a personal interest in the details of Natatorium Park and spends much of his spare time therein.

The transportation end of the park proposition has presented some interesting problems. Cars from the city loop at the park in a prepayment area, those bringing patrons to the park discharging their load at the side of the loop remote from the entrance gates. The

patrons then enter the park through a subway which passes under the prepayment area. Those leaving the park do so through prepayment gates, the approach to which is up a rather steep incline. This natural feature is utilized to slow down the loading, thus effectively preventing crowding at the gates.

Latest Type of Double-Deck Car

THE English have had a great deal of success with double-deck street car operation and the Ilford Council Tramways has just placed in service a late design of double-deck car. The cost of the car is given as about \$10,000 and the car has a seating capacity of sixty-four, the lower saloon accommodating twenty-six, the upper thirty and the canopies eight. The car is 30 ft. 6 in. over all in length, 16 ft. 6 in. over all in height and is mounted on a single truck with 8-ft. wheelbase. Ceilings are of aluminum and are arranged in three panels. A patent type of seat is used which



A SIXTY-FOUR PASSENGER DOUBLE-DECKED CAR

folds back against the side of the car when desired, permitting free passage and speeding up car cleaning.

The trucks are of the pendulum type, with the rigging that supports the side frames on the axle boxes consisting of independent longitudinal supporting frames, suspended flexibly from the truck by U-shaped saddles. This has the effect of increasing the wheelbase by 2 ft. and permits the wheels and axles to move laterally, independent of the side frames. The cars are equipped with 35-hp. motors and with Thomson-Houston K-10 controllers. The gears and pinions are of tool steel.

The cars are painted sage green and cream, are fitted with curtains and are finished in mahogany inside. They have illuminated destination indicators in each canopy and are very neat and attractive in appearance, as shown by the photograph.

An appropriation of \$85,000 has just been authorized to the Bureau of Standards for the investigation of standards of practice and methods of measurements of public utilities, such as gas, electric light, electric power, water, telephone, central station heating and electric railway service.

What Happens at the Trolley Contact?

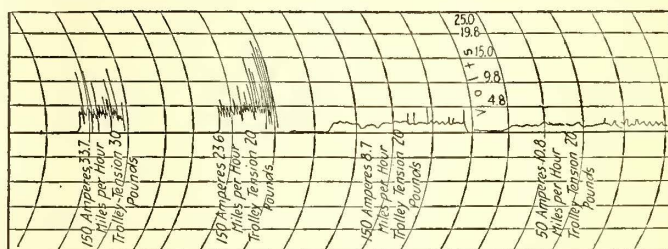
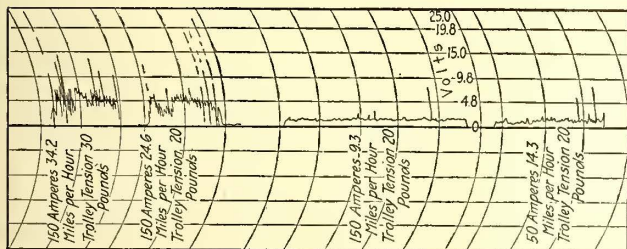
Results of Numerous Tests Under Various Operating Conditions Are Given—Average Power Loss with 5-in. Wheel Was Nearly 1/2 Kw.

BY D. D. EWING

Professor of Electric Railway Engineering Purdue University, Lafayette, Ind.

VIEWED from the standpoint of mechanical performance, the device that collects the propulsion current for an electric car has a hard job. "It must work in fair weather and in foul, particularly in foul weather," says the riding public. It must not interrupt the power circuit, and, therefore, it must keep in close touch with the contact line, which to the collecting device seems to have a chronic habit of continually bobbing up and down. On an interurban car it may be required to gather up a hundred or so amperes with the car traveling 60 or 70 miles per hour. We

periments were performed in the laboratory, actual operating conditions being simulated as closely as possible. A standard 6-in. trolley wheel with pole and base was used, but instead of having the pole move with reference to the wire the wire was moved with reference to the pole. The voltage drops between wheel and trolley wire and between wheel and harp were measured for a number of different speeds, currents and trolley tensions. From the experimental data thus obtained, the several resistances and losses were calculated. The mechanical loss, that is the fric-



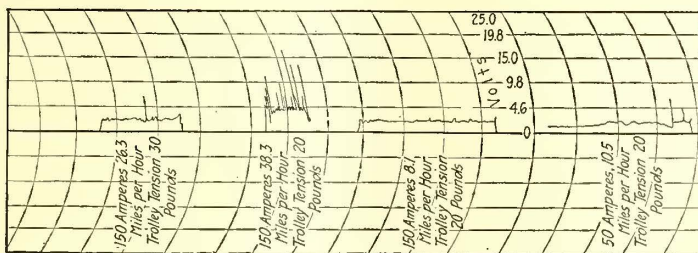
CONTACT VOLTAGE GRAPHS FOR A 5-IN. V-GROOVE WHEEL

CONTACT VOLTAGE GRAPHS FOR A 5-IN. U-GROOVE WHEEL

would like to have it do all of these things without losing any of the energy collected and without wearing either the device itself or the line with which we desire it to maintain such close contact. Also, economic considerations require that the device be cheap both in first cost and in maintenance.

The several requirements are more or less incompatible and an ideal device is one of the impossibilities. Any practical design necessarily involves compromises. In America the wheel trolley has given such good account of itself in the street and interurban railway fields that it has more than held its own against all comers. The tendency has been to develop this device to the point of greatest utility rather than spend time and money on other possibilities. But the wheel trolley is not a long-lived device and it does cause considerable wear on the trolley line. Because of these things railway operators, in their attempts to cut down maintenance expense, recently have been giving some thought to other contact devices. In this article some data on the electrical performance of the wheel and sliding shoe trolleys are presented.

In 1907 some experiments on trolley contact phenomena were made at Purdue University by G. M. Laird in connection with his graduation thesis. These ex-



CONTACT VOLTAGE GRAPHS FOR SLIDING SHOE TROLLEY

tension at different speeds and currents are shown in accompanying curves. It will be noted that the electrical loss at the wheel-wire contact for 150 amp. and 20 m.p.h. is 130 watts, while the mechanical loss is only 36 watts.

Briefly summarized the conclusions drawn from these tests are:

Both of the contact resistances decrease with increased current and trolley tension and increase with increased speed.

The voltage drops across these resistances increase with the speed and increase (slightly) with the current.

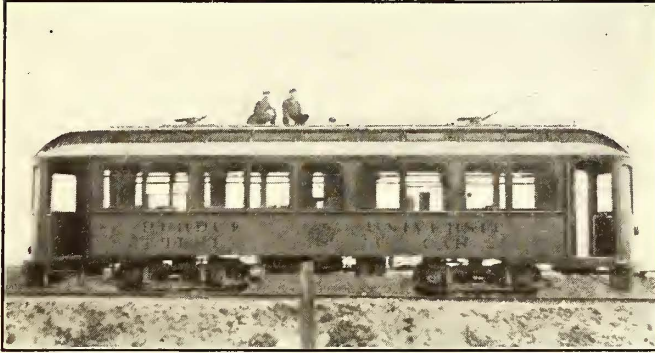
All of the losses increase very rapidly with increase in the speed.

The voltage drop between the wheel and the wire is the larger of the two voltage drops.

ARCS AT WIRE SUPPORTS USE MUCH POWER

In 1915, while making a series of tests on interurban cars, the writer made a number of measurements of the voltage drop between the trolley wire and the trolley base. In these tests the front trolley was used as a voltmeter contact on the trolley wire. The data show

that for speeds between 37 and 45 m.p.h. and for currents between 190 and 225 amp. the average voltage drop with the wheel running on smooth wire between span supports was 3 volts. At the points of trolley wire support voltmeter "throws" ranging from 5 volts to "off scale" on a 75-volt range meter were recorded. On the assumption that two-thirds of the voltage drop under smooth running conditions was chargeable to the wheel-wire contact the voltage drop at this contact would be 2 volts, and the watt loss at 200 amp. would



PURDUE TEST CAR AND TROLLEY ARRANGEMENT

range from 400 watts for smooth running to over 15 kilowatts for the arcs which caused the large voltmeter deflections.

COMPARATIVE TESTS ON WHEELS AND SHOE

Last year, C. P. Boggs, A. C. Clinger and W. V. Stockton, then seniors at Purdue University, working under the writer's direction, made some further investigations of trolley contact phenomena.

Tests were made on four wheels and one sliding shoe. Three of the wheels were manufactured by the Star Brass Works and are listed by the manufacturer as numbers 1, 2 and 20 respectively. The other wheel was manufactured by Vaile & Kimes. The principal physical features of the wheels and shoe are as follows:

Wheel	Kind of Groove	Throat Diameter, Inches	Weight, Pound (Including Harp)
No. 1.....	V	5	7
No. 2.....	U	5	7
No. 20.....	U	10	15
V. & K.....	V	4½	6¾
Miller Shoe.....	U	..	5¼

The tests were run on the Battle Ground Line of the Fort Wayne & Northern Indiana Traction Company. This is a stub end line whose overhead distribution system consists of a No. 0, B. & S. round copper trolley wire tapped to a paralleling feeder every quarter mile. The poles were spaced 100 ft. apart. In most of the tests the test car was the only car operating near the stub end. The test track was practically level and contained only one curve, which was short and of long radius. The Purdue Test Car with the trolleys arranged as shown in the accompanying illustration was used in making the tests. Car speed, contact voltage drop and current were measured. The front trolley was used as one voltmeter lead contact and the other lead was connected to the collecting trolley base. The voltage drop measured, therefore, consisted of the drop in the trolley wire between the two wheels, the drop across the wheel-wire contact, and the drop between the wheel and trolley base. The latter drop, as measured with the car standing still, was 0.6 volt per 100 amp.

As the distance between the trolley wheels was 21 ft., the drop in the trolley wire was due to the resistance of that length of No. 0 wire or 0.2 volt per 100 amp. All of the runs were made with the car moving toward the stub end of the line, but on account of the feeder system, the trolley wheel was, of course, fed from both directions. On the assumption that 50 per cent of the current passed through the trolley wire in front of the collecting wheel the voltage drop in the trolley wire was 0.1 volt per 100 amp. of car current and the total voltage drop, exclusive of the contact drop, was 0.7 volt per 100 amp.

In order to protect the low range voltmeter from excessive voltages such as would occur in case the collecting trolley left the wire, the connections used were those diagrammed in the accompanying reproduction. The circuit breaker was of the type used for protecting telephone circuits from stray power currents and proved itself to be a very satisfactory protective device.

In making the tests it was of course desirable to hold both current and speed constant. As the variation in line voltage made such a procedure impossible, the current being most easily controlled was made the constant quantity. Adjustment to meet the varying voltage conditions was effected by means of series resistances and the car brakes. The speeds marked on the accompanying graphic meter records are the averages for the respective runs.

The paper chart traveled at the rate of 1 in. in 1.15 minutes. Test runs involving a variety of combinations of speed, current and trolley tension were made, the charts here reproduced being for a few representative runs.

The charts are of especial interest as they show clearly what happens at the trolley contact. The rip-

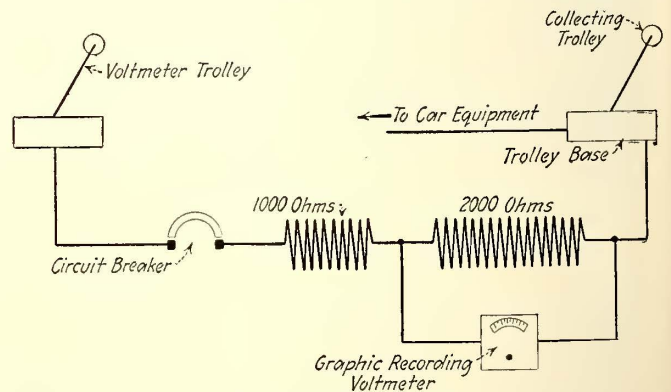


DIAGRAM OF THE CONNECTIONS USED IN MAKING VOLTAGE MEASUREMENTS

ples in the graphs are due to the trolley wire hangers and joints. With the wheel trolleys it is almost possible to count the wire imperfections, particularly in the low speed graphs. At higher speeds the ripples are greatly magnified. Each ripple represents the voltage drop over a small arc.

The arcs cause pitting both of the collecting device and the wire. The pitting of the wheels is affected in a marked manner by the shape of the groove as is indicated in the following comparisons:

Location	U-Groove	V-Groove
Bottom of groove	Small uniformly distributed pits	No pits
Sides of flange	Few small pits	Many large pits
Edge of flange	Many large pits	Few small pits

Owing to its great weight the 10 in. wheel did not prove satisfactory. Its inertia prevented it from following the wire as it should and the arcing was excessive except at very low car speeds.

CONCLUSIONS DRAWN FROM TESTS

The general conclusions drawn from the test data and from an inspection of the collecting devices after the tests were finished may be briefly summarized as follows:

The average voltage drop increases slightly with an increase in current and markedly with an increase in speed.

Increase in speed affects the character of the ripples in the voltage graph. At low voltages the ripples represent a voltage change of only a fraction of a volt, while at higher speeds the amplitude of the ripples or "throws" indicates serious arcing.

The voltage ripples were less pronounced with the higher trolley tensions than with the lower ones.

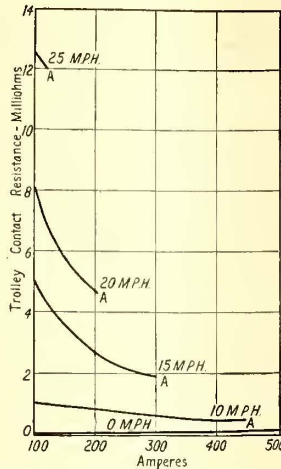
Of the two types of wheels the arcing was far less serious with the V-grooves than with the U-grooves.

There was far less arcing with the sliding shoe than with the wheel trolleys.

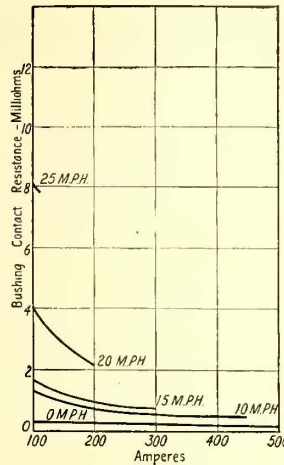
A calculation of the power loss at the trolley contact is of interest. For example, the average contact drop for the 5-in. V-groove wheel when collecting 150 amp. at 24.6 m.p.h., trolley tension 20 lb., is 4.3 volts. Correcting this for the voltage drops in the other part of the circuit at the rate of 0.7 volt per 100 amp. gives a contact drop of 3.3 volts. This voltage multiplied by the current, 150 amp., gives 495 watts.

Now an energy consumption of 500 watts is not at all alarming as far as the energy consumption of the car is concerned. At 25 miles an hour such a loss would amount to only 20 watt-hours on a car-mile basis. The important thing about it is that this energy loss must be dissipated in the form of heat at the very small area of contact between wire and wheel. Inasmuch as there is not time for the heat to be conducted away, the heating is highly localized. The momentary arcs indicated by the larger "throws" are quite destructive and cause the larger pits so often observed on trolley wheels and the contact wire.

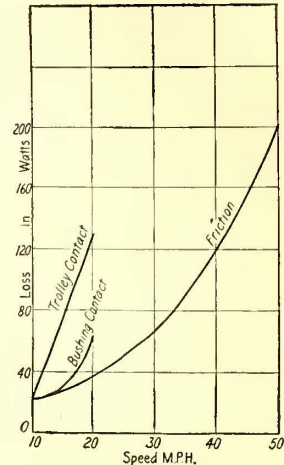
As the wear on any device is dependent on the work



Relation between trolley contact resistance, speed and current, trolley tension 30 lb.



Relation between bushing contact resistance, speed and current, trolley tension 30 lb.



Current of trolley wheel losses, trolley tension 30 lb., current collected 150 amp.

CHARACTERISTIC CURVES OF TROLLEY WHEEL CONTACT LOSSES

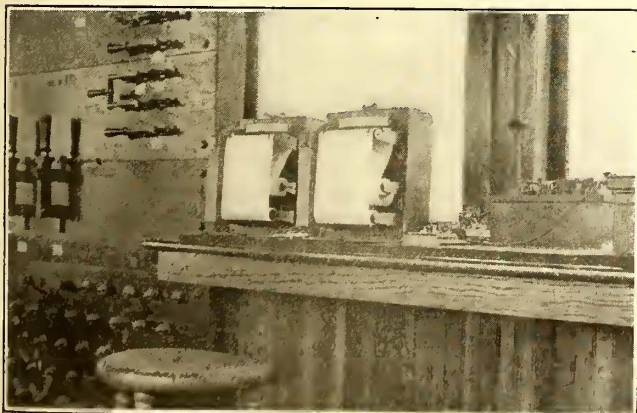
done on the device, the energy expended in heat on the various parts of the device should be a pretty good measure of the wear. The investigations detailed here indicate that the electrical energy losses at the contact exceed by a very considerable amount the mechanical energy expended in overcoming friction.

The above data are not presented with the thought that they answer the question "What Causes Trolley Wire Wear?" but they are presented with the thought that the electrical losses at the wheel-wire contact have an important bearing on the subject.

Irrigation Limits Water-Power Development

A UNIQUE condition exists in connection with many projected water-power developments in the West which has been met very largely by water wheel manufacturers. Irrigation is the primary object in water storage developments and the electric power is only incidental. This requires a water wheel or turbine which must act under variable head and flow conditions and also requires a large capacity in auxiliary steam plants or ample provision for interconnection to render available a constant supply of electric power.

At Fontana, Cal., in connection with an irrigation project a total gross head of 725 ft. was made available by a pipe line 6 miles long, but irrigation requirements caused a variation in head and flow ranging from 58 sec.-ft. with 505 ft. head to 10 sec.-ft. and 657 ft. head. Under these conditions flexibility and efficiency were essential elements of the impulse wheels to be installed. Two 1,350-hp. Pelton double-overhung, two-runner, impulse turbines equipped with electrically operated needle nozzles and governor-operated jet deflectors were installed. These wheels show an efficiency at the lowest operating point only 3 per cent less than the maximum developed under most favorable conditions. As the quantity of water flowing is the governing factor and not the load, the governing apparatus was designed to operate by water flow variation, which is a radical departure from practice where load demand and not water flow is the controlling factor. It is gratifying to the railway industry to know that these conditions have been met in prime mover design, as the new water-power law will expedite many combined irrigation and water-power developments in the near future.



CATCHING THE "THROWS" WITH GRAPHIC RECORDERS

The Modern Steam Locomotive*

The Author Shows How the Steam Locomotive Has Been Improved and Compares the Modern Machine with the Electric Locomotive from Several Standpoints

BY JOHN E. MUHLFELD

Railway & Industrial Engineers, Inc., New York City

IN MAKING comparisons of the relative values of steam and electric railway power some electrical engineers have frequently given out such an attractive and confident line of loose figures that railway managers and their engineers have often been misled into making recommendations that have later resulted in embarrassment. Comparisons have been made between the operations of new, up-to-date electric and of obsolete steam installations, of costs of repairs per locomotive-mile for electric and steam locomotives of different dates built new and of different average ages, and of fuel rates at the substations of modern central power stations with fuel rates of obsolete steam locomotives, per horsepower-hour. Also, assumptions have been made of extraordinary steam locomotive standby fuel losses, inclusion of steam locomotive tender, but exclusive of electric locomotive non-adhesive weight as non-revenue train tonnage, and of like erroneous factors. It is just as misleading to compare the most efficient electric locomotive operation on the St. Paul with that of its saturated steam locomotives of 1910 as it would be to compare the most efficient superheated steam locomotive performance on the Baltimore & Ohio with that of its electric locomotives.

In line with the foregoing several years ago a report was made on the advisability of electrifying about 275 miles, or a division, of one of the more prominent Western lines, and an erroneous comparison was made, first, between the existing antiquated and uneconomical steam and an up-to-date electric operation, and, second, by omitting the investment required to bring the steam operation up to date. When all involved factors were properly adjusted the net capital expenditure of \$4,000,000 required for electrification compared with \$1,000,000 as needed for modernizing the steam equipment, and the estimated annual operating saving of approximately \$750,000 from electrification was wiped out and replaced by a saving of \$250,000 from a continuation of the improved steam operation.

When we discuss or recommend the further electrification of the whole or any part of the 260,000 miles of steam-operated railroad system in the United States, which is now making use of about 65,000 steam and 375 electric locomotives for its passenger, freight and terminal service, the most important item involved is a comparison of the most up-to-date steam with similar electric operations, after which come the important factors of financing and legislation.

While there is much existing steam road trackage that can and should receive first consideration as regards electrification for the purpose of eliminating gases from underground terminals and tunnels and to give relief to terminal or line traffic congestion in the vicinity of large commercial and industrial centers, it would

be financial suicide to electrify immediately adjacent connecting and intermediate mileage, particularly in view of the improvements that can be made in both existing and new steam locomotives in the matter of reducing smoke, sparks, cinders and noise and in increasing general efficiency and economy.

With the decreased value of gold and purchasing power of the dollar has come an increase of from 4 and 5 to 7 and 8 per cent in the cost of money, which in combination with the 100 to 150 per cent increase in the cost for labor and material makes the procurement today of the most pressing railroad capital needs almost prohibitive. Therefore, when engineers and politicians propose reckless super-power plans for the electrifying even of such belts of steam roads as lie in the densely populated district between Washington, D. C., and Boston, at a new capital cost approximating \$1,000,000,000, and in addition mark off the books the principal value of existing steam locomotives, passenger cars, shops and terminal and intermediate facilities that would be unsuitable for the electrified service, they are planning either a new road to railroad bankruptcy or a further burden in traveling and shipping costs, or in taxes, which would be representative of criminal waste instead of increased earning capacity by means of more efficient and economical operation.

Therefore, before the electric locomotive can be made permissible for general application the electrical engineer must reduce his first costs, promote interchangeability, provide a motor which will efficiently, economically and flexibly cover a wide range of speeds and not break down or deteriorate from overloading and heating, reduce complication, wear and corrosion in transmission and contact line apparatus and substantially reduce the current losses between the point of power production and the locomotive drawbar. Likewise the steam railway mechanical engineers, locomotive builders and specialty manufacturers, if they are to guard the steam locomotive and continue it in its present field of usefulness, must become more active in modernization and bring about improvements that will substantially increase its capacity and thermal efficiency by the use of higher steam pressures and superheat, compounding, more efficient methods of combustion, utilization of waste exhaust steam and products of combustion heat, better distribution and use of live steam, reduction of dynamic weights, greater percentage of adhesive to total weight and a lower factor of adhesion and by a substantial reduction in standby.

As both steam and electric locomotives should have a useful life of from twenty-five to fifty years from the date built these policies should be inaugurated now in order that the least artificial age will be capitalized in all new built motive power.

In order to determine the relative advantages of modern steam and electric locomotives the items dis-

*Abstract of paper read at joint meeting of A. S. M. E. and A. I. E. E. sections, New York City, Oct. 22, 1920.

cussed hereinafter may be stated as important items for consideration.

1. *Legislation.*—This may be of such varied character that any assumptions for analysis purposes are out of the question.

2. *Financing.*—The electrification of the steam roads in the United States since 1895 now embraces about 1,250 road-miles on eighteen different lines and 375 electric locomotives, of which total about 375 road-miles on nine different lines and 230 locomotives (as well as 1,000 motor cars) are located in the territory between Washington, D. C., and Boston.

In view of past experience probably little if any financing of steam road electrification projects in the United States can be undertaken, particularly at present interest on money and labor and material prices, unless the returns are more adequately and fully guaranteed. In fact, few if any existing steam roads can justify or stand the additional capital investment required per mile of road for electrification, except for short distances under very special conditions such as prevailed on the Norfolk & Western, where the ventilation and 1.5 per cent grade line features of a $\frac{3}{4}$ -mile single-track tunnel restricted the train movements to a 6-mile-per-hour basis on a congested traffic section of the main line, and even then only providing the fixed charges and operating expenses are not too excessive.

The immediate requirements of new money for the more urgent steam equipment and facilities needed to provide adequate, safe and expeditious rather than luxurious service in the regeneration of the railroads is the obvious reason for the continued utilization of the over-all more economical steam operation, and only after the possibilities in this direction have been realized can any serious financial consideration be given to the proposed radical change to super-electrification.

3. *Adaptability to Existing Trackage and Facilities.*—First and foremost in the advantage of a continuation of the existing improved steam locomotive for all purposes for which it is permissible is its flexibility and adaptability to existing railroad trackage and terminal and operating facilities and the relatively low first cost at which it can be purchased per unit of power developed for the movement of traffic. Being a self-contained mobile power plant, it is possible quickly to transfer needed or surplus power from one part of the line to another and to concentrate it when and where necessary.

4. *Effectiveness in Increasing Track Capacity.*—Without a doubt electrification increases the capacity of a terminal, and this is fully evidenced by the intensified traffic movements at Grand Central Station, in New York, and at Broad Street Station, in Philadelphia; but an analysis of the situation on the New York Central shows that this is not due to decreasing locomotive movements through the use of multiple units as is usually stated. Special line conditions, as on the Norfolk & Western, may make electrification advisable for short distances, but neither the results on that road nor at the New York terminals justify the frequent reference by electrical engineers to the weakness of steam locomotive haulage during the unprecedented cold weather and volume of traffic conditions during the winter of 1917-18, in that electrification would not have obviated the difficulty. Furthermore, in the handling of heavy tonnage trains by the unlimited combining of electric locomotive units the factors of peak load, transmission lines and power plant capacity must all

be considered with the probability that permissible modern steam locomotive train units can be more economically handled over dense traffic lines than the electric multiple-unit super-trains.

5. *Train Speeds.*—The average freight car is in main line movement only about 10 per cent of its life. The balance of its time can be distributed 55 per cent in the hands of the railroads on account of interchanges, yard and loading and unloading track movements, surplus cars, repair tracks and road delays, and 35 per cent in the hands of the shipper and consignee, due to loading and unloading reconsignment and Sundays and holidays. Therefore, increasing train speeds beyond established economic limits at the sacrifice of tonnage, and with an increase in fuel, track and equipment upkeep and danger of operation, is not the solution of the freight traffic problem. As the electric locomotive is a constant-speed proposition, whether going up or down grade, and is unable to utilize its rated capacity and effectiveness through the same range of speed and tractive power variations as the more flexible steam locomotive, the latter can therefore be more efficiently operated over the continually changing up and down grades, levels, curves and tangents traversed by the average freight train in this country. With respect to passenger train service, where speed is more of a factor, the steam locomotive performance is equally satisfactory.

6. *Fuel Consumption.*—Great economy in fuel consumption and cost is the principal claim for electrification. Eminent electrical engineers have recently arrived at the startling conclusion that had the railroads of the United States, using 63,000 steam locomotives, been completely electrified in 1918 along lines fully tried out and proved successful today, they would have required, without the use of any water or other power, only 53,500,000, instead of 176,000,000, tons of coal or its equivalent, thereby effecting a modest saving of more than two-thirds, or 122,500,000 tons.

The basis for arriving at these comparative figures is for the steam operation a coal rate of 12.75 lb. per kilowatt-hour of useful work done, as measured at the driving wheel treads, or 7 lb. (including transmission and conversion losses inherent to electrical operation) as measured at a central power station. These data were obtained from some tests made in 1910 on the St. Paul on some probably long since antiquated types of saturated steam locomotives. For the electrical operation a modernized central power station coal rate of 2½ lb. per kilowatt-hour, in combination with a 40-watt hour rate at the point of delivery of the power to the railroad system for moving a gross ton-mile of passenger and freight train, was used, which would produce a movement of 1,000 average gross ton-miles for 100 lb. of coal of about 12,000 B.t.u. value per pound as fired. In arriving at these data apparently factors were overlooked or disregarded such as gradient and curvature, drifting train-mileage, human element, the necessity for hauling one-third of the freight car-miles without lading and its effect on train resistance, the use of 15,000 locomotives in switching and transfer service, the existence of 25,000 steam locomotives equipped with superheaters and of 35,000 equipped with firebrick baffle walls, the past ten years' improvement in steam locomotive boilers and machinery, that electrification will not eliminate the rail haulage of company coal or of dead weight on locomotive leading and trailing truck wheels, that large central power stations

will only show a fuel saving when operated somewhere near their rated capacity without peak load conditions, that the interconnecting of electrification systems will result in prohibitive conversion and transmission losses, that electric motors must operate at predetermined loads to produce maximum efficiency, that central power stations cannot be regulated to a basis of 50 per cent average load factor, and many others.

However, accepting the assertion that the proposed electrification will produce 1,000 gross ton-miles for an average of 40 kw.-hr., or 100 lb., of 12,000-B.t.u. coal, as stated and generally approved by electrical engineers, what can the modern steam locomotive do to justify its existence? The results of some dynamometer-car tests made during 1918 may be of interest. The steam locomotives tested were of the ordinary superheated Mikado freight type, weighing 110 tons. One locomotive was fitted for hand firing and burning coal on grates, while another was equipped with the "Lopulco" system for burning powdered coal in suspension, and the tests were made in tonnage freight service handling from 2,400 to 2,600 tons eastbound and from 1,850 to 2,250 tons westbound on the Santa Fé main line between Fort Madison, Iowa, and Marceline, Mo. (the profile consisting of 0.8 per cent ruling grades), a distance of 112.7 miles, during March and April, 1918. The comparative average results show a coal consumption of 3.74 lb. and 4.99 lb. per boiler and superheater horsepower-hour for the two engines respectively.

As the coal supplied to the grates of the hand-fired locomotive was considerably lower in heat value than that specified in the electrification project, and as the tests were run during March and April, it can be assumed from the foregoing that the average yearly performance will approximate 100 lb. of 12,000 B.t.u. coal per 1,000 gross ton-miles, or equivalent to what we are promised by electrification.

7. Efficiency of Locomotive Operation.—The offsetting fuel and energy losses, due to standby in the steam operation, and decrease in efficiency on account of fluctuating loads in the electric operation must not be lost sight of. Neither should those incident to the transforming transmission and conversion of electric current and like factors be neglected.

While the electrical engineers and manufacturers in this country deserve great credit for the progress made in the development of the electric locomotive, they have as yet been unable to design one which can operate at maximum efficiency throughout its range of load.

Furthermore, to produce electric current at various hydro-electric or steam power plants, to raise the voltage to a high value, transmit the power through transmission lines to switching substations, to step down the voltage and then convert the power into direct current at, say, 3,000 volts for locomotive use, all involve expensive lines, plants and equipment, as well as tremendous losses from the generator at the central power station to the bus bar on the direct current side of the transformer, where the current is usually metered for billing. Also the secondary system is responsible for further losses. After allowing for, say, 10 per cent regeneration, the actual dead loss in power from the central power station to the electric locomotive drawbar will be not less than 50 per cent.

The number of factors entering into an analysis of the net thermal efficiency of the electric locomotive, in terms of drawbar pull, are so many as to make it impossible with the lack of dynamometer-car and labora-

tory test data to arrive at a figure which is not based on a number of assumptions; but as a matter of interest, assuming that *all of the factors are affected equally* in the electric locomotive, the net thermal efficiency at the drawbar, when taking into consideration the boiler, engine, generator, step-up transformer, alternating-current transmission, step-down transformer, a.c.-d.c. converter, direct-current transmission, motors and machine efficiencies, may, as representative of average existing practice, be illustrated as in Table I.

TABLE I—ESTIMATED EFFICIENCIES IN ELECTRIC TRACTION

Equipment	Net Thermal, Per Cent	Load Rating, Per Cent		
		100	75	50
Boiler.....	Factor	.....	.....	.....
	Efficiency	76.7	76	72
Engine.....	Factor	18.25	18.29	19.17
	Efficiency	14	13.9	13.8
Generator.....	Factor	90	89.5	86
	Efficiency	12.6	12.44	11.88
Transformer, step-up.....	Factor	98	96	90
	Efficiency	12.34	11.93	10.67
Transmission, alternating current.....	Factor	90	95	97
	Efficiency	11.10	11.32	10.34
Transformer, step-down.....	Factor	98	96	90
	Efficiency	10.87	10.85	9.30
Converter, alternating to direct current..	Factor	80	75	63
	Efficiency	8.69	8.13	3.85
Distribution, direct current.....	Factor	90	95	97
	Efficiency	7.82	7.71	5.66
Motors, direct current.....	Factor	91.5	90.8	89.5
	Efficiency	7.15	7.00	5.05
Machine efficiency.....	Factor	81	85	90
	Efficiency	5.79	5.95	4.54

Likewise the net thermal efficiency of existing representative steam locomotives, in terms of drawbar pull, may be illustrated as in Table II.

TABLE II—ESTIMATED EFFICIENCIES IN THE STEAM LOCOMOTIVE

Equipment	Superheated or Saturated	Net Thermal, Per Cent	Load Rating, Per Cent		
			100	75	50
Boiler.....	Superheated	Factor	.....	.....	.....
		Efficiency	42.7	54.9	65.9
	Saturated	Factor	.....	.....	.....
		Efficiency	45.0	57.4	70.0
	Superheated	Factor	11.9	11.0	10.5
		Efficiency	5.08	6.04	6.92
Cylinders.....	Saturated	Factor	7.8	8.4	7.8
		Efficiency	3.51	4.82	5.46
	Superheated	Factor	75	80	85
		Efficiency	3.85	4.83	5.88
	Saturated	Factor	77	80	82
		Efficiency	2.70	3.86	4.47

Comparing the electric and steam locomotive figures as illustrated, the relative percentage of power delivered at the track rails to 100 per cent B.t.u. in the coal would be as in Table III.

TABLE III—COMPARISON OF EFFICIENCIES OF STEAM AND ELECTRIC TRACTION

Kind of locomotive	Net Thermal Efficiency at Load Ratings of		
	100 Per Cent	75 Per Cent	50 Per Cent
Electric.....	5.79	5.95	4.54
Steam, superheated.....	3.85	4.83	5.88
Steam, saturated.....	2.70	3.86	4.47

As 100 per cent load rating conditions would, in practice, occur only momentarily and as the majority of the drawbar load represents from 30 to 60 per cent of the locomotive maximum drawbar capacity, comparison should properly be made only of the net thermal efficiencies at 50 per cent load ratings.

At speeds of from 15 to 75 m.p.h. the existing superheated steam locomotive thermal efficiency actually ranges from 5.3 to 8.1 per cent as compared with the calculated figures of from 4.83 and 5.38 per cent for 75 and 50 per cent load ratings, respectively. Adding to this an increase of from 15 to 50 per cent in net thermal efficiency that may be produced from developments now under way and the steam locomotive of the future will be quite a respectable assembly of engineering efficiency.

8. *Cost for Enginemen.*—When the use of the electric locomotive was contemplated it was thought that a single motorman could be substituted for the steam locomotive engineer and fireman. Under existing conditions this is neither permissible nor practicable, and as each electric locomotive must carry a man comparable to but who does not function as a fireman, his wage is an added expense without economic return and must be charged to the cost of firing the central power station boilers or otherwise distributed.

9. *Cost of Maintenance.*—In determining the maintenance cost of the electric locomotive a true comparison can only be made by including all corresponding elements as found in the self-contained steam locomotive which goes back to the upkeep of all facilities having to do with the utilization of the fuel or water power, including the central power station buildings, boilers, engines, conversion, transmission, distribution and contact line systems, substations, track rail bonding and insulation, electric disturbance cut-outs or neutralizers, extra expense in upkeep of the electric zone trackage and like auxiliaries, and finally the electric locomotive itself.

10. *Peak-Load Conditions in Relation to Traffic Requirements.*—With the steam locomotive the traffic requirements are met by the distribution and utilization of the necessary number of self-contained motive power units as required, regardless as to the capacity of one or more central power stations or of any limitation in quantity, or in price, of the total available power output. The operation of one or of 500 steam locomotives at their maximum capacity at any given, or for any duration of, time on a single division is of no concern. However, in order to meet the ideal conditions for electrification, the traffic should be uniformly spread or scattered over the twenty-four-hour period, whereas in the majority of cases train movement is based on traveling and shipping conditions and cannot be advanced or delayed in order to eliminate peak-load conditions.

11. *Ease of Starting Trains.*—Due to the uniform torque as developed by the electric locomotive, its adherents have laid great stress on its ability to start a heavier train than a steam locomotive of relatively the same tractive power and factor of adhesion. In steam railroad service the locomotive is seldom required to start "the train," but what it does is to start each car in the train, successively, and which nullifies this theoretical advantage of the electric locomotive. In fact, with steam locomotives of the Mallet and other types having cylinders equipped with properly designed simpling devices the starting power is increased about 20 per cent as compared with electric locomotives of equivalent road rating.

12. *Rate of Acceleration.*—In order that the desired running speeds can be reached in the minimum of time after the starting of trains, the ability of a locomotive to rapidly accelerate its load is of considerable importance, and in this respect the electric power has had the advantage. The steam locomotive engineer has, however, not lost sight of this fact and improvements already made in boiler and cylinder horsepower ratios, as well as developments now under way for the utilization of existing non-productive adhesive weight and to increase the coefficient of friction between the propelling wheels and the track rails, will enable the steam locomotive to duplicate the performance of its electric competitor in this regard.

13. *Train Braking.*—Since the development of regenerative braking with the electric locomotive, great emphasis has been laid on the increased security of operation over heavy grade lines due to the ability of the locomotive to hold the train under complete and positive control on the down grade without brakes, by temporarily converting the main motors into generators to produce electricity, which is returned to the line for use by some other locomotive in pulling a train. Considerable attention has also been directed to the saving brought about through the elimination of the ordinary air braking on such down grades. The Baltimore & Ohio has, with steam locomotives, successfully and safely handled its heavy tonnage and dense traffic on the Cumberland and Connellsville divisions for many years, and this tonnage descends a grade averaging approximately 2.2 per cent for 17 miles, at an average speed of from 15 to 20 miles per hour for freight and from 25 to 30 miles per hour for passenger trains, without slow-downs or stops. This performance is comparable with that on the worst grade conditions in the St. Paul electrified zone.

14. *Effect of Weather Conditions.*—Even though the full steaming capacity, horsepower and drawbar pull of a modern steam locomotive can be developed during cold weather conditions, there are the factors of radiation and freezing to be reckoned with, which gives the electric locomotive the advantage in winter, particularly as its effectiveness is greater on account of the lesser tendency for the motors to overheat. This winter advantage, however, is largely overbalanced during the summer, when the main motors heat, especially under overloads, and require cooling at terminals or otherwise overheat and result in insulation break-downs or burn-outs, or other troubles.

15. *Road Delays and Tie-Up.*—While the electric locomotive has the advantage of not being required to take on fuel and water, except for the operation of steam-heating equipment for passenger trains, with the increased capacity of the modern steam locomotive tenders and the lower water and fuel rates per drawbar horsepower developed, the delays due to taking on these supplies have been greatly reduced and need not be serious. Barring collisions, wrecks and like accidents not due to the system of motive power in use, steam operation is not susceptible to complete tie-ups as is the case with electrification.

16. *Terminal Delays.*—There is no doubt but that the electric has an advantage over the steam locomotive as regards time required for periodical boiler work, fire cleaning and rebuilding, fueling and watering except where fuel oil is used, but where terminal delays occur due to waiting for trains, such as the foregoing statement set forth, the time required for such work does not become an expensive determining factor in the daily average miles to be obtained per locomotive. Also the fact that the electric locomotive cannot, without terminal rest periods or without the consumption of power to operate auxiliaries, operate at its maximum capacity must not be overlooked. Furthermore, many improvements in the fuel and ash handling and combustion equipment of the steam locomotive using coal are now in process and terminal delays due to these causes are annually being reduced by improved means and methods.

17. *Hazards.*—With the establishing of more scientific and careful methods of designing, testing and inspection, and the more extended use of safety appli-

ances, the failures of steam locomotive boilers and machinery, particularly those resulting in personal injury, are relatively low as compared with the work performed. It is therefore doubtful if there is any greater proportion of risk from the steam locomotive in that regard than from electrocution and other attendant dangers from high-voltage electrification.

Transportation Possibilities with Electric Locomotives*

Summary of Savings Secured by Electrification of Steam Roads—Co-operation Between Electric and Steam Locomotive Designers Urged

BY F. H. SHEPARD

Director of Heavy Traction
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THE steam locomotive is a marvelous machine, representing to a wonderful degree the combination of designers' skill and years of experience. The electric locomotive, on the other hand, while a notable machine, should, in its present service, be taken as indicative only of what may be accomplished in the future. The transportation problem is about the most serious one which now confronts the American people. For a number of reasons, for only part of which the railroads are responsible, provision for the movement of railroad traffic has fallen far behind the productive capacity and needs of the country today. At the same time, the demand for traffic movement will undoubtedly be doubled in about twelve years. So the question arises, What are we going to do, and how are we going to do it?

The limit to physical expansion of railroad line and terminals has been about reached in many cases, on account of both the prohibitive cost and the inefficiency of terminals of unworkable size. A large measure of relief can still be secured by line and terminal revisions and improvements, but when the inevitable increase in the demand for traffic movement of the future is considered these expedients to secure relief are seen to be only temporary and very limited in extent.

The great need of the country is the free and expeditious movement of traffic. The way to move traffic is to *move it* and to keep it moving. The yearly average of 22 miles per day for a freight car for the whole country, with monthly averages of as low as 5 miles on some of our most congested railroads for a single month, emphasizes the fact that this is a problem that some how, some way, we must solve. The solution lies, to a large extent, in the electrification of railroads.

With the present standards of train make-up, classification and terminal handling, electrification will double the capacity of any railroad. With the better equipment we can expect in the future, together with the evolution of improved methods of operation contingent on electric power, this capacity should be doubled again, thus securing four times the present capacity.

The electric locomotive has generally, thus far, been a mere substitute for the steam locomotive, although in some cases, due to the greater power of electric locomotive, there has been a modification of the handling of traffic. Two conspicuous examples are the Norfolk & Western and the Chicago, Milwaukee & St. Paul.

In the case of the Norfolk & Western, two electrics handle the same train as was formerly handled by three Mallet engines, but at twice the speed. In this operation, owing to the great increase in hours of road service as well, one electric locomotive is the practical equivalent of four of the Mallet engines replaced.

On the Milwaukee the notable change has been the elimination of intermediate terminals on the 440-mile electrified section between Harlowtown, Mont., and Avery, Idaho. There is at present a single intermediate engine terminal, but the latest passenger locomotives are detached from trains at this terminal for inspection and work only, which takes place about once in eight or ten trips. On regular schedule those engines make a run of 440 miles each day, being taken off for inspection at Deer Lodge after a mileage varying from 3,000 to 5,000. On occasion, when due to a schedule derangement engines have been maintained in continuous road service for thirty hours or more, for a full day of twenty-four hours records up to 766 miles in this mountain service have been established.

The advantages of electric power are its great flexibility and mobility. The difference between steam and electric locomotives is fundamental. The steam locomotive carries its own power plant, while the electric locomotive, on the other hand, is simply a transformer of power. The design of the steam locomotive is circumscribed by the necessity of tying up the rest of the machine to a steam boiler. On the other hand, the electric locomotive assembly can differ amazingly as to type, length, axle loading and driving connections. A group of small motors does not differ materially from a single large motor in efficiency. The speed and power, therefore, of an electric locomotive is limited only by conditions of track and construction, and of car equipment. It is entirely practicable to build an electric locomotive to take any train which will hold together, over any profile whatever and at any desired speed. Therefore, it should easily be practicable greatly to increase the speeds of freight trains so that they could all run at a common speed not very different from that at which the superior trains are operated.

Again, with the retirement of the lighter and weaker car equipments, a material increase in the weights of trains will be realized. Without the limitation in train speed commonly accepted as a handicap to operation of tonnage trains, who can say what the limit to train load will be with electric power? Every other industry that has been electrified has experienced a revolution in methods and service due to electrification. This should be equally true in the case of the movement of our railroad traffic.

Our present methods have been built up entirely under the necessities and limitations of the steam locomotive. This is evidenced by the existence of intermediate terminals at the ends of all the so-called engine districts, where all traffic halts. Again, the steam locomotive requires attention en route, needs supplies of water and coal, and, because of its slow movement when hauling our present tonnage trains, it is frequently sidetracked for superior trains, and thus there are more and still more halts to traffic.

Car inspection now takes place at the terminus of each engine district. If, under condition of electric operation, the engine district can be increased to 200, 400 or even 500 miles, is there any good reason why car inspection should not be eliminated at the present intermediate terminals? In fact, is not the general

*Abstract of paper read at joint meeting of A. S. M. E. and A. I. E. E. sections, New York City, Oct. 22, 1920.

standard of maintenance of equipment of doubtful value on the present basis of inspection at each 100-mile interval? Cars in subway service, which is certainly full of potential hazard, are economically and reliably maintained through inspection at intervals of 1,000 to 3,000 miles. The elimination of these intermediate terminals, with the resultant necessity of keeping the trains moving on the main line, would secure an enormous increase in miles per car with a corresponding saving in equipment.

Furthermore, with the dispatch obtained in handling trains, movement could be so marshaled and scheduled that the necessity of storing goods at terminals to protect exports and local consumption would be largely eliminated, and terminals would then become in fact, as in fiction, gateways open instead of closed.

Coming now to the comparative performance of steam and electric locomotives, it is important to bear in mind that one is a generator and the other a transformer of power. The generation of power in central stations is surrounded with many refinements, and in the consumption of coal there is every opportunity for skillful handling and supervision, so that the thermal efficiency of a modern central station is relatively high and is continuously maintained at a high value. With the steam locomotive, on the other hand, the thermal efficiency is dependent not alone upon the design of the locomotive but the manner in which it is worked, its

condition, which differs widely from the best, and finally by the skill in firing. The electric locomotive, on the other hand, consumes power only when in service and works at any load at its designed efficiency. The average performance, in the case of the electric, approximates the maximum in efficiency, while the steam, on average performance, will differ widely therefrom. There is further economy due to the lesser work performed, because the electric locomotive does not have to trail supplies of fuel and water, nor is there need for the hauling of coal to points of local supply, which will always be greater than hauling to electric central stations.

There are a considerable number of different designs of electric locomotives all in successful operation, and each possessing certain advantageous features. The great latitude with which electric locomotives can be designed, while fundamentally most desirable, is in itself at the present time somewhat of a handicap. This is now the subject of intensive analysis and this study is undoubtedly developing as well a better knowledge of the running characteristics of the steam locomotive.

To state the case briefly, we are all interested in the transportation problem. Electrification is bound to be the most potent factor for its relief. We should, therefore, secure the closest possible co-operation with the engineering and mechanical skill which has been so productive in the steam locomotive field.

The Electric Locomotive in Heavy Traction*

The Several Factors in Its Application Are Stated and Illustrated by References to Data from Operating and Test Records

By A. H. ARMSTRONG

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A COMPARISON of the modern steam and electric locomotive leads immediately to a discussion of the relative fitness of the two types of motive power to meet service conditions. At present railway practice has closely followed steam engine development, but are we not justified in looking at the transportation problem from the broader standpoint of a more powerful and adaptable type of motive power?

A locomotive is primarily a hauling machine. Its design is defined by recognized limits such as maximum degree of track curvature, coefficient of adhesion between driving wheels and rail, gross weight and dead weight per axle, tracking qualities at high speed, etc. Furthermore, the locomotive should be simple in construction, reliable and adaptable in operation and capable of being maintained in condition for a reasonable percentage of its cost.

Accepting the Mikado and Mallet as the highest developments of steam-road and helper engines for freight service, the general comparison of Table II, shown on page 872, is drawn with an entirely practicable electric locomotive that can be built without in any respect going beyond the experience embodied in locomotives now operating successfully.

The above analysis brings out the fact that to equal

the hourly ton-mile performance of one electric locomotive it would require three and four engine crews respectively for the Mallet and Mikado types.

The electric locomotive has demonstrated its very great advantages in relieving congestion on single-track mountain-grade divisions. Due to the increase in number of meeting points through its higher speed,

TABLE I—COMMONLY ACCEPTED CONSTANTS IN HEAVY TRACTION

Limiting gross weight per axle, lb.	60,000
Limiting dead weight per axle, lb.	18,000
Limiting coefficient adhesion running, per cent.	18
Limiting coefficient adhesion starting, per cent.	25
Ruling gradient, per cent.	2
Maximum curvature, deg.	10
Maximum rigid wheelbase, ft.	18
Maximum speed on level, passenger, m.p.h.	65-70
Maximum speed on level, freight, m.p.h.	25-30
Maximum drawbar pull, lb.	150,000

and on account of the independence of climatic conditions of the electric locomotive and other time-saving factors, it is safe to say that the daily tonnage capacity of single-track mountain-grade divisions will be increased fully 50 per cent over possible steam-engine performance by the adoption of the electric locomotive.

REGENERATIVE BRAKING IS A UNIQUE ELEMENT

The hazard of mountain operation is greatest on down grades, although the perfection of automatic air

*Abstract of paper read at joint meeting of A. S. M. E. and A. I. E. E. sections, New York City, Oct. 22, 1920.

TABLE II—COMPARISON OF STEAM AND ELECTRIC LOCOMOTIVES

	Mikado	Mallet	Electric
Type.....	2-8-2	2-8-2	6-8-8-6
Weight per driving axle, lb.....	60,000	60,000	60,000
Number of driving axles.....	4	8	12
Total weight on drivers, lb.....	240,000	480,000	720,000
Total weight locomotive and tender, lb.....	480,000	800,000	780,000
Traction effort at 18 per cent coefficient.....	43,200	86,400	129,600
Gross tons, 2 per cent grade.....	940	1,880	2,820
Trailing tons, 2 per cent grade.....	693	1,495	2,430
Speed on 2 per cent grade, m. p. h.....	14	9	16
Horsepower at driver rims.....	1,620	2,080	5,570
Indicated horsepower at 80 per cent efficiency.....	2,030	2,600	.....
Trailing ton-miles per hour on 2 per cent gradient.....	9,700	13,500	38,800

TABLE III—ELECTRIC LOCOMOTIVE MAINTENANCE DATA FOR 1919

	N. Y. C.	C., M. & St. P.	B., A. & P.
Number of locomotives owned.....	73	45	28
Locomotive weight, tons.....	118	290	84
Annual mileage.....	1,946,879	2,321,148	566,977
Cost of repairs per mile, cents.....	6.39	14.65	6.48

brakes has done much to modify its dangers. It is left to electricity, however, to add the completing touch to the safe control of descending trains by supplying regenerative electric braking. Aside from the power returned from this source (14 per cent of the total on the Chicago, Milwaukee & St. Paul Railway) the chief advantage of electric braking lies in its assurance of greater safety and higher speeds permitted on down grades.

The electric locomotive shows great advantage over the steam engine in cost of maintenance. Special importance attaches to this item of expense in these days of high labor and material costs. In order to draw a fair comparison, however, there should be included in steam-engine repairs all expenses of round-houses, turntables, ashpits, coal and water stations, in fact the many items contributing to rendering necessary steam-engine service, as most of these charges are eliminated by the adoption of the electric locomotive. Spare parts can be substituted so quickly that, excepting wrecks, there is no need of the back shop for electric locomotives, unless turning tires and painting can be considered heavy repairs. Electric locomotives are now being operated 3,000 miles between inspections on at least two electrified railways and the data that are given in Table III show recent costs.

On the basis of pre-war prices, maintenance costs were approximately 60 per cent of the figures given in Table II. In contrast, it can be stated that the present cost of maintaining a type 2-8-8-2 Mallet may be taken at 60 cents per engine-mile, without including many miscellaneous charges not shared by the electric locomotive. Possibly more direct comparison may be better drawn by expressing maintenance in terms of driver weight, as in Table IV.

TABLE IV—STEAM AND ELECTRIC REPAIRS ON WEIGHT BASIS

	Steam Mallet	C., M. & St. P. Elec.
Cost of repairs per mile, cents.....	60	14.65
Weight on drivers, tons.....	240	225
Cost of repairs per 100 tons locomotive weight on drivers, cents.....	25	6.52

TABLE V—FUEL COMPARISON, SHOWING STANDBY LOSSES

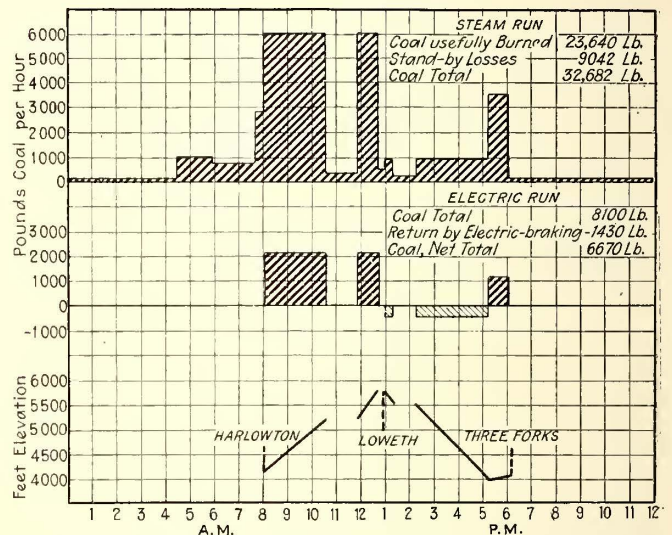
	Steam	Electric
Doing useful work, lb.....	23,640	8,100
Making up fire, lb.....	1,535	.....
Delay at Harlowton, lb.....	2,270	.....
Held up at Loweth, lb.....	394	.....
Held up at Dorsay, lb.....	128	.....
Held up at Dorsay, lb.....	230	.....
Fire, banked 9 hr., lb.....	1,425	.....
Coasting down grade, lb.....	3,060	.....
Total standby losses, lb.....	9,042	.....
Regenerative braking, lb.....	.....	1,430
Total net coal, lb.....	32,682	6,670

Including all engine service charges, the facts available give foundation for the claim that electric locomotives of the largest type can be maintained for 25 per cent to 30 per cent of the upkeep cost of steam engines operating in similar service.

FUEL SAVING AS PROMISED BY ELECTRIFICATION

As to fuel saving effected by steam railway electrification, estimates of electric engineers have been called extravagant by steam engine advocates. Fuel economy figured prominently among the reasons leading up to the replacement of the steam engine on the Chicago, Milwaukee & St. Paul Railway as brought out by a careful analysis of the performance of the steam engines then in service.

The following runs are chosen for illustration as bringing out most strikingly the inherent disadvantages of operating a steam engine over a single-track mountain-grade division and handicapped by the usual delays attending freight train service under such conditions: The run of 111.1 miles from Harlowton, elevation 4,162 ft., to Three Forks, elevation 4,066 ft.,



COAL CONSUMPTION COMPARISON ON IDENTICAL RUNS

over the Belt Mountain divide at Loweth, elevation 5,789 ft., was made by steam with 871 tons trailing load in twenty-six cars and by electric locomotive hauling sixty-four cars weighing 2,762 tons. The accompanying diagram shows the results reduced to a common basis of 1,000 gross tons moved, including the locomotive and tender weight. The running speed of the electric train was but slightly higher than the steam and the additional correction in the power demand rate of the former is made proportional to the lower speed. Both runs are therefore shown as made in identical time on the basis of 1,000 total gross tons moved in each instance. The fuel furnishing power to the steam train was 11,793-B.t.u. coal. Electric power was furnished by water and hence no direct coal equivalent is provided by the test result. To afford a common basis of comparison, however, a rate of 2½ lb. of coal per kilowatt-hour is taken as representative of fair electric power station practice. Coal burned under the steam engine boiler was determined by weighing at the end of the run and by detailed record of scoops en route. Power input to the electric locomotive was obtained by means of carefully calibrated recording watt-hour meters as well as curve-drawing volt and

ampere meters. These values of locomotive input were raised to the value of three-phase power purchased, in the ratio given by R. Beeuwkes in his A. I. E. E. paper of July 15, 1920,* and the kilowatt-hours so obtained were reduced to coal equivalent in the ratio of 2½ lb. of coal per kilowatt-hour.

While the electric locomotive demands power only when in motion, the steam engine requires coal during twenty-four hours, whether doing useful work, standing idle or coasting down grade. In fact, the standby losses were such a large percentage of the total coal consumed that a careful record was kept of their several amounts, as may be seen by referring to Table V.

The run of a more modern steam engine would have effected a material reduction in the 23,640 lb. of coal burned in doing useful work, but the amount of coal wasted in standby losses (9,042 lb.) might have been duplicated or even possibly increased with larger grate area. As standby losses constitute so large a proportion of the total coal burned (27½ per cent in this instance) it is apparent that enormous economies over the simple engine tested must be realized in the modern superheater and other improvements since introduced to offset in part the high inherent efficiency of the electric locomotive.

The commonly used unit measurement of pounds of coal per 1,000 ton-miles is at best a very rough and unstable comparison of steam engine runs over different profiles, variable quality of fuel and operating conditions. For example, the data given in Table VI show that pounds of coal per gross 1,000 ton-miles may vary from 650 to 50.5, according to gradient, with no standby losses included. The boiler must always be kept hot, however, and fully 33 per cent can safely be added to the above figures to include the inevitable standby losses inherent to steam engine operation. Except over very long runs with terminals at the same elevation it seems hardly possible therefore accurately to compare engine performance over different profiles by such a variable unit as pounds of coal per 1,000 ton-miles.

A truer understanding of what takes place under the engine boiler may be shown by continuous records of coal burned, tons moved, profile, delays, etc., all reduced to pounds of coal burned per useful horsepower-hour of work done at the driver rims with segregation of the many standby losses, as in Table VII.

Under the same conditions a modern engine would undoubtedly have consumed much less than 9.02 lb. of 11,793-B.t.u. coal while doing work measured at the driver rims. The addition of superheaters gives greater output and economy, while mechanical stokers add output only and, it is claimed, at some expense in economy over good hand firing. However efficient the power plant on wheels may reasonably be developed without too seriously interfering with the sole purpose of the steam engine, the hauling of trains, it can never approach the fuel economies of modern turbine generating stations. Whatever transmission and conversion losses are interposed between power house and electric locomotive are more than compensated for by the improvement in the load factor resulting from averaging the very fluctuating demands of many individual locomotives.

*See issue of ELECTRIC RAILWAY JOURNAL for July 31, 1920, page 227.

TABLE VI—POUNDS OF COAL PER 1,000 TON-MILES

	2 per Cent Grade	Level Track
Horsepower-hours at driver rims.....	123	18.8
Indicated horsepower-hours at 80 per cent efficiency.....	154	23.5
Pounds water per indicated horsepower-hour.....	20	16.0
Pounds water per pound of coal.....	6	8
Pounds coal per indicated horsepower-hour.....	3.33	2.0
Pounds coal per 1,000 ton-miles.....	513	47
Pounds coal per 1,000 ton-miles trailing.....	650	50.5

TABLE VII—ANALYSIS OF STEAM AND ELECTRIC RUNS HARLOWTON TO THREE FORKS, IN UNITS PER 1,000 TONS MOVED

	Steam	Electric
Kilowatt-hours at driver rims.....	2,038	2,038
Horsepower-hours at driver rims.....	2,625	2,625
Coal per horsepower-hour at driver rims, lb.....	9.02	*3.09
Credited regenerative braking, lb.....	.....	0.55
Standby losses, 27½ per cent, lb.....	2.47	.....
Total coal per rim horsepower-hour, lb.....	11.49	2.54

*Measured at power house; includes locomotive losses and 32 per cent transmission and conversion loss.

It would be a simple matter to carry through a series of runs over the electrified zones of the Milwaukee with a modern Mikado equipped with up-to-the-minute fuel-saving devices and thus provide the necessary data to draw direct comparisons with the electric locomotive. Such tests with modern steam equipment would undoubtedly discredit the above comparison based upon the economies of six years ago and might lead to something approximating the blend of fact and theory shown in table VIII.

The above table is based upon actual electric locomotive performance, Harlowton to Three Forks, coal taken at 2½ lb. per kilowatt-hour at assumed steam power station. Steam engine values are based upon the known working efficiency of a Mikado equipped with superheaters but penalized with the same standby losses actually determined with a simple engine tested Harlowton to Three Forks. A test run from Harlowton to Three Forks with a modern Mikado engine hauling 1,420 tons may possibly show a lower average fuel rate than 3 lb. per indicated horsepower-hour at drivers less standby waste than 9,042 lb. of coal, but the average annual performance of many such engines would be most excellent if it reached the net figure arrived at of 5.9 lb. of coal per actual horsepower-hour of work performed at drivers. The electric run, however, is being duplicated daily, as to relation between kilowatt-hours and ton-miles, and it is just this reliability of electric operation that may at times give rise to misunderstanding in the comparison of steam and electric data.

In view of all the facts a broad statement may be made that the general adoption of the electric locomotive would probably result in saving fully two-thirds the fuel now burned on present steam engines and possibly one-half the amount of fuel necessary to steam engines of the most modern construction.

TABLE VIII—THEORETICAL COMPARISON OF MODERN STEAM AND ELECTRIC LOCOMOTIVES, HARLOWTON TO THREE FORKS

	Mikado	Electric
Type.....	2-8-2	4-4-4-4-4
Weight on drivers, lb.....	240,000	450,000
Weight engine and tender, lb.....	480,000	568,000
Traction effort, 18 per cent coefficient, lb.....	43,200	81,000
Trailing tons, 1 per cent grade.....	1,420	2,836
Horsepower-hours at driver rims.....	4,360	8,200
Coal per indicated horsepower-hour, lb.....	3	.....
Coal per driver, horsepower-hour, lb.....	3.75	.....
Standby loss, test result, lb.....	9,042	.....
Standby loss, per horsepower-hour, lb.....	2.15	.....
Total coal per driver, horsepower-hour, lb.....	5.90	.....
Coal at power house, per kilowatt-hour, lb.....	.....	2.5
Coal at power house, per horsepower-hour, lb.....	.....	1.86
Coal at locomotive driver, per horsepower-hour, lb.....	.....	3.09
Coal credit due regeneration, lb.....	.....	0.55
Net coal at driver per horsepower-hour, lb.....	5.90	2.54
Total net coal, lb.....	24,800	20,900
1,000 trailing ton-miles.....	157,500	314,000
Coal per 1,000 ton-miles, lb.....	158	66.7
Ratio coal burned.....	2.37	1

The superior operating advantages of the electric locomotive are admitted by many who believe the first cost to be prohibitive, largely due to the necessary trolley construction, copper feeders, substations, transmission lines, etc. Such auxiliaries do add an amount that may equal the electric locomotive expense and the task of proving the electric case is not made easier by the fact that steam engine facilities are already installed and may have little or no salvage value to offset new capital charge for electrification.

Comparing the cost of equivalent steam and electric motive power, it is apparent that on the basis of the same unit prices for labor and material the first cost is approximately the same. While electric locomotives cost possibly 50 per cent more than steam for equal driver weight, the smaller number required to haul equal tonnage may quite offset this handicap, especially with quantity production of electric locomotives of standard design.

The steam engine also demands a formidable array of facilities peculiar to itself, as shown by expenditures made on fourteen railways included in the Northwestern group from 1907 to 1919. This expense covers fuel and water stations, shops and engine houses, shop machinery, turntables, ashpits, etc., and amounted to \$42,200,000 as compared with expenditures of \$68,000,000 for engines. Proper facilities for rendering adequate steam engine service apparently add some 62 per cent to the cost of the latter.

One of the advantages of electric locomotives rests in the longer engine divisions which they make possible. Considered as a problem of construction only, electrification of a new road may, in some instances, compare quite favorably with the complete first cost of steam engines and all facilities incident thereto. The general problem, however, is one of replacing steam engines now running so that the economic advantages of electrification are rather individual to the particular railway under consideration. The operating economies effected under favorable conditions have been found sufficient to show an attractive return upon the additional capital charge incurred besides providing the improved service which was the main objective in view in replacing the steam engine.

No discussion of electric railway economies would be complete without comment upon the increased value of real estate brought about by terminal electrification. Not only is neighboring real estate benefited thereby, but the "air rights" over the electrified tracks may become so valuable as to largely pay the cost of the change from steam. With the work but partly finished the Grand Central Terminal district is already a remarkable example of the indirect benefits derived from electrification.

A SUMMARY OF THE WHOLE MATTER

Some of the principal advantages claimed for the electric as compared to the steam locomotive may be briefly stated as follows:

1. No structural limits restricting tractive effort and speed of electric locomotive that can be handled by one operator.
2. Practical elimination of ruling grades by reason of the enormously powerful electric locomotives available.
3. Reduction of down grade dangers by using regenerative electric braking.
4. Very large reduction in cost of locomotive maintenance.
5. Very large saving of fuel, estimated as two-thirds the total now burned on steam engines in operation.

6. Conservation of our natural resources by utilizing water power where available.

7. Material reduction in engine and train crew expense by reason of higher speeds and greater hauling capacity.

8. Increased valuation of terminal real estate following electrification.

9. Increased reliability of operation.

10. Material reduction in operating expense due to elimination of steam engine tenders and most of the company coal movement, the two together expressed in ton miles approximating nearly 20 per cent of present gross revenue ton-mileage.

11. Large reduction in effect of climatic conditions upon train operation.

12. Postponement of immediate necessity for constructing additional tracks on congested divisions.

13. Attractive return on cost of electrification by reason of direct and indirect operating savings effected.

14. Far-reaching improvements in operation that may revolutionize present methods of steam railroading.

Unusual Trolley Guard Installation

ON ONE of the Council Bluffs, Iowa, lines of the Omaha (Neb.) & Council Bluffs Street Railway the track crosses at grade a group of thirteen steam railroad tracks, including main-line tracks of two railroads, and at the same time curves through an arc of about 75 deg. The difficulty of holding the trolley



A 507-FT. TROLLEY GUARD INSTALLED ON A CONTINUOUS CURVE OVER THIRTEEN STEAM ROAD TRACKS

wheels on the wire while traversing this curved crossing may be readily appreciated, likewise the necessity to resort to every means available to keep the trolley wheel on the wire. If the car were to lose power at any point of the crossing it would be practically certain to be stranded and consequently would be in a dangerous predicament.

In coping with this situation, the Omaha company installed an unusually long stretch of Ohio brass overhead trolley guard. It is 507 ft. long and none of it is tangent. Its installation was a difficult piece of work. Not only was there very heavy traffic on the several steam lines to contend with but the linemen found it difficult to bend the trolley guard sideways and still retain the V-shape. This was done by using bending clamps, which were kept in place while the guard was worked sideways. A $\frac{3}{8}$ -in. backbone messenger cable was first installed and the trolley guard supported from this, with double pull-offs to hold messenger and trolley wire in proper position over the tracks.

W. O. Jacobi, superintendent of electric lines, reports that this installation is of great assistance.

Responsibilities of Foremen with Reference to Safety*

Good Will and Expression Thereof Must Supplement Rules and Printed Matter in Promoting the Safety Movement Among Employees

By JOHN H. MALLON

Superintendent of Transportation Metropolitan West Side Elevated Railway, Chicago, Ill.

THE importance of the position of the foreman in connection with safety work can hardly be overestimated. Unless the men in positions of authority show an interest in the work we cannot hope to attain the desired end.

When I began railroad work, accidents were looked upon as an inevitable accompaniment of the calling. If a collision occurred and an employee was killed there might be an investigation, but that was usually the end. Little attention was given to changing operating methods, to taking steps to guard against the recurrence of the accident. The workmen became callous and careless, assuming that, according to an old superstition, when one accident occurred two more would surely follow. Happily, however, managers of railways or other properties no longer think that accidents are necessary and inevitable; they have been "sold" on the safety movement in a general way, but I doubt whether all of them realize their responsibility in this field fully.

While my subject has to do with the responsibilities of the foreman, we might go further and point out that the higher officials are responsible for the selection of foremen, and this is a great responsibility. Foremen are often selected because they are competent workmen or because they have been long connected with an organization, without due regard to their qualifications for dealing with the men under them.

The workmen in any organization cannot be better than the foremen under whom they work. They get their ideas of the management from the foremen. It is highly important, therefore, that the foremen should know the policies of the management with reference to safety work as they must educate the men under them.

It has been my experience that the character of the man at the head of a company is reflected in all of his subordinates down the line. If he is an enthusiast on accident prevention, the organization as a whole will adopt safe practices. While I fully appreciate the splendid work that has been accomplished by safety committees during the past few years, I feel that we can never attain the best results until the executive heads of the various industries show that they have more than a passive interest in our work. It is not enough merely to authorize the expenditure of money for safety committees, for there is the "human equation" to be considered.

In large organizations there must of necessity be a chasm between the chief executive and the workmen, because their duties are of different natures. The chief executive cannot come into close contact with the workmen except on rare occasions, but it is quite possible for him to acquaint them with his policies through intermediaries, such as heads of departments, superintendents and foremen.

In placing new employees, great care should be exercised in acquainting them with all details of their

work. The foreman who does not look out for the safety of the men under him is not, in my opinion, qualified for his position no matter how efficient he may be in other directions. We are constantly striving for greater efficiency and increased production, but I hold that real efficiency and safety are inseparable.

The confidence and good will of the employees is the first essential step toward safety. The foreman who cultivates that confidence and good will is a big asset to an organization. I do not undervalue the vast amount of good done the safety movement by printed literature, cards, bulletins, etc., but in my judgment the spoken word is more effective, especially when that word comes direct from the man in authority and is spoken in a friendly way. The printed word may soon be forgotten and the caution sign go unread, but the kindly warning registers every time.

The Urgency of Observing Operating Rules*

Intelligent Selection of Men, Followed by Careful Training, Makes Possible Maintenance of Discipline and Enforcement of Rules

By C. E. THOMPSON

Assistant to the President Chicago, North Shore & Milwaukee Railroad, Highwood, Ill.

WHENEVER a task is to be accomplished by the united efforts of many, rules must be established to insure team-work. The company with which I am connected issued a book containing some 500 rules governing the employees of the transportation department. These are practically the standard rules used throughout the country and are designed to cover details of electric railway operation.

These rules may be considered in four general classes: (1) Those governing the physical fitness, appearance and personal conduct of employees; (2) those governing the instruction and training of employees; (3) those governing the operation of trains, and (4) those governing the attitude of the employees toward the public.

First in importance, in my opinion, are those rules governing the selection of men, because this is the very foundation upon which an operating organization is built. In selecting men for transportation work it should always be borne in mind that special physical and mental fitness is required.

Having used due diligence in the selection of the men, the next step is instruction and training. It is very important that new employees be instructed by men who are not only experienced and capable but who will see that rules are fully understood and complied with.

Conditions on every railway are changing from day to day, making changes in the rules necessary. It is therefore very important that the old as well as the new employee be examined as to the rules at frequent intervals. Much can be accomplished by having group meetings, where the rules can be discussed and the reasons behind them given.

Again, the employees are points of contact between the public and the company and must, therefore, so conduct themselves that the public will know the aim of the company to be all-round service. The real problem of the electric railway today is so to train its employees that they know the aims and needs of the or-

*Abstract of paper read before Electric Railway Section, Ninth Annual National Safety Congress, Milwaukee, Wis., Sept. 30.

*Abstract of paper read before Electric Railway Section, Ninth Annual National Safety Congress, Milwaukee, Wis., Oct. 1.

ganization and realize that the company's success is their success and that the company can be successful only when it serves the public courteously and efficiently.

Most delays in service are caused by failure of the human element, orders forgotten or rules broken. Whether the failure results in damage to equipment or injury to passengers, or neither, the delay is serious. Delays to service can be rectified, damaged equipment can be repaired, personal injury claims can be settled, but it is much more difficult to regain the confidence and good will of disappointed and dissatisfied patrons. Popularity of a public utility enterprise can only be retained by efficient service, which in turn requires a religious observance of correct rules by capable, intelligent, trained employees.

Pension Retirement Promised

Beaver Valley Traction Company Makes Provision for Regulating Voluntary and Forced Retirement with Pension

THE Beaver Valley Traction Company and the Pittsburgh & Beaver Street Railway Company, New Brighton, Pa., W. H. Boyce, general manager, have instituted a pension-retirement feature for all employees of the two systems.

This retirement is made on the following basis:

Class "A"—Regular Retirement

All male employees who have reached the age of seventy years, and all female employees who have reached the age of sixty-five years, shall retire from active service.

Class "B"—Retirement at Request of Employee, or at Discretion of Company

All male employees who have reached the age of sixty-five years, and all female employees who have reached the age of sixty years, and whose term of service has been twenty-five or more years, may at their own request or at the discretion of the company be retired from active service.

Class "C"—Retirement at Request of Employee

All male employees who have reached the age of sixty years, and all female employees who have reached the age of fifty-five years, and whose term of service has been thirty or more years, may at their own request retire from active service.

The payment for regular allowances under Classes "A," "B" and "C" shall be as follows:

For each year of his or her term of employment two per centum (2 per cent) of the average annual pay during the ten years next preceding retirement, provided, however, that the company may, at its discretion, base such allowance upon the average annual pay of the ten consecutive years of service during which the retired employee was paid the highest rate of wages. The minimum allowance shall be \$25 per month, and the maximum allowance shall not be more than seventy-five per centum (75 per cent) of the average annual pay upon which said allowance is based.

Class "D"—Retirement at Discretion of the Company

Any employee whose retirement on account of advancing years is desirable, or who has become permanently and totally incapacitated or disabled as a result of sickness or injury, other than by accidental injury arising out of and in course of employment by the company, and whose term of employment has been fifteen years or more, may, at the discretion of the company, be retired from active service. If an allowance is granted it shall be for such period as the company may determine, and if at any time during such period the employee recovers sufficiently to resume active service, the allowance may be discontinued by action of the company, if the employee re-enters the service of the company, at the time such allowance is discontinued, the period of absence shall be considered a leave of absence and not as a break in the continuity of the employee's service. The amount and duration of each allowance under Class "D" shall be determined by the company.

It is provided that the decision of the company based on company records shall be final on possible disputed

questions of term of employment and payment for service of employees. Many details of interpretation of how years and salaries are figured, of methods of paying allowances, of insurance provisions now in force, etc., are added to the formal statement.

H. O. Allison, safety engineer for the two companies, who has charge of the employment of all trainmen, states that the use of the pension feature as an inducement to the applicant and for the older employee to stay has been most effective. He thinks that men do give consideration to the future held out by the job offered.

In addition to the pension feature these two companies carry a blanket insurance policy covering all employees. These policies pay on the basis of $\frac{1}{2}$ year's wages to dependents in case of death of an employee who has been in service for one year. An employee of two years' service holds a policy calling for the payment of a full year's wages to his dependents in case of his death from any cause. The only stipulation made in these policies is that none shall call for more than \$2,400. There is no charge to the employee.

Pacific Claim Agents Meet

THE Pacific Claim Agents' Association held its annual meeting at San Diego, Cal., on Sept. 22, 23 and 24, and the following officers were elected to serve for the years 1921 and 1922: President, Charles A. Blackburn, Butte Electric Railway; first vice-president, John S. Mills, Oakland Terminal Railways; second vice-president, Frank D. Oakley, Tacoma Railway & Power Company; third vice-president, S. A. Bishop, Pacific Electric Railway; secretary and treasurer, B. F. Boynton, Portland Railway, Light & Power Company.

The following were elected members of the executive committee: J. H. Handlon, chairman, San Francisco; T. G. Aston, Spokane; C. M. McRoberts, Los Angeles; A. M. Lee, Seattle; H. G. Windsor, Tacoma, and J. W. Grace, Sacramento.

West Virginia Convention

FOR the first time since the war the West Virginia Public Utility Association became operative when the first annual meeting since 1917 was held on Oct. 5. One of the important decisions reached was to establish permanent headquarters in Charleston and employ a paid secretary. The meetings were held at the West Virginia Engineers' Club.

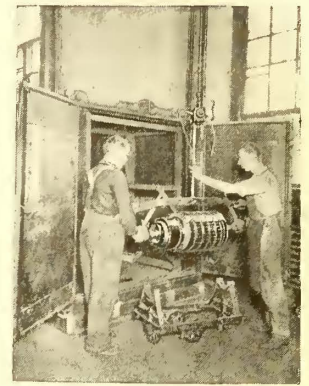
The following officers were elected: President, Herbert Markle, Bluefield; first vice-president, C. P. Billings, Wheeling; second vice-president, M. Hetzer, Moundsville; third vice-president, E. W. Alexander, Charleston; treasurer, A. M. Hill, Charleston; executive committee: W. P. Rawley, C. C. Bosworth, W. R. Power, H. H. Grimsley, A. C. Babson, H. S. Newton, C. S. McCalla and C. H. Brewes.

The retail price of gasoline in England is now more than 4s per gallon; that is, it is approximately \$1 in American money at the normal rate of exchange. Of course the "imperial" gallon is 20 per cent larger than the gallon which is standard in the United States. The *Electric Railway and Tramway Journal* attributes the recent rate increase to rise in ocean freight, increased railway charges, more expensive labor and higher maintenance charges.



Shop, Track, Power and Line

These Articles and Ideas Are From Men on the Job Who Find Special Applications and New Methods an Incentive for Greater Effort — If You Have Something Good Pass It Along

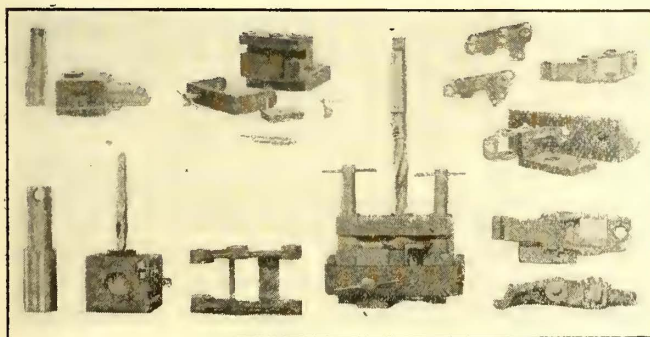


Repairs to Control Equipment

Shop Jigs for Drilling Magnet Plungers and Bushing Worn Contact Levers and Contact Fingers Increase Their Life

IN THE shops of the Wilkes-Barre & Hazleton Railway and the Lehigh Traction Company, Hazleton, Pa., under the direction of James W. Brown, superintendent of shops, jigs have been made up for use in making and repairing the wearing parts of D.B.-131 GE type M control interlock boxes. Accompanying illustrations show these various jigs and the manner in which they are used.

At the left of the illustration is seen the magnet plunger and the jig used to drill the $\frac{1}{8}$ -in. hole near the end of this plunger. The plunger itself is turned down from soft steel. The jig is made of cast iron and the



CONSTRUCTION OF JIGS AND METHOD OF APPLICATION TO CONTACT LEVER, CONTACT FINGER AND CONTACT PLUNGER FOR DRILLING AND BUSHING

guide hole for drilling is bushed with hardened steel. A set screw holds the plunger firmly in position for drilling. Plungers have to be renewed due to the wearing of the shoulder and this jig insures that the drilling is properly done.

The equipment used in bushing and repairing contact levers is shown in the center of the illustration. When the contact lever is worn it is placed in the jig and the hole originally $\frac{1}{8}$ in. in diameter is drilled out to $\frac{3}{8}$ in. and reamed. Small bronze bushings made up from brake valve stems and other scrap materials are used to bush these holes to the proper diameter. These bronze bushings are turned to a pressing fit on the outside and bored out to $\frac{1}{8}$ in. inside and then cut off at the proper lengths. As in the previous case, the jig is made of cast iron, the construction details being clearly shown in the illustration. The guide holes for drilling are bushed with

hardened steel. The contact lever is placed in the jig and two set pins are used as illustrated to center the lever in the jig. A clamp is then hooked over two pins on the side of the jig and a set screw holds the lever firmly in place for drilling. Both a bushed and an unbushed lever are shown beside the jig illustrated.

Contact fingers become badly worn and have to be bushed in the same manner as the contact levers. The contact finger is of an awkward shape and is held in a squared position for bushing with difficulty. At the right of the illustration is shown the means used to accomplish this. Two specially constructed angle plates are screwed firmly to the finger, as shown in the illustration. These insure that the finger will remain in a squared position for drilling. As with the contact lever, the original $\frac{1}{8}$ -in. diameter holes are drilled out to a diameter of $\frac{3}{8}$ in. and reamed, following which they are bushed with the same size bronze bushings as are used on the contact lever.

Pumping Corrosive Liquids

THE development of the chemical industry and more refined methods in water treating for power plant work have brought about a demand for apparatus to handle corrosive acid, gases or liquids at different temperatures and under varying amounts of pressure.

The substance which is most generally suitable for resisting the action of corrosive liquids is some kind of siliceous ceramic material, as this can be obtained in any form desired, can be molded and baked and is insoluble in any liquid and unattacked by erosion or by gases. Heretofore, Germany has had the monopoly on this business, but during the war a new acid ware, called "ceratherm," was prepared by the English. Like silica-ware, it can be plunged when red hot into cold water without cracking, and its good heat conductivity permits of a rapid equalization of temperature in vessels.

A line of centrifugal pumps made from this material in modified form has been placed on the market for use wherever a pump possessing the qualifications outlined is needed. By special features of design, the material, cemented into iron casings, is protected from excessive mechanical strains and what metal bearings are necessary are protected from contact with the liquid pumped. The range of sizes built by the manufacturers in England, the Guthrie Company, runs from deliveries of 10 gal. to 5,000 gal. per minute.

These pumps have been used successfully for pumping sodium peroxide and other liquids, such as hydrochloric, nitric and acetic acids, both hot and cold.

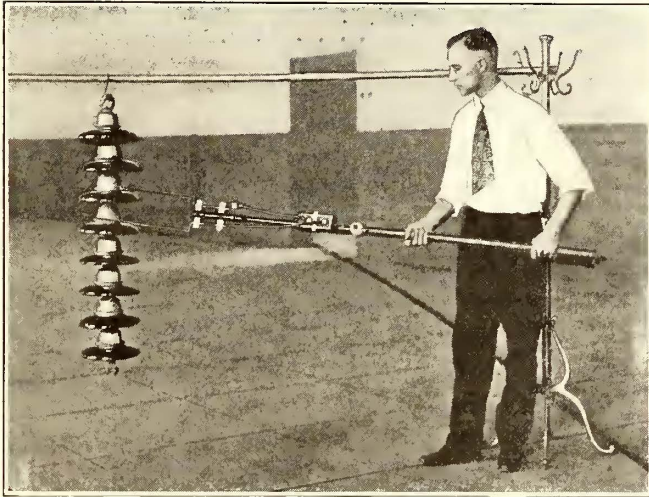
Unique Insulator Tester

Device Which Facilitates the Continuous and Special Inspection of High-Tension Transmission Line Insulators

DEFFECTIVE insulators on installed lines are difficult to locate without serious disturbance to service or great expense for equipment. No matter how thoroughly defective units have been weeded out during the winter and spring months, the first few hot days of summer bring failure of insulator units. If the defective units are not immediately located and removed they become a serious menace to satisfactory line operation.

The Mississippi River Power Company has developed a unique method for testing the insulators on its lines which may be of interest to other line operators. This company operates two 110,000-volt transmission circuits, carried on a single tower line 144 miles between Keokuk and St. Louis. On these two lines 87,000 suspension-type insulator units are in service.

Previous to 1915 it was possible to take one of the St. Louis lines out of service during daylight hours on

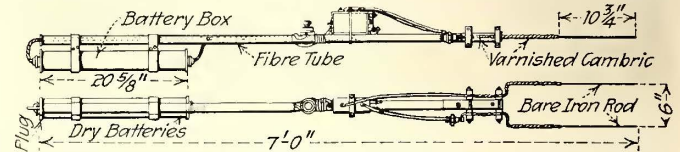


METHOD OF APPLYING INSULATOR TEST FORK TO INDIVIDUAL UNITS

weekdays for megger testing of insulators. The amount of power carried over these two circuits has increased, however, during the last two years to such an extent that at present neither line can be cut out during the week except at night, without reduction of load and resultant loss of revenue. Under these conditions testing which can be done during daylight hours only is limited to Sunday periods. The time necessary for testing the insulators by the megger method was limited by the great number of insulators on the line, and also the megger method for testing insulators gives trouble at night due to dampness. The company then attempted to work out some equipment which would be self-contained in a single-testing outfit which would not require any long wires connecting the test points to additional equipment on the ground. After trying out several schemes, the so-called Keokuk insulator tester was developed as can be seen in the accompanying figures.

Upon the handle of a fork is mounted an automobile induction coil, the high-tension winding of this coil being directly connected across the tines of the testing fork without an automobile spark plug connected in

series with the circuit. The low-tension winding of the induction coil is connected in series with three dry cells in a container at the handle end of the fork, and in series with this circuit is a 5-amp. snap switch by means of which the induction coil can be energized during tests. This testing fork is not designed for use on live lines, and any circuit on which tests are to be made must be taken out of service and perfected before the fork is applied to individual units. When the line is ready for test the fork is applied to each unit in an insulator string. If the unit is of satisfactory resistance no discharge occurs across the spark gaps. Whenever the fork is placed across a defective insula-



DETAILS OF CONSTRUCTION OF THE TEST FORK FOR TESTING OF INDIVIDUAL INSULATOR UNITS

tor unit which has a low resistance a heavy discharge occurs across the spark gap, and in this way the defective insulator is easily located. Three ordinary dry cells are sufficient for testing several thousand insulator units.

During the period from June 23 to July 26 of this year 44,000 insulators at dead ends and anchor towers on the Keokuk-St. Louis 110,000-volt line were successfully tested with this device, and 2,087 units, or 4.74 per cent, were found defective and replaced. As many as six testing tools were employed simultaneously during the interval between 10 p.m. and 6 a.m., and an average of between 700 and 1,000 units per crew were tested each night.

The present plan is to provide each of the nine patrolmen, who live at 16-mile intervals along the St. Louis line, with a testing fork. Once each week during the hot weather season each patrolman will test insulators at two anchor towers. In this way any progressive deterioration in insulators will be detected before severe line trouble can develop.

The above information is gleaned from an article by R. B. Howland, *Stone & Webster Journal*.

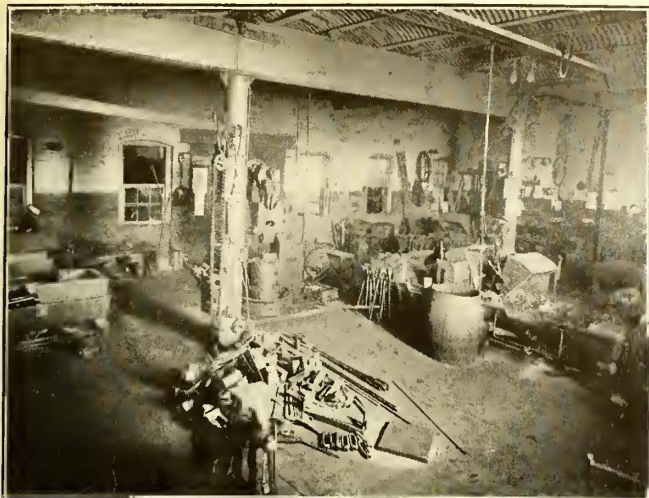
Efficiently Arranged Forge Shop

Washington Railway & Electric Company Located Its Forge Shop So That It Is Convenient to Iron Rack and to Machine Shop

THE forge shop of the P Street shops of the Washington Railway & Electric Company, Washington, D. C., was laid out with the primary view of efficient handling of materials to and from the forges and was as centrally located as the layout of the plant permitted. The accompanying sketch shows this general layout, together with the location of forges, anvils, etc.

For receiving and storing iron an iron rack was built in the adjacent yards. This is handy to the alley through which the iron is delivered and to the main door of the forge shop. This iron rack is built of horizontal pipe supported by wooden members and is large enough to take a large and varied stock of iron and steel.

The rack is 30 ft. long, 8 ft. high, and 16 ft. deep, and is convenient to the shear and punch, which is



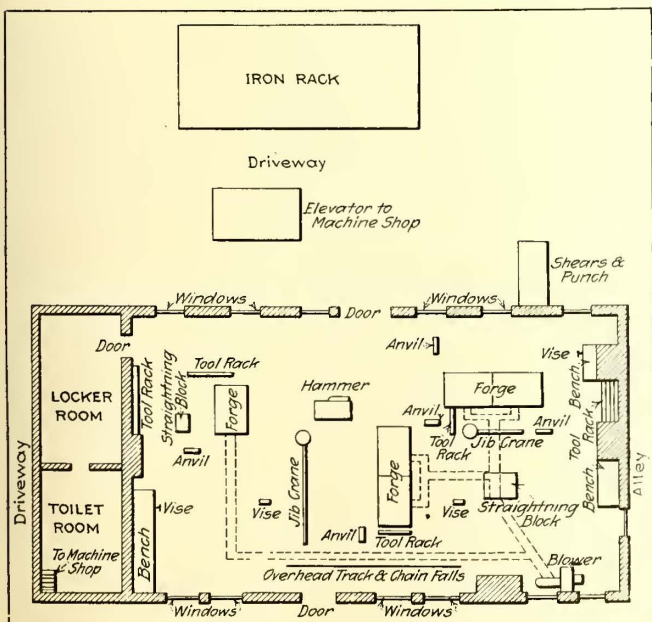
INTERIOR ARRANGEMENT OF FORGE AND BLACKSMITH SHOP

located just outside the shop so as to allow extra long pieces of steel to be cut and punched for use in the forge shop. For convenience in handling finished work, the elevator shown on the layout serves the machine shop and all work from the forge shop to the machine shop is carried this way.

A locker room has been constructed next to the blacksmith shop which is used by the machinists and blacksmiths. This is equipped with 6-ft. lockers. The toilet and washroom adjoins the locker room and is supplied with both hot and cold water. The shop itself is well lighted during the daylight by large windows opening direct onto the street, and at night by 100-watt incandescent lamps.

Five forges located as shown in the sketch are of the Buffalo down-draft type. The draft ducts are laid under the concrete floor and all come together at the blower, which is located as shown in one corner. This blower is operated by a 10-hp., 600-volt d.c. motor. Each forge has a separate draft fan and one 8-hp. motor, which is situated at head of the forge and readily accessible.

The shop is also equipped with a No. 7 Beaudry power



PLAN OF BLACKSMITH SHOP OF THE WASHINGTON RAILWAY & ELECTRIC COMPANY

hammer and a combined shear and punch, both with independent motor drives. The shear and punch, as already referred to, is located just outside the shop.

A ½-ton gib crane serves one end of the shop, and here all the heavy forging is done. A smaller gib serves the other end. In addition to this principal equipment other necessary benches, anvils, straightening blocks and tool racks are arranged in convenient locations.

Economies in Car Painting

Methods and Processes Used in Painting Simplified Considerably During Past Few Years—Further Economies Can Be Accomplished

WITH a view of obtaining information on additional economies in car painting that might be possible, the editors of this paper have made some special investigations of the methods used in painting automobiles and methods recommended by paint manufacturers. From the information obtained it appears that a large saving in time can be obtained through the use of a rapid drying filler. Every painter knows that if a perfect job is to be produced it is of the utmost importance to begin with a good foundation. The filler should provide this foundation and should be of such a nature as to eliminate the natural suction that is peculiar to some forms of filler material, and so enable the varnish and body coats to remain in place until natural wear removes them.

The Poughkeepsie Paint Company has placed a filler on the market known as "Filokote." This filler is intended to replace the primer and plastering coats, and two coats of this filler will provide a surface equal to the primer and two plastering coats, a saving of one operation. Carriage and automobile painters in that vicinity have used this product for the past eight or ten years with very good results. The great advantage obtained from the use of this filler is due to its rapid drying. It may be applied at the rate of a coat every twelve hours, and with the employment of artificial drying may be applied as often as every three hours. By doing away with the primer lead and guide coats it cuts down the time required for a job by at least five or six days, and the labor necessary for applying these coats.

Another advantage claimed for this filler is that it does away with the use of water for rubbing and thus eliminates the necessity of waiting for the water used under the old way to evaporate before further work can be done. If the water is not thoroughly evaporated it will cause trouble in the finished job in the form of blisters scaling and the sinking of the varnish coat.

Most railways lay out their painting and varnishing schedule in a systematic manner and along lines which will require the removal of cars from service during periods when they are least needed. In former years it was considered necessary to have a car in the paint shop from two to three weeks while it was being repainted. Under methods which are now used this time has been reduced to approximately ten days on some railways. In pre-war days methods generally used for painting electric cars required one primer coat, one lead coat, three coats of rough stuff, one guide coat, one filler coat, one coat of colored varnish, one lettering coat and one coat of finishing varnish.

The methods now in general use consist, first, of scrubbing the car when it is received in the shop. After the car is thoroughly dry a primer is applied. In general with the usual type of surface car, the scrubbing will take two men approximately ten hours, and it will be necessary to allow the car to dry for the succeeding twenty-four hours before the primer coat can be applied. This priming coat will take approximately seven man-hours, after which the car must stand for drying an additional twenty-four hours. After the primer is dry plastering or glazing is done. This takes one or two coats, depending upon the condition of the car and the surface that is desired. With a car in ordinary condition the plastering would take from five to nine hours' time of a single man, and an additional ten hours would be required for drying after each coat. The car body would then be ready for the body color, after which it could be lettered and varnished. The application of the body color would take approximately fourteen man-hours, the drying twenty-four hours and the varnishing approximately seven man-hours, after which it would be necessary to dry twenty-four hours longer before the car could be returned to service. Many roads are now using enamel paint instead of the body color and varnishing. Where varnish is not used this saves nearly two days' time.

By analyzing the figures just given it is readily seen that a large amount of the time that a car is in the shop is consumed in drying. If this can be shortened the car could be returned to service more speedily. Where an operation can be performed in a week the car could be returned to service for the Sunday traffic. Ordinarily no work is done in shops on Sunday and the painting schedules are usually arranged so that the cars can dry on this day.

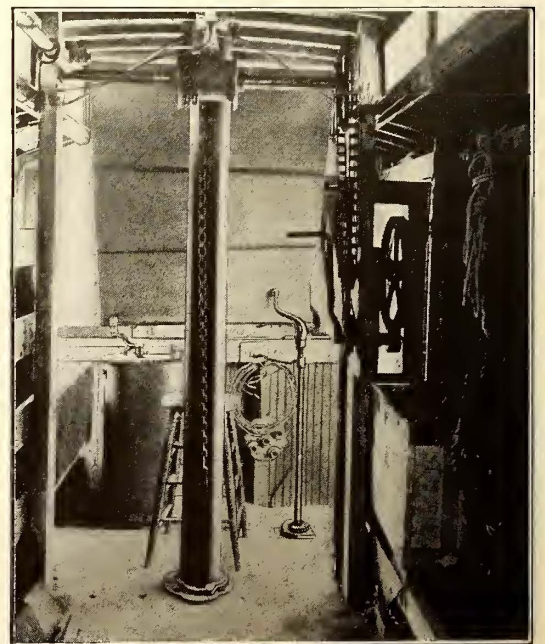
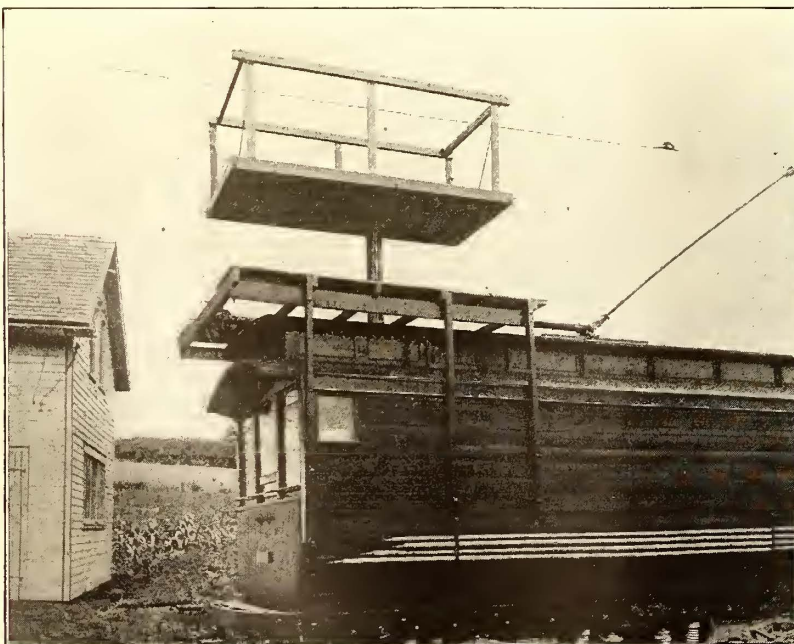
As a result of the high prices for paint and oils, the use of cheaper substitutes has received considerable attention. Great interest has been manifest in the use of semi-drying oils and driers in general. As a result of investigations, important advances have been made and some valuable scientific work has been accomplished with reference to the chemical reactions

that take place while oils are drying. The question of how and why some metallic salts make an oil in which they have been dissolved dry to an elastic film has not yet been fully answered. This, however, is a very important factor in car painting, as cars in operation are frequently subjected to rapid changes of temperature which will cause the paint to crack unless the film is quite elastic. Under some conditions the oil used will dry with satisfactory speed, but to a tender, cheesy film, which is not serviceable.

An average figure for the revenue of a car under present conditions is approximately \$40 per day. When a car is not in operation the greater part of that sum of money is definitely lost. If by employing new methods or different materials for car painting the time of completing a car can be shortened by four days, which it seems probable can be accomplished under favorable conditions, this would mean a saving of approximately \$160. In addition to this saving there would be undoubtedly a saving in the labor charges. Neat and well-painted rolling stock adds materially to any operating company, and it is certain to result in increased revenue by attracting riders more frequently who desire clean and comfortable transportation.

Convenient Line Car Platform

ACCOMPANYING illustrations show the general arrangement and working details for a type of line car platform which was constructed by the Northampton Traction Company of Easton, Pa. All the working parts for raising and lowering the platform are installed on the inside of the car. The platform above the car is supported on a post and has a swivel joint where it is attached, so that the platform can be turned to any desired position. Gearing connected to the mast on the inside of the car enables one man to raise the platform to its full height with two men on the platform in less than one minute's time. As at present constructed the platform can be hoisted 7 ft. above the roof, which permits work on line and overhead troughs at railroad crossings which are 22½ ft. high. The platform is 8 ft.



AT LEFT, LINE CAR WITH PLATFORM RAISED. AT RIGHT, INTERIOR GEARING FOR HOISTING PLATFORM

x 4 ft. and has a railing 2 ft. 9 in. high, which is hinged so that it will fold down on the platform when not in use. This railing can be readily folded or turned up by hand. The car, together with this platform, was originated by Edward Welch, line foreman of this railway, who will be glad to supply others with additional details of its construction.

Automatic Car Air and Electric Couplers

Safety in Operation and Economy in Maintenance Have Proved an Incentive for Improvements in Car Couplers for Train Operation

TRAIN operation presents many problems which did not exist when cars were operated as single units or even occasionally as motor and trailer. Not the least of these is the means for connecting the cars together. In the early stages of electric railway development the primitive link and pin type of coupler was fairly satisfactory, as at infrequent intervals only was it necessary to operate more than one car at a time, such as the hauling of a light trailer to meet

sible accidentally to separate them while the train is in operation due to uneven track, etc. Furthermore, the fundamental idea of the air brake is maintained in that unintentional separating of the cars will produce an emergency application.

If the lock of one coupler should become deranged or defective the other is not affected in any way, and it alone will prevent accidental uncoupling of the cars.

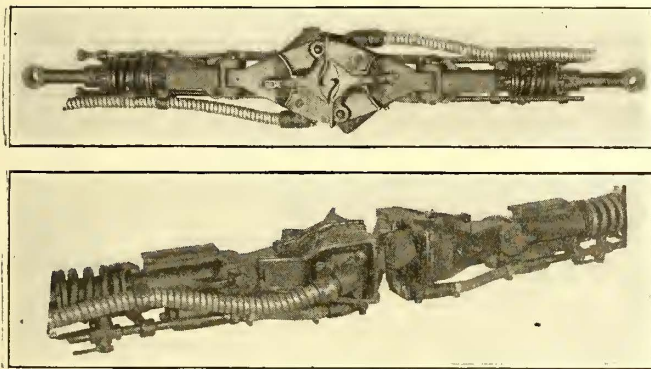
The couplers are of the "tight lock" type and are held together rigidly so that all slack is eliminated, and the train moves as a solid unit without severe shock or possibility of damage to car apparatus or equipment.

From the standpoint of economy there are many advantages. Time is saved because trains may be made up more promptly and congestion at terminals avoided. Delays due to failure of air or electric connections are obviated.

Maintenance is reduced because there is no expense for electric jumper up-keep or replacements and the wear and tear on hose connections is eliminated.

The coupler comprises a cast steel head and draw bar with suitable draft gear spring and an electric portion. The head has a hooked end and recess in its face adapted to engage with the corresponding face of another coupler. Vertical motion is provided where the head is attached to the draw bar and lateral movement at the point where the draw bar is attached to the car. The coupler heads are doubly locked together and become as rigid as a single casting, so there is an entire absence of slack, permitting the train to move as a single unit without shock.

The air connections are brought to outlets at the coupler face and provided with soft rubber gaskets to seal the joints. Thus the pneumatic connections are accurately and reliably made when the couplers are locked. The electrical portion consists essentially of a series of "butt" type contacts which are brought together when the couplers become engaged. These contacts while coming together are caused to rotate in opposite directions, which subjects the surfaces to



TOP AND SIDE ARRANGEMENT OF COUPLERS

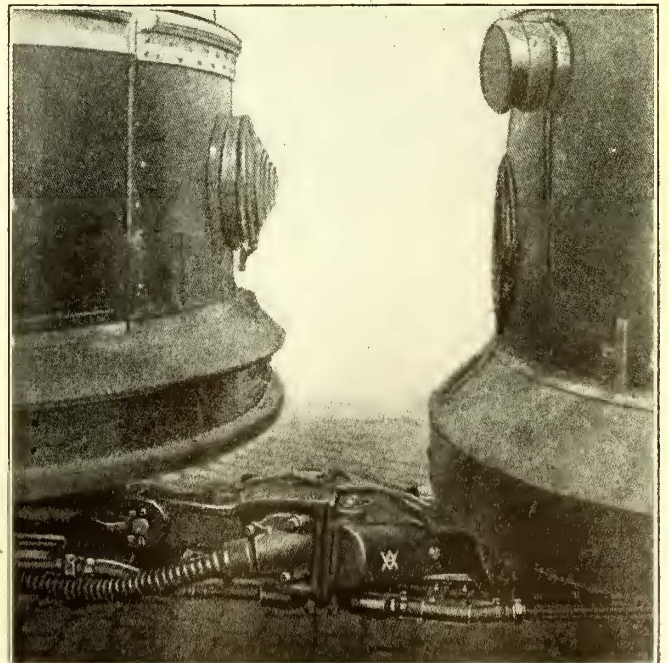
special demands, or the hauling of a disabled car to the carhouse. When, however, two or more cars are operated together regularly the means of connecting them becomes of great importance.

The introduction of the automatic car coupler marked a wonderful advance in train make-up facilities, effecting, as it did, a saving in the matter of time and a reduction in the element of danger involved. However, this left something yet to be desired since manual coupling of the air connections was still necessary. Further progress was made when the Westinghouse car and air coupler was evolved a few years ago. This obviated the necessity for hose connections, but still required the use of separate electric jumpers. Obviously, the ideal condition is that in which all necessary connections between cars, mechanical, pneumatic and electrical, are made automatically.

The coupling of cars together for train operation involves the two important considerations of safety and economy.

The safety element is increased as the element of personal danger in making up trains is eliminated, there being no need for the train crew to go between the cars because the mechanical, pneumatic and electrical connections are all made simultaneously and automatically.

When the couplers are locked together it is impos-



COUPLING OF CARS IN SERVICE

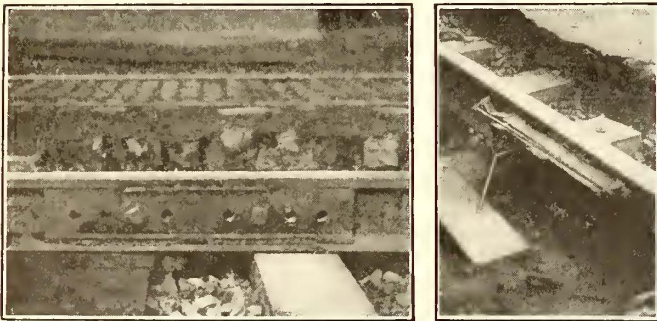
a rubbing action, removing all non-conducting material which may have accumulated and insuring a perfect contact. The contacts are well protected from mechanical injury on the open end of a car.

The K-1-A Coupler is adapted for multiple car or motor and trail car operation in street railway service. It is entirely automatic in the coupling operation, but the uncoupling is manual. The impact of the couplers, one against the other, locks them together and makes the air and electric connections, the operation being completed by manipulation of circuit closing switches and cutout cocks. The reverse movement of switches, cutout cocks and movement of unlocking handles comprises the uncoupling operation. When the coupler part the latch is automatically tripped to locking position, so that they are reset and ready to be coupled again without the necessity of further manual action.

The electric portion, consisting of a group of nineteen contacts which permit the use of thirteen separate circuits, is mounted in the face of the coupler. The contact faces are entirely within the contour of the coupler head and being in a cavity back of its projecting nose are well protected from accidental contact with any foreign object. When the couplers meet, and at a point where the gathering and aligning surfaces have engaged, the contacts come together and are compressed by each other against such a spring resistance as, combined with the self-cleaning feature, will insure good contact and provide full carrying capacity without overheating. A rubber gasket prevents the entrance of moisture to the contacts.

Welding Rail Joints to Obtain Flexibility

HAVING experienced a number of broken joints where the fishplates had been welded to the rail for the full length of the top and bottom edges, and also riveted, Charles H. Clark, engineer maintenance-of-way Cleveland (Ohio) Railway Company, came to the



AT LEFT, MANNER OF WELDING RAIL JOINTS TO SECURE A DESIRED DEGREE OF FLEXIBILITY. AT RIGHT, JIG USED TO SUPPORT FUSING ROD AND TO CUT OFF UNDERCURRENT OF AIR

conclusion that the joint was too rigid and that it was desirable to weld it in a way that would introduce a certain degree of flexibility. The joints were breaking down completely, that is, the fishplates were breaking in two at the joint. This was caused, it was believed, by the action of the car wheels as they approach and pass over a joint. As the car approaches the rail tends to bend upward at the joint, causing a tensile stress at the top of the plates and a compressive stress at the bottom. Then as the wheels come upon the joint these stresses are suddenly reversed and in the absence of any flexibility there apparently develops a strong tendency to snap the plates.

In October, 1917, a different plan of welding was inaugurated, and since then not a single joint has broken in the manner previously encountered. The new scheme is shown in the accompanying picture. Along the head of the rail the plate and rail are fused or welded together continuously for a distance of 6 in. each side of the rail joint, leaving an unwelded length of about 8 in. at each end of the plate. Along the base of the rail the plate is welded for a 10-in. length on either side of the joint, but leaving a gap at the joint about 3 in. wide, and about a 3-in. unwelded length at each end of the plate.

Plates that are welded in this manner are placed on both sides of the rail and riveted in addition, following the standard joint practice in Cleveland. In the joint shown in the picture the riveting was omitted, since the track under construction was a short piece to permit a by-pass in case of a tie-up and is little used.

The welding of the joint, making use of a Lincoln Electric Company bonding machine, is facilitated by the use of a jig which is braced in position against the joint. This provides a copper surface just even with the top edge of the fishplate and fitting tightly against the plate, on which the soft steel welding rod is laid adjacent to the rail. The copper form on which the steel rod rests prevents the air from coming up around the arc during welding and thereby overcomes the tendency to oxidize and harden the metal.

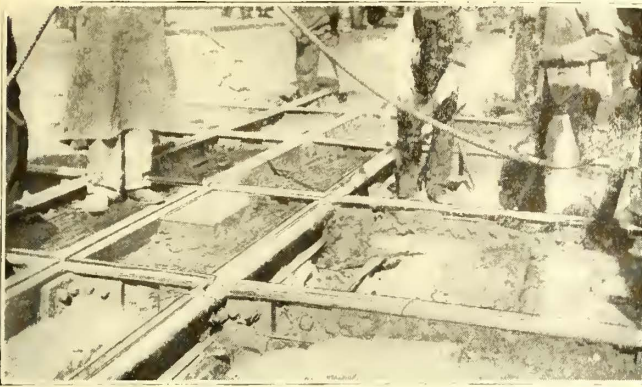
The jig also includes a rod supported up above the copper form, on which the operator rests the insulated handle of his electrode while welding. This makes it possible to draw an arc of just the right length and then hold a steady flame of uniform length all the way across the weld. The rail, joint plate and soft steel rod are fused together rather than welded in the ordinary sense.

Cast Weld Joints in England

THE cast weld, or Falk joint, as it is sometimes called, has been successfully used in England, according to a recent issue of the *Tramway & Railway World*. A. E. Collins, city engineer of Norwich, is credited with the statement that the Falk joint has been continually used on the tramway system of that city for twenty-two years with very few breakages. Following a description of the process of manufacture of these joints, which is very similar to that now used in this country, Mr. Collins says that in the joints made twenty years ago the cast metal was carried to the top of the rail but it was later thought advantageous to stop it off at a lower level; this has now been abandoned and the previous method reverted to. It is of interest to note that American cast weld joint practice has passed through the same stages.

The rails used were principally those weighing 65 lb. per yard (presumably of the British type of narrow-groove section), but in relaying the weight was increased to 90 lb. per yard.

The Danes recently celebrated the one-hundredth anniversary of the announcement of the discovery of the magnetic effect of the electric current by Prof. Hans Christian Oersted on July 21, 1820. This celebration centers in Copenhagen, where he taught and where he founded a technical college. A statue of the scientist has been unveiled in his native town, Rudkøbing, and a memorial museum in Copenhagen is projected.



OLD CROSSING WITH FAILING RAIL JOINTS, BUT WITH GOOD RAIL AND SLOT JOINTS

Thermit Welding for Special Trackwork Repairs

Interesting Combination of Thermit Welding for Rail Joints and Arc Welding for Rail-Slot Joints in Washington

BY R. H. DALGLEISH

Chief Engineer the Capital Traction Company, Washington, D. C.

THERMIT welding for special trackwork repairs is being used by a number of railway companies and has been used by the Capital Traction Company for some time with satisfaction.

Special trackwork for a double-track surface track crossing a double-track conduit track has been recently built by this company in the main shops, using thermit for the wheel rail joints. This special trackwork was built by us for this intersection five years ago, using metal electrode arc welding at the joints. The wheel rail joints failed in the weld, but the joints where the wheel rail joined the slot rail were satisfactory, none of them having failed when the crossing was removed.

One of the accompanying illustrations shows some of the wheel rail joints that failed and also shows the slot and wheel rail joints in good condition. We were compelled to renew this crossing due to the failure of the wheel rail joints and decided to use thermit weld for the wheel rails and metal electrode welding for the slot rail joints, inasmuch as the slot rail joints were satisfactory in the old crossing.

The other illustration shows the new crossing installed with the thermit-welded wheel rail joints and arc-welded slot-rail joints. The crossing is made in four sections and the wheel rails and slot rails are con-



NEW CROSSING WITH THERMIT-WELDED RAIL JOINTS AND ARC-WELDED RAIL AND SLOT JOINTS

tinuous on the conduit track. The wheel rails on the surface track were cut $\frac{1}{2}$ in. short to allow for thermit welding.

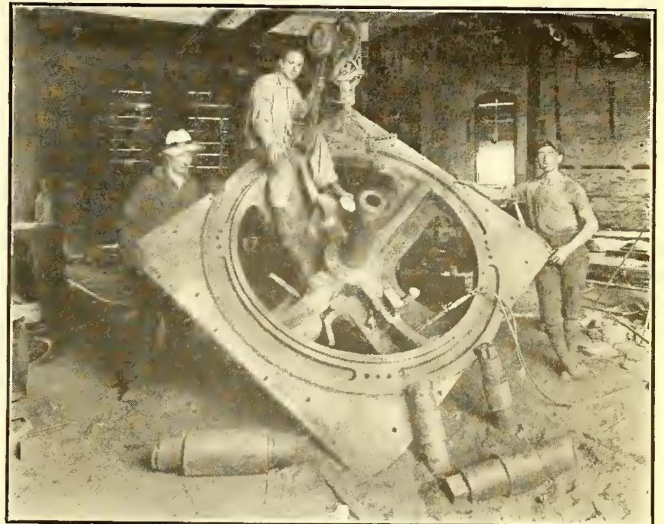
The old crossing was installed on planed head yokes for the conduit track, and as the new crossing was installed on the yokes already in place we were unable to have any thermit metal below the base of the rail. In order to get a good bond at the joint it was necessary to allow the metal to flow under the base of the rail and grind it off before installing the crossing in its permanent location.

In work of this character it is very important that the rails be securely clamped down before the thermit is poured in order to prevent them from twisting out of shape. It is also important that all the care possible be taken, as a very good job in this class of work can be easily spoiled by a little carelessness on the part of the workmen in the fastening of the rails in position.

Repairing an Electric Locomotive Crane Base

THE illustration shows a cast-iron turntable base of an electric locomotive crane which was recently repaired by thermit welding for the Boston Elevated Railway at the Worcester, Mass., plant of the New England Welding Company, of which R. M. Taylor, is president.

The crane base was broken in three places, the average dimensions of each break being 6 in. x 9 in.



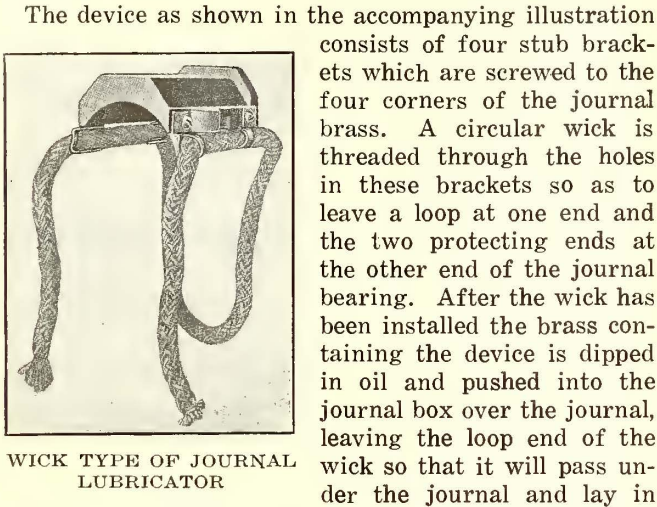
CRANE BASE AFTER WELDING

with a 6-in. opening. The job was turned over to the welders Saturday afternoon and repairs were immediately started on the first break. The first pour was made at 10 o'clock Saturday night. It was necessary to cover the entire casting with a charcoal fire to prevent unequal shrinkage, letting the fire die down and the casting cool before the second weld could be attempted. The job was completed on the following Saturday morning and shipped that afternoon as soon as the casting had become cool enough to handle.

Thermit to the amount of 940 lb. was used in successfully making the three welds. This repair saved the Boston Elevated Railway many weeks' loss of the use of its electric locomotive crane.

New Method of Lubricating Car Journals

A NEW arrangement for lubricating car journals is being placed on the market by the Horrocks Desk Company of Herkimer, N. Y., in the form of the "Da-night Lubricator."



WICK TYPE OF JOURNAL LUBRICATOR

The device as shown in the accompanying illustration consists of four stub brackets which are screwed to the four corners of the journal brass. A circular wick is threaded through the holes in these brackets so as to leave a loop at one end and the two protecting ends at the other end of the journal bearing. After the wick has been installed the brass containing the device is dipped in oil and pushed into the journal box over the journal, leaving the loop end of the wick so that it will pass under the journal and lay in the bottom of the journal box. This method of lubrication may be used as an auxiliary waste lubrication or it may be used independently without waste.

New Asbestos Insulated Wire

THE Independent Lamp & Wire Company, New York, N. Y., announces that it is marketing a new asbestos insulated wire which will be known as Salamander W.E. finish. This is intended for use in winding armature coils, fields and magnet coils for railway equipment. This wire has an insulation coating of pure asbestos free from molecular moisture and treated with compounds and heat in such a way as to make the asbestos resemble rawhide. The manufacturers claim that this wire will withstand extremely high temperatures and that it has high dielectric qualities as well as being impervious to moisture, fire, acid and oil.

New Line of Insulated Cloth

A NEW line of treated cloths for insulating purposes is shortly to be placed on the market by the General Electric Company. The cloths are all woven from long fibered yarn and treated by a special process to remove nap, thus eliminating the possibility of the varnish film being penetrated by the cotton fibers, which would reduce the insulation value. This process makes it unnecessary to starch the cloth to lay down the nap.

All the varnishes used in treating these fabrics are extremely flexible and age well under all operating conditions. By use of special machinery for impregnating the cloth, uniform coatings are obtained.

Yellow varnished cloth is a closely woven cloth treated with a high-grade yellow varnish which is baked in place. It has good dielectric strength and a hard surface film. Two others are yellow oiled muslin and oiled canvas. They are impregnated with insulating oil and oven treated to give them a hard, smooth surface. The linen is used for a large variety of purposes, such as wrapping armature coils, while the canvas is used for pads under railway motor field coils.

Black varnished cloths are very flexible and have longer life under elevated temperatures than the yellow variety. Their oily surface renders them particularly

impervious to oil and moisture, and they are preferable wherever a hard surface is not required because of their better insulating qualities. They are of three kinds: First, a black varnished cloth of great mechanical strength, used either as a tape for wrapping armature, field and transformer coils and leads, or as a sheet for wrapping the slot portions of armature coils; second, a duck of a very close weave treated with a black japan of high insulating qualities, and oven cured, and third, a cloth similar to the first except that it is thinner, being used to wrap the slot portion of coils.

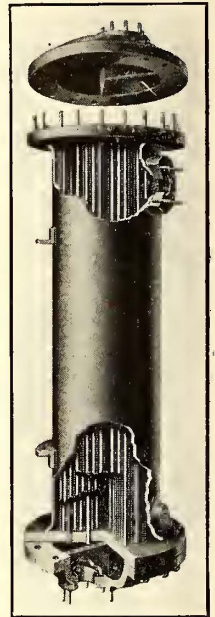
All of these fabrics may be put to other uses than those mentioned, it merely being the idea to suggest some applications to which their particular qualities make them especially adaptable.

New Oil Heater

THE Griscom-Russell Company, New York, N. Y., manufacturers of the Reilly oil heater of the coil type, has recently placed on the market a new oil heater unit of the straight tube type. This is to supplement its coil heater line and is known as the G-R oil heater.

As shown in the accompanying illustration this is designed for the pre-heating of fuel oil before it goes to the burner and to insure complete atomization of the oil and perfect combustion under boilers or in furnaces. The oil is pumped through the tubes and high pressure steam in the shell serves as the heating medium.

The shell of the heater is constructed of wrought steel welded to steel tube plates. The tubes are of seamless drawn steel expanded into tube sheets at either end.



STRAIGHT TUBE OIL HEATER

Alberta Engineers Organize

THE engineers of Alberta, Canada, have formed the Alberta Association of Professional Engineers, the first general meeting of which was held at Calgary on July 10. The president of the association is F. H. Peters, commissioner of irrigation and chief engineer Department of the Interior, Calgary, and the registrar and honorary secretary is Prof. R. S. L. Wilson, department of civil engineering, University of Alberta, Edmonton. R. A. Brown, city electrical engineer, Calgary, who succeeded Thomas H. McCauley as manager of the electric railway department, is one of the councilors representing the electrical section.

Final Registration at Atlantic City

AMERICAN Electric Railway Association headquarters reports the total registration for the 1920 convention to have been 3,330. Separate figures for the various associations, manufacturers, guests, etc., were not kept this year. This total registration shows that the 1920 convention surpassed any in recent years, the previous figures being: 1919, 3,166; 1916, 3,271; 1914, 2,454.

There were 136 exhibitors, occupying 59,678 sq. ft. of exhibit space.

Mobile Has Unique Fare Collection

Passenger Drops Metal Ticket in Fare Box, Through Which No Coin Can Fall; Hands Cash Fare to Conductor

FOR several months now the Mobile (Ala.) Light & Railway Company has had in force a 7-cent cash fare and a 6-cent ticket fare. While 86 per cent of the riders are making use of the tickets the company found that with the 14 per cent it was losing revenue and having arguments with the conductors because of passengers withholding one or two of the coins when dropping cash fares into the fare box. It was claimed by the conductors that it was difficult to detect this practice during rush hours when many people were boarding the car in rapid succession at a given stop. The company makes use of the double-check system of registration, the conductors being required to ring up on a clock having two cyclometers all fares and transfers collected. This is supposed to check against the fares registered in the fare box.

In order to overcome these troubles, the company had the tops of the fare boxes changed so that no coin would fall through. The metal ticket which has been in use for several years in Mobile is slightly smaller than a dime, and the new fare box tops were made so that nothing larger than this metal ticket would fall through. The metal pass used by employees is slightly smaller than the ticket. A third metal piece, termed a "slug," slightly smaller than the pass, is also used, as pointed out below, and the fare box mechanism was changed to register on separate dials these tickets, passes and slugs, with a fourth dial for total fares.

Passengers boarding the car with metal tickets simply drop them into the box and pass on into the car. Passengers boarding and paying the cash fare of 7 cents are required to hand the money to the conductor, who in turn drops a slug, representing a cash fare, into the fare box. Should the passenger put the cash fare into the box in error the coins will not drop through and can then be recovered by the conductor and a slug dropped in instead.

The fare boxes formerly were arranged to register nickels or dimes, tickets and metal passes. During the interim while the company was having the fare boxes changed over to handle the three classes of metal tickets a hinged cover was placed on all fare boxes, preventing passengers from dropping their fares into the box. All passengers were required to hand their fares, of whatever kind, to the conductor, who by receiving the money or ticket in his own hands could prevent passengers from withholding a part of their cash fare and assure, it was thought, that the company would collect the full revenue. The conductor then would lift the lid and drop the coins and tickets into the fare box.

The present system of fare collection was complicated somewhat by the fact that two of the lines of the company extend outside the city limits, where a separate contract with the county calls for a 5-cent fare. That is, a passenger boarding a car and riding between any two points outside of the city limits is required to pay only a 5-cent fare, although the end of the city-fare zone was some distance outside the city limits. To take care of this situation the company had to install another register, on which these 5-cent fares could be tallied in order to keep them separate from the 6-cent and 7-cent rates collected within the city zone.

There are only a few of such passengers, so the fact that they are not registered in the fare box is not a serious matter.

Letters to the Editors

Mechanical Department Stores Accounting

THE CONNECTICUT COMPANY

NEW HAVEN, CONN., Oct. 21, 1920.

To the Editors:

Referring to the paper "Mechanical Department Stores Accounting," presented by Thomas Kennedy before the Iowa Electric Railway Association on Sept. 16, 1920, I have been very much interested in reading the paper and particularly interested in the forms as reproduced on page 719 of the JOURNAL of Oct. 9.

The form on page 718, "Not Stores" tag, to mark material not charged to stores account would seem to me to be more or less unnecessary, and I should think, if I understand the situation correctly, that it would be liable to lead to erroneous accounting.

It is my belief that all material should be charged to stores account, or some subdivision of stores account, and unless such material is so charged it would seem that it would be lost sight of. The master mechanic, or any shop foreman, might take some of that material and use it for repairs, or it might disappear from the storeroom entirely without any record being made of it.

In our storeroom accounting practice we have found it advisable to have all stores included in the stores account, or in some subdivision of that account. In that way we never lose track of it, and if it is used without a requisition to the storekeeper our system is such that it is charged to the proper operating account (or if not used, it is charged to the operating accounts) at the close of the year. This is because such material is usually inventoried at the close of the year, and if that inventory is short of the amount shown on the books for the same class of material the previous year, then the difference is charged off to certain operating accounts as are other inventory differences.

Perhaps I have misunderstood the purpose of the tag mentioned. If so, I should be glad to have Mr. Kennedy's correction. Let's have a little discussion as to the advisability of a "Not Stores" tag.

I. A. MAY, Comptroller.

Paper on "Creeping of Railroad Rails"

35 NASSAU STREET,

NEW YORK CITY, Oct. 12, 1920.

To the Editors:

There is about to be issued by the American Society of Civil Engineers a paper of mine, entitled "The Creeping of Railroad Rails." It consists mainly of a compendium of information received through a questionnaire from more than a hundred of the highest authorities on the subject in North America. I greatly desire to have this paper thoroughly discussed; hence, if any railroad man who wishes to discuss it will write me to that effect, I shall send him an advance copy, provided his letter reaches me before my supply of copies is exhausted.

J. A. L. WADDELL,
Consulting Engineer.

Suggestions on the Proposed Use of Movies

Letters Received as a Result of Editorial Suggestion of Sept. 25 Indicate Keen Interest—The Educational Possibilities of This Medium

SEVERAL letters have been received in response to the editorial suggestion in the issue of the JOURNAL for Sept. 25 with reference to the possibilities of the use of motion pictures in electric railway publicity. Space permits the publication of only a few of these this week, but other communications will be published in early issues.

Railway Propaganda Can Form Only a Flash of an Interesting Film

THE METROPOLITAN WEST SIDE ELEVATED RAILWAY
CHICAGO, ILL., Sept. 29, 1920.

To the Editors:

The proposal to tell the story of the electric railways in a film is a valuable suggestion and it only remains for some astute mind to work out how the story can be told so as to interest the average film audience. It must be borne in mind that an audience that pays to be interested will resent anything that is not to its liking, and no matter how great the problem it will not stand for education in the economics of street railways. It might be possible, however, that nine-tenths of a film would be like any other film, interesting and amusing, and just for one flash to work in something illustrating some feature of the street railway problem.

For instance, a real Western drama, with mountains, plains and cowpunchers, etc., and a brief scene in a town or city where the gas company or the street railway company has gone out of business and ceased to function, due to bankruptcy, with the consequent effect upon the merchants of no business and a dead town. Now this scene would only be an incident in order to convey what happens if the utilities cease to function.

BRITTON I. BUDD,
President.

Hopes That an A. E. R. A. Committee May Be Appointed to Study the Idea

INDIANAPOLIS STREET RAILWAY COMPANY
INDIANAPOLIS, IND., Sept. 29, 1920.

To the Editors:

I am thoroughly in accord with the idea of the many advantages that the motion picture plan offers in setting forth to the people the actual facts regarding the present street railway situation throughout the country. The great obstacle that seems to be in the way of accomplishing most excellent results through this medium is the difficulty of working up a set of films which would be sufficiently interesting to the public to draw them to the theater in connection with the regular motion picture scenes and which would in any adequate way tell the true story of the street railway and bring home the vital interest which every one has in the continued operation of the street railways.

There is no doubt that it is quite possible to produce a satisfactory film for some special local situation which may exist in any particular city. But to make a general film that would be descriptive and illustrative of the street railway, its needs and necessities, the dependence of the public on satisfactory street railway service, and depict it in a way that would be clear and understandable would be a most difficult problem. It would require the most careful thought of the ablest men in the industry, but assuming that the proper thought and attention was given, it should not be impossible of accomplishment.

Personally, I sincerely hope that the suggestion made in your issue of Sept. 25 will crystallize in the very near future into definite form, and that a committee of the

ablest minds in the street railway business may be selected who, together with some expert in the motion picture business, may work out a general film which will tell the actual story of the street railways to the public, and impress upon it their needs and necessities in such an interesting way that it will convince the public of its vital interest and secure its hearty co-operation along constructive lines.

ROBERT I. TODD,
President.

Expense the Deterrent Feature for Single Company

PACIFIC ELECTRIC RAILWAY
SAN FRANCISCO, CAL., Oct. 14, 1920.

To the Editors:

I have no doubt of the value of using motion pictures provided arrangements can be made with motion picture theaters to carry out the necessary plans. We have used motion pictures in connection with the training of our men and our Pacific Electric reels have been loaned extensively throughout the United States to other companies and in connection with safety lectures. The subject of attempting to reach the public has also been considered, but the expense here on the Pacific coast has been a deterrent feature.

Possibly all the electric railways through the American Electric Railway Association or in some other manner might join together in one campaign which could be carried on throughout the United States. It would require, of course, a conference with the motion picture companies to determine how this could be best done if it be practicable at all.

PAUL SHOUP,
President.

Would Use Travelogue Rather Than Play to Carry Message

"MIDDLE WEST RAILWAY"
Oct. 1, 1920.

To the Editors:

The idea expressed in the items in the Sept. 25 issue of the JOURNAL on the use of motion pictures has so much merit that it ought to, and undoubtedly will, have the early attention of the industry generally. I am not so much impressed with the plan of preparing a scenario of nation-wide appeal as I am with the basic plan of using the medium of motion pictures to present the utility to its public. The attempt to prepare a scenario, however, could not but be helpful and it might prove successful. The street railway business is, truly, a national industry, but its situation varies in the different cities and municipalities. For example, snow removal, taxes, governmental regulation, competition, rates of fare, cost of injuries and damages are each of great importance to some companies and of none to others. Unless the presentation of the industry in the picture were general its use would be limited, and if general, what would be its effect in the various localities? I think I know what the reaction would be on our public if it saw some street railways that I have seen.

On the other hand it could not but be helpful to show people everywhere the service demands of twenty-four hours on a street railway, big or small. Congestion in the Loop District of Chicago, in Campus Martius, Detroit; Brooklyn Bridge; Park Street Station, Boston; Cleveland Public Square; vehicular traffic in the car tracks of Baltimore, Chicago and Pittsburgh; jitneys and automobile competition in Kansas City, Newark or Los Angeles, and inter-urban traffic at the Indianapolis and Akron stations are some of the things which would bring home to the car-riding public the daily operating burden carried by this industry.

From the above you will observe that I am inclined to use the movie in the form of a travelogue, instead of a play, but we are agreed on at least one thing, and that is, the motion picture ought to be used by the electric railways of the country as an educational medium.

PRESIDENT.

News of the Electric Railways

FINANCIAL AND CORPORATE • TRAFFIC AND TRANSPORTATION
PERSONAL MENTION

Progress at Detroit

Municipal Railway Commission Reports on Results Since \$15,000,000 Bond Referendum

In its report covering the first six months' activities of the Detroit (Mich.) Street Railway Commission after the passage of the \$15,000,000 bond issue to finance the municipal railway planned by Mayor Couzens, the commission enumerates the work done, work under contract, bids authorized and plans ready for execution and assurances from various sources, including the steel mills, that delivery of material needed will be made promptly.

WORK GOING AHEAD

The mileage of tracks already laid amounts to 1.75 miles. Three-quarters of a mile of pavement has been laid, while 3 miles of the first layer of concrete foundation has been completed and the excavation of 7 miles of roadbed completed, all for double-track lines. The advertising for twenty-five one-man safety cars has been authorized and according to a statement attributed to Joseph S. Goodwin, general manager for the municipal system, cars can be procured and will be running on the St. Jean line early next year.

It is reported that during the week ended Oct. 2, which indicates the rate of progress being made, 3,370 ft. of excavation was done, 3,975 ft. of concrete base was laid, 10,070 ft. of second course of concrete was completed, 1,850 ft. of track ballast was placed and 2,650 ft. of paving constructed. The first course of sub-base concrete on the eastern part of the Charlevoix line is finished. The excavation on the St. Jean line between Kercheval and Harper Avenues, including the Shoemaker and Montclair sections, is completed. The Harper Avenue line, on which work by the Detroit United Railway was stopped and construction started by the city, will be completed at an early date.

COMMISSION COMPLETES ORGANIZATION

The monolithic block type of foundation, in which all the concrete used as foundation, rail supports, and paving bed is in one unit, is considered by the commission to be better than the original type used, and it is estimated that its use will result in a saving of from \$20,000 to \$25,000 a mile. The depth of the excavation is considerably reduced and the use of steel ties is permitted. Paving between the rails will be asphalt instead of granite block.

Departments have been organized to handle equipment, overhead construc-

tion and engineering construction. The organization, according to Mr. Goodwin, is complete and can be added to and expanded to meet the needs of construction.

Seven law suits have been begun against the commission. Four of these have already been dismissed and one, instituted by the residents of Clairmount Avenue to enjoin the commission from constructing a municipal line on their street, is referred to elsewhere in this issue. One case has been appealed to the Supreme Court. The Detroit United Railway will be given an opportunity to present to the Supreme Court its reasons why Mayor Couzens, the Detroit City Council, the City Comptroller, the City Treasurer and the Board of Street Railway Commissioners should be enjoined from using the public funds in the construction of a municipal railway. An order has also been granted for Mayor Couzens and the city officials to show cause why such an injunction should not be issued. Oct. 19 was set as the date for hearing oral arguments.

In accordance with its policy of doing as much of its own construction work as possible, bids have been asked by the city for apparatus including six gasoline-driven locomotives, $3\frac{1}{2}$ tons each for hauling concrete, and six steam shovels, and ninety V-type bucket cars for dumping concrete. Bids for switches and other special steel track will also be opened in the near future.

Strike in Ohio Settled

The strike of the trainmen of the Springfield (Ohio) Railway has been settled. The men went out on Oct. 1 at the termination of their agreement with the company. The scale of wages under the old arrangement was 43, 45 and 47 cents an hour. The company had been negotiating with the city authorities for an increase in fare from 6 cents to 7 cents. During the month of September the city, instead of granting the necessary relief, amended the franchise providing for workmen's tickets during specified hours of the day on a 5-cent basis. After this action had been taken the company notified its trainmen that an increase in wages was impossible.

The trainmen declined to accept the existing wage scale and went on strike. The city was without service for thirteen days. Finally the City Commission allowed a 7-cent fare without special tickets during the rush hour as the former ordinance had provided. An adjustment of the wage scale was reached with the men on the basis of 53, 55 and 57 cents an hour, other conditions remaining the same.

M. O. in New York

Staten Island to Be the Proving Ground for Mayor Hylan's Five-Cent Ideas—Operation Planned Dec. 1

The Board of Estimate of New York, by a unanimous vote on Oct. 18, approved the contract between the city and the Staten Island Midland Railroad, providing for the operation by the city of the lines of the company for at least one year.

A PROFIT-SHARING CONTRACT

There were a few modifications in the terms of the contract which have to be approved by Federal Judge Chatfield, but Commissioner Grover A. Whalen announced that he had assurances that the court would approve the plan in its present form. Briefly, the terms of the agreement are that the city is to equip the lines, operate them for six months, standing all the loss and having all the profit, and that during the following six months the company is to share any profits equally with the city. A clause permits either side to cancel the agreement on a thirty-day notice, and power is left with the court to cancel it at any time. This last provision is to cover legal requirements.

To pay the cost of equipment and to operate the lines of the Midland Company and the Silver Lake line of the Richmond Light & Railroad Company, which will also come within the city control, the Board of Estimate appropriated \$300,000. It is expected that this will cover all costs, although the city, if it carries out its announced intention of putting operation on the same basis it was before the company quit, will have to acquire twenty cars, and to buy virtually all of the equipment needed for their operation. Commissioner Whalen hopes to have the lines running by Dec. 1.

LINE TO BE OPERATED

The lines to be operated are the Richmond line between St. George and Richmond; the Silver Lake line between St. George and Richmond Terrace via Silver Lake; the Concord line between Port Richmond and St. George and Richmond Terrace and Port Richmond via Concord; the Manor Road line between West Brighton line and the Eckstein Brewery, and the seasonal lines between St. George and Midland Beach and Port Richmond and Midland Beach. The fare will be 5 cents.

The proposal to have the lines operated by the city was referred to at length in the **ELECTRIC RAILWAY JOURNAL** for Oct. 16, page 840.

Churches Plan Inquiry

Affairs of the Denver Tramway and Causes of Recent Strike to Be Looked Into

Dr. Edward T. Devine, associate editor of the *Survey* and formerly professor of social economy in Columbia University; the Rev. Father John A. Ryan, S. T. D., professor in the Catholic University of America, and Dr. John A. Lapp, managing editor of *Modern Mechanics*, are actively engaged in collecting information for a basis of a report on the Denver Tramway strike and the present situation. They have established headquarters in the Brown Palace Hotel and are working under the Federal Council of Christian Churches, following an invitation extended by a Denver commission of nine ministers and laymen named in August.

GOOD WILL AND JUSTICE SOUGHT

This is said to be the first time that the National Protestant Council of Churches and the National Catholic Council have been associated in such an investigation. The three representatives of the national body have issued a statement as follows:

The report will attempt to present an unvarnished account of the relations between the tramway company and its employees, before and since the strike; will go as far as necessary into the question of fares and the financial problems of the tramway company which has in Denver, as in other cities, precipitated the question of increasing fares; the subject of public regulation, whether exercised by a state public utilities commission or by the municipal council, and especially into the question of compensation to employees and its relation to the cost of living, as ascertained by official investigations and otherwise.

It is not the purpose of the investigation to try the case and to pronounce judgments, but to assemble the information which will enable citizens to form their own conclusions.

The national bodies are undertaking this study at the invitation of the Denver commission because it is believed that the situation in Denver is typical and that lessons can be drawn from the experience of Denver which will be useful in other communities where similar situations arise.

It is of course the purpose of the churches to promote good will on the basis of justice and fair dealing, and it is in the hope the investigation will contribute to this end, not only in Denver, but elsewhere, that the investigation has been undertaken.

"Plain Dealer" Articles Concluded

The series of articles which has been appearing in the *Cleveland Plain Dealer* on the present situation of the Cleveland Railway has been concluded. In this review several conclusions have been reached. They are as follows:

1—That at least 200 new cars, considerable track renewal, some rerouting of cars, connecting links between existing lines and new lines for the west side, the Collinwood district, the Flats, Brooklyn and parts of the Heights are immediately necessary;

2—That at least four new operating stations and two power houses are required to take care of present needs and that any material increase in the load on the system or any expansion must entail a more comprehensive building program;

3—That the improvements and extensions recommended, particularly in regard to the provision of new operating stations and power houses, will reduce both operating and maintenance costs;

4—That while the population of Cleveland proper has grown 150,000 and the number of car riders increased from 375,000,000 to 405,000,000 during the last five years, the system is short 271 cars, no new operating stations have been built and the

annual track extension in this five-year period has been seriously curtailed.

5—That at least \$5,000,000 is required to carry out the development program recommended by the street railway company and Street Railway Commissioner Fielder Sanders to improve service and bring the system up to immediate requirements;

6—That more than \$4,000,000 worth of capital stock, sale of which has been authorized by city council, still remains unsold;

7—That city authorities, company officials and bankers are agreed that the program should be financed by the sale of capital stock rather than by the sale of bonds, preferred stock or Liberty bonds owned by the company;

8—That frequent appeals to company stockholders to buy new stock at par at a time when the company's stock is listed on the market at 93 and when other securities can be bought to produce a higher rate of return than 6 per cent have not been successful;

9—That unless new capital is raised not one new car can be purchased nor a yard of new track laid and that the present intolerable situation must get worse instead of better.

In the main the report goes on to say that the street railway problem in Cleveland is in the hands of the citizens themselves but that not one of the "improvements, betterments or extensions" imperatively necessary can be provided without additional capital.

City's Representative Wants P. R. T. to Expand

Colonel Sheldon Potter, the city's representative on the board of directors of the Philadelphia Rapid Transit Company, on Sept. 24 demanded that the company be forced to take steps looking to the future growth of the city. He said that the city was developing in a northerly direction, while the company was confessing its inability to construct the absolutely necessary extensions.

He stressed the underlying company rentals and expressed his opinion that rentals could be reduced. Everything, he said, depended on the valuation now being compiled before the Public Service Commission.

Colonel Potter was recently asked to appear before the transportation committee of Council when that body conducted its public hearing on the straight 5-cent fare. He then prepared a statement outlining his views and emphasizing the need for the company to make extensions, etc., that would take care of the transit development of the city. He is reported to have said:

I am absolutely opposed to the city taking any action that would merely continue the present status quo in the transit situation. The company is entitled to all of its legal rights, but the city is likewise to be protected. We will not wreck the company, but it is appealing to us to save the company from bankruptcy.

The city has given the right to our streets to the Philadelphia Rapid Transit and now that company is in the position of preventing other companies from doing that which it apparently cannot do—develop the city. The situation is very critical and important to the city's future. The company says it is on the verge of bankruptcy and needs a higher fare to save it. But it says nothing of using that money for extensions or improvements. The entire proposal merely temporizes and delays the day of reckoning.

I feel that the company, as the party most affected, ought to enter the suit against the rentals and fight them in order to save itself. Then the situation would be clarified and the company enabled to do that which it is morally bound to do—give the people adequate facilities to enable the city to develop to the utmost.

Authority in Commission

Alabama Legislature Vests Public Service Body with Authority Over Rates and Franchises

All power to regulate public utilities was taken away from the cities of Alabama by the Legislature at a special session which ended on Oct. 2. The Alabama Public Service Commission, under a bill adopted with the support of the Governor and of the commission, was granted the exclusive right to regulate the rates of utilities and to govern all contracts and franchises. The City Commission of Birmingham and others vigorously opposed the bill.

RATE PETITIONS FILED

Since the adoption of the bill a petition for a 37 per cent increase in rates in Birmingham and for increases of from 20 per cent upward in other Alabama towns has been filed by the Southern Bell Telephone & Telegraph Company. The Birmingham Water Works Company has filed a petition for an increase and asks a revaluation of its property and that rates be fixed, which will give the company a fair and equitable return on its investment.

As yet the Birmingham Railway, Light & Power Company has not filed a petition for an increase, but it is expected that such a petition will be filed.

Under the terms of the bill as adopted by the Legislature even present existing contracts with utilities are affected and can be modified or changed by the Public Service Commission. In short, the commission is given exclusive right to fix rates and to govern all franchises and contracts between public utilities and municipalities of the State.

Further Canadian Hydro-Radial Commission Evidence

At a further sitting of the Ontario Hydro-Radial Commission in Toronto on Oct. 14, Chief Engineer Gaby of the Hydro-Electric Power Commission continued his evidence with respect to the Toronto to St. Catharines lines. It was stated that the Canadian Pacific steam line carried more than 80 per cent of the Toronto-to-Hamilton traffic because it ran a non-stop service over the Grand Trunk right-of-way and its station in Hamilton was centrally located. The hydro-radial line was estimated to carry 355,000 passengers a year, with an hourly service, making the time between the two cities in one hour for the 40 miles.

The revenue returns from the London & Port Stanley Railway, now operated by the Hydro Commission, were submitted, showing \$24,000 a mile a year, the highest in Ontario. The Toronto & York Radial earned \$10,000 to \$12,000 per mile serving a population outside of Toronto of 20,000.

Mr. Gaby explained the report of W. S. Murray, New York electrical engineer. The estimated cost for the Toronto to St. Catharines line was \$22,000,000.

New York Being Throttled

Head of I. R. T. Points Out How City's Short-Sighted Fare Policy Hampers Future

Frank Hedley, president and general manager of the Interborough Rapid Transit Company, New York, N. Y., says that nothing is more significant to New York in its rapid transit needs than the decision of the Public Service Commission of Pennsylvania authorizing a 7-cent fare in Philadelphia with a continuance of the existing 3-cent charge for transfers. In this connection he points out that New York is now the only large city left in the United States where the policy of preservation and expansion of transit facilities has not been followed. In no other city, he says, is the need for increased transit facilities so great as in New York.

2,000,000 PASSENGERS A DAY

The original subway in New York was opened sixteen years ago. The Interborough subway alone is four times as big as the original subway, but it is still overcrowded. The original subway was built to carry about 400,000 passengers a day. It was gradually increased in carrying capacity until 1,000,000 passengers a day were being handled. The present Interborough subway is carrying more than 2,000,000 a day. The only relief is more subways. Mr. Hedley says:

Transit Construction Commissioner John H. Delaney made public on Sept. 24 a report by Chief Engineer Daniel L. Turner of the Public Service Commission, submitting for discussion a plan for the construction of about 830 miles of single-track rapid transit lines. It contemplates a twenty-five-year program of construction and a cost at present day prices of about \$350,000,000, not covering, however, equipment, interest during construction, or engineering and superintendence. This is an official recognition of the need the Interborough Rapid Transit Company has pointed out on numerous occasions.

The report does not explain how the money for the project is to be obtained. The report states that the operators of the lines would be required to equip them. Equipment cost would at least equal one-half the construction cost. The operators certainly could not raise \$175,000,000 new money until their credit shall have been restored by an adequate fare. The way to get more subways is to make the present system self-supporting and investors will then furnish capital for new subways. On a 5-cent fare the city is obtaining no return on its present subway investment and until it does it is too near the constitutional debt-limit to finance the project for this gigantic system. As a 5-cent fare is not profitable the inducement for investors to furnish the funds is not made clear.

The city is groaning in the anticipation of a budget in excess of \$350,000,000. This is directly tied up with its policy as to fares. As the 5-cent fare is insufficient to give the city any return whatever on its present subway investment, it has to meet the interest on its subway bonds by taxation, which will amount to about \$13,000,000 as soon as the present subway system is all completed and in operation. This increases the tax rate, which, in turn, increases rents and prices.

Additional Bus Permits Denied

The City Commissioners of Pasadena, Cal., have denied the applications of jitney bus owners to operate additional buses in the city until the Commissioners decide upon a fixed policy in regard to the regulation of jitneys.

The city will not allow the expansion of jitney lines within the city limits. It is pointed out by the City Attorney of

Pasadena that sooner or later Pasadena must decide on a single form of local transportation.

The installation of the one-man car by the Pacific Electric Railway will doubtless lessen the increase of jitney bus competition in Pasadena.

Co-operation Urged Between City and Utility

Edwin F. Sweet, assistant secretary of commerce and vice-chairman of the Federal Electric Railways Commission, expressed himself in favor of "friendly co-operation between the company and the community" in an address before the Grand Rapids Rotary Club on Oct. 5. Mr. Sweet said in part:

The practice of many cities, for instance, of forcing the street railway to pay for the paving between the tracks, to my mind, is an outrage. I would distinguish between the car rider and the rest of the community, for now the street car is the poor man's means of conveyance and he is forced to bear the burden of the other fellow when he must pay the company a fare high enough to meet all such burdens placed upon the company, whereas the entire community should help share the expense.

No profit should be made by private individuals in the operation of public utility companies beyond a fair return on their investment. Whatever profit is produced beyond a fair compensation should be reflected in a reduction of fares, into the car rider's pockets.

However, the period of antagonism to street railway companies is fast approaching the end. A period of better understanding is on the way and the problem will be solved with justice to all concerned. God grant that that time shall soon come.

Power Consumption Curtailed

Large users of industrial power supplies from the lines of the Milwaukee Electric Railway & Light Company, Milwaukee, Wis., have announced that they will reduce their power consumption by approximately 20 per cent. This action follows a recent appeal by the company in which the latter stated that, owing to shortage of power, the city was threatened with interruption of electric railway service.

Courtesy Pays

George I. Plummer, superintendent of traffic of the Dallas (Tex.) Railway, contributed some hints to transportation employees to *Partners* for September, published in the interest of the employees of the company. On the matter of service he said:

Service is a commodity we are selling to the public. Are we selling the best and most efficient service? Or are we just getting by?

To give first-class service, we must be attentive to our duty and courteous at all times. We are often called upon to do things not necessarily in the line of duty; we are often called upon to perform a disagreeable task; we are often called upon to deal with unreasonable passengers.

The courteous man handles these situations and disposes of them without difficulty. The discourteous, "hard boiled" species sooner or later gets into trouble and spends most of his time working up excuses in order to account for his action.

This latter type is considered undesirable for this class of work and his services are not wanted, while the other type finds many opportunities to perform real service and to advance in the employ of the company. The opportunity is here for advancement and the ambitious fellow who is always doing the right thing and trying to help out will have no trouble in getting along.

Detroit Injunction Denied

Residents Defeated in Attempt to Restrain City from Building Railway on Certain Streets

Judge William B. Brown, Grand Rapids has ruled against issuing an injunction asked by the 110 Clairmount residents to restrain the city of Detroit from building a municipal railway on their street. The ruling was made on the ground that no detailed plans had yet been made for the construction of the municipal line. The information was conveyed to Bernard F. Weadock, attorney for the Clairmount residents, and Corporation Counsel Clarence E. Wilcox before the court completed its opinion or reduced the decree to writing. It was held that the majority of the voters must be observed, and any change the voters might desire could be obtained at a later election.

SINKING FUND DECISION RENDERED

An opinion similar to that handed down by Judge Mandell was handed down by Judge Brown in ruling on the right of the Sinking Fund Commission to purchase street railway bonds. Judge Mandell refused to issue the injunction asked by the Detroit United Railway when it sought to enjoin the sale of the railway bonds to the Sinking Fund Commission, in order that the case might have an early hearing before the Michigan Supreme Court.

Because the issues were considered of such great importance to Detroit, Judge Brown decided that the local judges should be acquainted with the proceedings and accordingly he invited opinions by Wayne County Judges and suggested they hear the arguments on the case if they desired. The judges concurred with his opinion in the case.

Corporation Counsel Wilcox and a special attorney for the city of Detroit appeared before Judge Mandell asking that the case be reopened because facts had changed which were true previous to the suit.

BONDS DISPOSED OF

The city Sinking Fund Commission has disposed of the most of its holdings of 5½ per cent public utility bonds named in the bill of complaint when the suit was started by the Detroit United Railway. More than \$1,500,000 of bonds have been disposed of to investors. It was stated that the practice of selling bonds to the Sinking Fund Commission has been of value to the taxpayers in that it allowed the city to save money which would be lost if the bonds were sold at a sacrifice to private investors. According to Mr. Wilcox, no further difficulty will be experienced in disposing of as many of the street railway bonds to investors as it is desired to issue.

It was held by Judge Mandell that he could not without propriety reopen the case. A later date was set for a hearing between the city and the Detroit United Railway on the return entered by Corporation Counsel Wilcox.

Wage Rise in Vancouver

A new wage scale effective on Oct. 1 has gone into effect on the lines of the British Columbia Electric Railway, Vancouver, B. C. This was the result of an offer made by the company which the men accepted. The men originally asked for 75 cents an hour, but the company offered an advance of 5 cents, making a maximum of 65 cents on city lines. The new wage scale for the various classes of work is as follows:

Motorman and conductors, 65 cents; interurban motormen and conductors, 67 cents; car repairers, 70 cents; mechanics' helpers, 65 cents; car cleaners, 58 cents; carpenters, 77 cents; blacksmiths and machinists, 80 cents; trackmen, 60 cents.

Mexico Men After More Money

It is asserted by the Mexican Tramways, Ltd., City of Mexico, that should the demands of the employees of that company for another 25 per cent increase of their wages be granted it would add 1,200,000 pesos, or approximately \$600,000 in American money, to the annual pay roll.

In a statement which it has issued to the public the company claims that it is actually losing 250,000 pesos a month at the present time and that its financial affairs are in critical condition. The demands of its employees since 1914 have been excessive, it is pointed out. During the last six years the total sum paid out in wages each year has increased from 2,044,000 pesos to 6,250,000. This, with the 1,200,000 that is now being asked, would bring the total annual pay roll up to 7,812,000 pesos.

It is on account of the alleged unreasonable demands of its employees and the losses incurred by the company during the long revolutionary period that the company opened negotiations for the sale of its property to the Mexican government. Whether this transaction will be finally consummated is not known. Representatives of the Canadian banking interests that control the Mexican Tramways, Ltd., are now in the City of Mexico.

Vote Proposed on City Ownership

The City Council of Ottawa, Ont., has decided to recommend that plebiscites be submitted to the electors entitled to vote on money by-laws at the next annual election, to be held in January, on the following questions:

1. Are you in favor of the city applying for legislation enabling it to borrow money without a further vote of the electors to acquire the property and assets of the Ottawa Electric Railway under the agreement between the city and the railway at a price fixed by arbitration as provided by the agreement? And in the event of the question being answered in the affirmative, that legislation be applied for conferring the necessary borrowing powers.

2. Are you in favor of the city applying for legislation to provide that the city will not be compelled to acquire the property and assets of the railway pursuant to the agreement between the city and the railway unless a by-law setting out the amount of the arbitration award shall first be submitted to and receive the assent of the electors entitled to vote on money by-laws, or for such plebiscite as in the opinion of the city solicitor will carry out the intention of this motion?

News Notes

Strike on Alabama Line.—Union carmen in the employ of the North Alabama Traction Company, Albany, Ala., went on strike on Oct. 5. Service on the company's lines was completely tied up. The men demanded an increase in pay.

New Agreement Being Prepared.—The union employees of the Virginia Railway & Power Company in Norfolk, Portsmouth, Petersburg and Richmond drew up a contract on Sept. 13 in Richmond which sets forth the working arrangements and wage agreement to be asked of the company. None of the terms have been made public.

Consideration of Franchise Proposal Put Off.—Consideration of the petition of the Virginia Railway & Power Company, Richmond, Va., for a general franchise in lieu of the group of franchises under which the company now operates was deferred to a later date at the meeting of the committee on streets of the Council held recently.

Fares an Election Issue.—The Labor party of Winnipeg, Man., is opposing the higher fares granted recently to the Winnipeg Electric Railway. It is making the controversy an election issue. The platform is confined solely to the election of a Council pledged to the establishment of a municipal motor bus service to reduce transportation to a reasonable basis and a demand that the company live up to its original franchise or surrender the same to the city.

Would Abandon Findlay Lines.—The Toledo, Bowling Green & Southern Traction Company, Findlay, Ohio, has appealed to the State Public Utilities Commission for permission to abandon service on its Findlay city lines. The use of automobiles by townspeople is said to have reduced passenger business in the small city to a minimum. Nov. 12 is set for hearing at Columbus. The Findlay City Council recently repealed an ordinance granting the company increase in fare from 5 cents to 10 cents.

Conciliation Board Suggests New Wage Scale.—The State Board of Conciliation has recommended to the Railroad Commission of Wisconsin that all trainmen of the Wisconsin Railway Light & Power Company operating in La Crosse, Wis., should be granted wage increases. Under the new pay scale recommended employees of three years will receive 58 cents an hour, two-year employees 56 cents an hour and first-year employees 55 cents an hour. The Railroad Commission will hold a hearing on the recommendation of the State Board of Conciliation.

Will Take Up Case of One-Man Cars.—William D. Mahon, president of the Amalgamated Association, is expected in Boston soon to take up with the executives of the Eastern Massachusetts Street Railway grievances of the men in relation to the operation of the one-man cars. In consequence of dissatisfaction among the men over the one-man cars and the alleged wholesale layoffs that have occurred since their inception and the establishment of the new wage schedule a few weeks ago, William J. Murphy, chairman of the joint conference board of the unions of the men, sent a telegram to President Mahon urging him to come to Boston at once. Mr. Murphy said nearly 1,000 men have been laid off within the last few weeks. He says this is due in part to the operation of the one-man cars and the new system of curtailment that is being followed out by the executives of the company since the men's maximum wage was increased from 51 to 63 cents an hour.

Akron Ordinance Awaits Review.—The proposed contract between the city of Akron, Ohio, and the Northern Ohio Traction & Light Company for the future operation of the railway system in the city is completed and awaits the final review by E. E. Brownell, the traction expert employed by the city to assist in working out the details. Mr. Brownell is engaged in other work at this time but is expected in Akron shortly to complete his work. As has been stated before, the proposed ordinance provides for service-at-cost, with the city assuming full control. A public utilities commissioner is to be appointed to represent the city and there is a limit placed upon fares. The ordinance provides for the establishment of auto bus lines. It provides also for the purchase or lease of the city system when the city so desires. In fixing the valuation only the physical property used and useful in the operation of the city system is to be taken into consideration by the appraisers. Matters under dispute are to be submitted to arbitration.

Program of Meeting

American Society of Mechanical Engineers

The 1920 annual meeting of the American Society of Mechanical Engineers will be held in the Engineering Societies Building, New York City, from Dec. 7, through Dec. 10. Sessions will be held on the subjects of appraisal and valuation and the application of engineering to woodworking.

The newly-founded professional sections on management, power, fuels, machine shop, railroads and textiles will also conduct sessions to consider the vital problems in their field. In addition to the above a number of valuable papers will be presented at general sessions.

A memorial session for Dr. Brashear is planned, as a fitting tribute to his life and work.

Financial and Corporate

Gross Earnings Increase

Gross Earnings Advance 12 per Cent, but Net Income of Interurban Is Decreased 20 per Cent

The annual report of the Chicago, North Shore & Milwaukee Railroad for the year ended Dec. 31, 1919, shows an increase in gross earnings of \$337,946, but a decrease in net income of \$103,240. The operating revenue for 1919 increased to \$3,237,921, or 11.7 per cent. In 1919 the operating expenses were \$2,319,464, as compared with \$1,856,038 in 1918, an increase of \$463,426, or 25 per cent. The net operating revenue decreased by 12 per cent, from \$1,043,937 in 1918 to \$919,457 in 1919. The taxes decreased about the same percentage. Due to an increase in non-operating income, the gross income decreased by only 11 per cent from \$867,585 in 1918 to \$773,235 in 1919. Net income transferred to profit and loss showed a decrease of \$103,240, or 20 per cent, changing from \$535,079 in 1918 to \$431,839 in 1919.

The increase in the gross earnings was recorded in the face of a very large decrease in traffic which the company had enjoyed in connection with the Great Lakes Naval Training Station and other government activities along the

Public Service Commissioner Lewis Nixon recently directed him to operate for the convenience of the public. The lines are the Ocean, Rogers, Church and Park Avenues and the Thirty-ninth Street-Coney Island lines, operated by the Nassau Electric Railway and the

Metropolitan and Wyckoff Avenues line and the Ralph Avenue shuttle of the Brooklyn, Queens County & Suburban Railroad.

Mr. Garrison, in his communication to Judge Mayer, stated that the lines of the Nassau system were losing \$103,000 a year and those of the suburban system \$400,000, exclusive of taxes and other charges. All of the other lines of the companies, he explained, were barely making operating expenses and if they were forced to carry the burden of these lines' deficits all would have to suspend, thus depriving the Brooklyn public of the limited service now supplied.

Municipal Road Does Well

Small City Road in Florida, Purchased from Receiver, Has Net Operating Profit of \$17,234

For the first year of municipal operation ended June 30, 1920, the railway system of St. Petersburg, Fla., shows a net operating profit of \$17,234. While this was not enough to cover interest and sinking fund charges, the showing is regarded as a good one. The total receipts for the year were \$93,168. The operating expenses were \$75,934.

STATISTICAL INFORMATION—MUNICIPAL RAILWAY OF ST. PETERSBURG

Year ended June 30	Municipal Ownership 1919-20	Private Ownership 1918-19	Percentage Change
Total passengers carried	1,802,739	1,383,742	+30.3
Total passenger fare receipts	\$89,303	63,585	56.2
Total car-miles	459,413	406,863	+12.7
Total car-hours	43,744	35,838	+22.0
Average car speed (m.p.h.)	10.50	11.35	-7.5
Average passenger fare receipts per car-mile (cents)	19.417	15.603	+24.4

The railway consists of approximately 26 miles of track. It was formerly owned by the St. Petersburg & Gulf Railway. This company went into the hands of a receiver, and the city was notified that service would be discon-

INCOME STATEMENT MUNICIPAL RAILWAY OF ST. PETERSBURG

Year Ended June 30, 1919	
Passenger fares	\$89,303
Freight revenue	3,865
Total operating revenue	\$93,168
Maintenance of way and structures	10,317
Maintenance of equipment	11,879
Power	14,853
Conducting transportation	31,420
General and miscellaneous	7,465
Total railway operating expenses	\$75,934
Net operating revenue	\$17,234
Loans from bondholders and city	4,777
Proceeds from bond sale	263,479
Sale of equipment	634
Total non-operating income	\$268,890
Gross income	\$286,124
Deductions from gross income:	
Purchase price to bondholders	\$179,660
Improvements to overhead construction	9,490
Improvements to track and roadbed	14,007
Improvements to buildings	64
Improvements to rolling stock (new cars)	44,868
Real estate purchases	1,020
To Booker Creek bridge and various improvements	8,500
Contingent improvements	210
Back taxes	5,972
Refund of loans	4,777
Interest on bonds	6,875
Total non-operating expenses	\$275,443
Balance on hand June 30, 1920	\$10,681

tinued and the system sold as junk. Rather than lose the service of the railway, the city took charge of the operation of the system on July 1, 1919. A bond issue of \$250,000 was voted. The railway was purchased for \$175,000, about \$75,000 being left for new work.

The old equipment was used most of the year. This greatly increased the cost of operation. It is expected that with one-man cars in use on all lines, the operating cost can be materially reduced. Six new Birney safety cars were put in operation on April 15, 1920, and eight more have been ordered.

The railway has two suburban lines, 6 and 7 miles long, respectively. The cash fare on these lines is 10 cents with coupon books making the ticket fare 7½ cents.

INCOME STATEMENT—CHICAGO, NORTH SHORE & MILWAUKEE RAILROAD

Year ended Dec. 31	1919	1918	Percentage change
Operating revenue:			
Passenger and special car revenue	\$2,951,618	\$2,678,693	+10.2
Freight and express revenue	219,397	151,729	+30.9
Miscellaneous revenue	66,906	69,553	-3.8
Total railway revenue	\$3,237,921	\$2,899,975	+11.7
Operating expenses:			
Way and structures	\$306,524	\$302,525	+1.3
Equipment	262,922	172,183	+52.7
Conducting transportation	923,913	650,042	+42.2
Power	351,011	354,173	-0.9
Traffic	56,223	35,100	+60.2
General and miscellaneous	418,871	342,015	+22.5
Total railway operating expenses	\$2,319,464	\$1,856,038	+25.0
Net operating revenue	\$919,457	\$1,043,937	+12.0
Taxes assignable to railway operation	163,101	185,822	-12.2
Operating income	\$755,356	\$858,116	-12.0
Non-operating income	17,879	9,469	+88.8
Gross income	\$773,235	\$867,585	-11.0
Deductions from gross income:			
	341,396	332,506	+2.7
Net income transferred to profit and loss	\$431,839	\$535,079	-19.5
Surplus at beginning of year	855,812	320,733	+166.8
Surplus adjustment	16,697		
Surplus at end of year	\$1,270,954	\$855,812	+48.5

North Shore. The decrease in net income was caused largely by increases in cost of labor and material. Increased wages effective on Aug. 1, 1919, amounted to \$300,000 per annum.

Service Suspensions Authorized in Brooklyn

Federal Judge Mayer on Oct. 16 granted the request of Lindley M. Garrison, receiver of the Brooklyn Rapid Transit Company and its subsidiaries, for authority to suspend indefinitely operation of nine surface lines which

Judge Mayer said that if Commissioner Nixon would consent to a suspension of transfers on the Church Avenue line and to the substitution of a shuttle service for the Thirty-ninth Street-Coney Island line, these roads might speedily resume operation. None of the lines, with the exception of the Rogers Avenue line, has been operated since the recent strike.

The roads that it is proposed to abandon total about 65 miles of track.

The proposal has aroused much opposition on the part of residents served by the Church and Ocean Avenue lines.

Deficit for Vienna Municipal Railways

Aftermath of the War Proves Too Much for Municipal Tramways Despite Heavy Traffic—Road Overstaffed

The tale of a brave fight against overwhelming odds is revealed in the annual report of the Vienna (Austria) Municipal Tramways for the year ended June 30, 1919. It is a story similar, perhaps, to others elsewhere, but it is accentuated by the horrifying increases in the cost of material and labor, by the need for giving work to

raised the 30-heller fare to 60 heller (12 cents). Since the last report was issued a further increase is reported as of July 8, 1920.

During the period covered by the four fare increases, passenger traffic, density of traffic and revenue per passenger changed as indicated in the accompanying table.

Year	Passengers Carried	Passengers per Car-Mile	Average Revenue per Passenger in Heller (1/5 Cent) and Cents
1916	401,296,245	5.4	16.6 heller 3.3 cents
1917	458,587,787	6.7	18.2 heller 3.6 cents
1918	557,042,590	8.5	21.1 heller 4.3 cents
1919	560,712,667	10.2	28.9 heller 5.8 cents

*The heller is given here at its pre-war exchange value.

men who were in war service but who really are not required, and, above all, by the discouragement that comes from underfeeding and the slight hope for an early betterment of economic conditions.

HEAVY TRAFFIC STAYED OFF DISASTER

One gage to the low estate of the Austrian Republic is the fact that the international exchange value of the kroner has fallen from 20.3 cents to 0.45 cent. While the kroner's loss of purchasing power is not so great as this in Austria itself, the fact that the most popular ride (two sections) cost five times as much in June, 1919, as in May, 1916, is significant enough.

During the feverish war years there was a heavy increase in traffic. Part of this, however, came about through the cessation of taxicabs and private vehicles and through the reduction of service and eventual closing down (December, 1918) of the steam Stadtbahn. This increased traffic had to be handled in the face of severe fuel scarcity, shortage of workable rolling stock and lack of experienced personnel. The various fare increases caused only temporary recessions in traffic. The results are all the more remarkable in that traffic kept up after the armistice, although the population of Vienna as of Jan. 31, 1920, has just been announced as 1,842,005 compared with 2,031,496 in 1910, a drop of 9.3 per cent.

The Vienna system has a combination of zone fares, free transfers, unit fares for workmen, special low rates for children, special high rates for racetrack traffic, monthly and semi-annual season tickets, etc. It would take up too much space to note the increases in these various classes of fares, but the changes in the fare paid for the most common length of ride will give a picture of the whole. On June 7, 1916, the first increase raising the popular 12 heller (2.4 cents) fare to 16 heller (3.2 cents) went into effect; the second increase, Aug. 1, raised the fare from 16 heller to 22 heller (4.4 cents); the third increase, Aug. 28, 1918, raised the 22-heller fare to 30 heller (6 cents) and the fourth increase, June 11, 1919,

Thus, while traffic increased nearly 40 per cent, traffic density increased 88 per cent and revenue per passenger 77 per cent. During the fiscal year ended June 30, 1919, the railway revenue was 160,839,982 kroner. This included 116,862 kroner from freight and express—a service of considerable importance during the shortage of automotive vehicles and draft animals during the war. Operating expenses and other charges exceeded this by 16,202,295 crowns, the first deficit incurred since the municipality acquired the Vienna tramway systems in 1903. In the year 1918, the tramways turned over 8,500,000 kroner profit and in 1917, 7,000,000 kroner. Operating expenses and fixed charges per car-mile in 1919 were actually 100 per cent greater than in 1918, aside from earlier increases.

The chief item of increased expense was in higher wages and the care of employees discharged from the army at the end of the war, both in furnishing them jobs and relieving their immediate needs. Special payments were also made to the displaced female employees. An idea of the desperate state of affairs may be gleaned from the fact that because of fuel uncertainties many labor hours had to be wasted although paid for. The introduction of the eight-hour day January, 1919, (forty-eight-hour-week compared with fifty-one-hour week) and the inability of sadly-underfed men to work with their old-time efficiency also counted heavily. There were 18,364 employees in 1919 compared with 11,963 in 1916. Through the joint efforts of Ludwig Spängler, managing director, and committees of employees, more than twoscore co-operative food distribution shops and restaurants were placed in service.

IRON TROLLEY WIRE AND WOODEN TIRES

The total trackage of the system comprised 585 km. (363 miles) measured as single-track, only a mile or two having been added during the war to permit certain freight and post-office connections. As is well known, copper trolley wire in the former Central Empires was appropriated to quite an extent for military purposes. In Vienna,

iron wire had been installed on 137 km. (85 miles) of track. Aside from the losses due to lower conductivity, the rough and easily pitted surface of rolled iron wire in particular has been found to reduce greatly the life of the aluminum sliding bow current collectors as compared with copper wire.

Although provided with 3,072 cars (1,494 motor cars and 1,578 trailers), shortage of labor and supplies was so acute that at one time there were but 759 single car or train units in operation compared with from 900 to 1,000 in pre-war times. On the average, the number supplied, as in July 1918, was only 800. This caused a drop from 173,600 car-miles to 161,200 car-miles a day and the absolute stoppage of nine routes and the partial suspension of service on others. With the arrival of a coal famine lasting from December, 1918, to April, 1919, service was cut off after 8 p.m. and 100 usual stops omitted. Sunday traffic was cut from the regular 736 to 357 operating units. By June 1, 1919, conditions had improved enough to permit service up to 10:30 p.m. in a city of 1,800,000 people. In spite of these amazing handicaps, the traffic actually was 0.7 per cent higher than the year preceding.

One curious item in war expedients relates to the tramways trackless trolley route. It appears that the substitution of wood for rubber as tires overloaded the motors because of the resulting increase in the size of the wheels. This difficulty was overcome by rebuilding the motors for self-ventilation. Gasoline motor-bus operation had to be suspended completely.

Would Issue Equipment Notes

The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has applied to the Wisconsin Railroad Commission for permission to issue short-term trust notes to finance the purchase of new cars and other equipment. The application was heard before the commission at Madison on Oct. 9, and at the close of the hearing was taken under advisement.

In its order of Oct. 30, 1919, granting the company an increase in its rates of fare, the commission included a provision requiring the company to obtain not less than 100 cars with a total seating capacity of 5,000 persons. The cars were to be available for service by Nov. 1, 1920. The order was later modified to provide that at least fifty of the cars were to be in use on or before Sept. 1, 1920.

Owing to transportation and other difficulties, the St. Louis Car Company, to which the contract for the cars was awarded, was unable to supply them in time to permit compliance with the commission's order. At the hearing on Oct. 9, John I. Beggs, president of the Milwaukee Electric Railway & Light Company and also of the St. Louis Car Company, testified that deliveries on the new cars would begin on Nov. 1, 1920, and would continue until the 100 new cars are in operation.

P. R. T. Deficit Decreasing

Summary Presented of Earnings for September and for the Nine Months Ended Sept. 30

After deducting fixed charges, which amounted to \$820,873, the Philadelphia Rapid Transit Company shows a deficit for the month of September of \$50,860, as against a net income of \$205,359 for the same month of 1919. This deficit for September contrasted with the showing for the month of August indicates an improvement. The company in its report makes mention of a deferred wage adjustment amount-

comes due the money may be forthcoming. The total sum due on Oct. 1 was \$87,000. It is the interest accumulated on outstanding bonded indebtedness totaling \$2,500,000, issued for three years at 7 per cent.

An interest payment due on Nov. 1 totals \$278,930. An additional sum will be necessary to retire 1 per cent of the bonds for the sinking fund, which is provided for annually. Mr. Boettcher, chairman, said:

The company cannot pay the money at this time. That does not mean, however, that we will not be able to pay it in the near future. Of course, we have been at a big expense lately, and then our revenue was cut down for a time when there were

receiver. Kansas City, Kan., interests nominated L. H. Chapman, now Water and Light Commissioner, who has built up the light plant on the Kansas side.

Three intervening petitions were filed. The first was by the Continental & Commercial Trust & Savings Bank, Chicago, and E. F. Swinney, Kansas City, trustees under the first mortgage. The second was by the American Car Company in the interest of noteholders. The third was by the city of Kansas City, Mo., and the A. S. Heckert Construction Company, which is proceeding with work on the Twenty-third Street viaduct. Representatives of Wyandotte County announced that the county might intervene because of an obligation of \$800,000 concerning the use of a bridge and viaduct.

Frank Hagerman announced that he was in court to represent J. O. Armour and nobody else, Mr. Armour having advanced \$1,000,000 for interest, \$500,000 for equipment and other sums for other purposes. Mr. Hagerman receded from any implied recommendations of men for appointment as receiver.

Henry Russell Platt spoke for the protective committee representing the bondholders.

Colonel Harbor, City Counselor of Kansas City, Mo., declared that it was possible for a receiver of the right kind to operate the property in the public interest without any further increase in fares. He also declared that it was impossible for the company ever to pay the bonds in full and that the facts would be shown to the court.

PRESIDENT KEALY SURPRISED

A dramatic feature of the proceedings was the presentation to the court of petitions and statements from employees of the Kansas City Railways urging that there be no disturbance of present pleasant relations between the employees and the company, and that Col. P. J. Kealy, now president of the company, be made one of the receivers or retained as operating head of the company. The document was signed, it was said, by 3,300 employees.

John B. Pew, attorney presenting the petition by the employees to the court, recited the steps of the past two years which have built up the present harmonious organization. The most impressive paragraph of the document was the promise by these signatories that they would co-operate heartily with the receivers and the court, and that they would resist any interruption of service.

Colonel Kealy, to the court, disclaimed any prior knowledge of the action of the employees. He expressed appreciation of the compliment, but asked definitely that the request of the men be disregarded.

Mr. Pew, further presenting the interest of the employees, requested definite assurance that they would be heard by the court and receivers, although he said that the men had no purpose to intervene in the proceedings.

There was no intimation as to whether a single receiver or several receivers would be appointed.

SUMMARY OF EARNINGS OF PHILADELPHIA RAPID TRANSIT COMPANY

	1920	1919	Percentage Change Over 1919
Month ended Sept. 30, 1920			
Operating revenue.....	\$3,093,995	\$3,030,931	2.1
Operation and taxes.....	2,384,731	2,055,299	16.0
Operating income.....	\$709,264	\$975,632	-27.3
Non-operating income.....	60,749	42,006	43.7
Gross income.....	\$770,013	\$1,017,638	-24.4
Fixed charges.....	820,873	812,279	1.1
Deficit, 1920 — Net Income, 1919.....	* \$50,860	\$205,359	-125.0
Deferred wage adjustment—			
One month.....	\$187,500		
5 per cent return on P. R. T. paid in capital—one month.....	125,000		
Amount by which gross revenues are insufficient to provide for operating expenses, taxes, fixed charges and the 5 per cent return upon P. R. T. stock.....		\$363,360	
Nine Months Ended Sept. 30, 1920			
Operating revenue.....	\$27,854,734	\$25,995,431	7.2
Operation and taxes.....	20,560,230	17,888,629	15.0
Operating income.....	\$7,294,504	\$8,106,802	-10.0
Non-operating income.....	422,351	396,095	6.6
Gross income.....	\$7,716,855	\$8,502,897	-9.3
Fixed charges.....	7,356,843	7,295,944	0.8
Net income.....	\$360,012	\$1,206,953	-70.2
Deferred wage adjustment—four months.....	\$750,000		
5 per cent return on P. R. T. paid in capital, nine months.....	1,125,000	1,875,000	
Amount by which gross revenues are insufficient to provide for operating expenses, taxes, fixed charges, and the 5 per cent return upon P. R. T. stock.....		\$1,514,989	

*Deficit.

ing to \$187,500 and a 5 per cent return on stock amounting to \$125,000. With these two items considered the company shows a deficit of \$363,360.

For the nine months ended Sept. 30 the company shows a net income of \$360,012, which is a decrease of 70.2 per cent over the net income for the corresponding period of 1919. The company shows a deferred wage adjustment for a four months' period amounting to \$750,000 and with a 5 per cent return paid on stock amounting to \$1,125,000 the company shows "an amount by which gross revenues are insufficient" of \$1,514,989.

Committee Appointed to Inquire Into Denver Finances

Members of the board of directors of the Denver (Col.) Tramway have appointed a committee to investigate the financial condition of the company and formulate, if possible, a method of preventing the company from being thrown into the hands of a receiver.

The payment on bonded indebtedness due on Oct. 1 was not met, but it is anticipated that within the six months intervening before another payment be-

no cars running. Before the second payment on the indebtedness comes due I think it highly probable that we will be able to meet the obligation. I do not think there is any possibility of a receiver being appointed. In the meeting of the directors we selected a committee to take up the matter and see what can be done.

Receivership Hearing

Court at Kansas City Sets Oct. 26 for Naming Permanent Receiver—Dramatic Appeal by Employees

Judge Stone in the Federal Court at Kansas City, Mo., on Oct. 21 set Oct. 26 for the appointment of a permanent receiver or receivers for the Kansas City Railways. Many other matters involved will also be heard then, including the suggestions of supply creditors and requests for immediate determination of the status of contractors.

The interests represented at the hearing before the court on Oct. 21 in connection with matters affecting the receivership expressly disclaimed any purpose to secure the appointment of a receiver who would conserve any special interest. The representative of the committee which is acting for the bondholders, however, suggested the appointment of James D. Mortimer as

Receivers Would Sell Road

Application has been made to the Superior Court at New London, Conn., by Robert W. Perkins, receiver of the Shore Line Electric Railway, to sell the Norwich & Westerly Railway. Petitions have been signed for authority to discontinue the operation of the road on Nov. 15 if it should be deemed advisable by the receiver so to do. The application names \$191,047 as the price at which the road could be sold, but Mr. Perkins states that this did not mean that he has a customer who would take the road at that price. Rather it is an "upset price" on which the court is to be asked to give him authority to sell in case he can find a customer at that figure or better. In regard to the application to discontinue the line Mr. Perkins said it did not necessarily imply that the road was to be discontinued on that date.

Financial News Notes

Jitneys Force Suspension.—Electric railway service between Danbury and Bethel, Conn., was suspended on Oct. 18 by the Danbury & Bethel Street Railway on account of the controversy over jitney regulation referred to in the department of Traffic and Transportation elsewhere in this issue.

Interest Payment Ordered.—The United States District Court has ordered Joseph K. Choate, receiver, to pay the coupons on the Aurora, Elgin & Chicago Railroad first mortgage 5 per cent bonds, which was due on April 15. The necessary funds have been deposited with the trustees.

Milwaukee Company Sells Bonds.—The Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has completed the sale of \$5,000,000 of 7½ per cent first mortgage bonds. The proceeds of the sale will be used to finance the company's new power plant now under construction. The bonds were purchased by a marketing syndicate. They will be retired by means of a 3 per cent sinking fund each year, so that during the twenty-five years the issue runs, 75 per cent will be paid off at the maturity date.

City Asks Receiver for Railway.—The suit which the city of Davenport has been threatening to file against the Tri-City Railway, in which it asks that the company be placed in the hands of the receiver, has been brought in the Scott County District Court by City Attorney U. A. Screechfield. The filing of the suit is in accordance with a resolution passed by the City Council several weeks ago. The petition charges that the company violated the terms of its franchise by failing to keep its property in repair and by charging excess fares, that the cars are unsanitary

and cites other reasons why the company should go into receivership.

Interurban Results Improving.—Harrison B. Freeman, receiver of the Hartford & Springfield Street Railway, Warehouse Point, Conn., told the Superior Court an Oct. 16 that his lines had been operating at a profit the last three months. He obtained an order from the court to continue business for four more months. Operation of the company is under the scrutiny of a committee which represents the holders of the bonds of the company. Profits during the summer were reduced by the company's inability to get coal at any price, but on the whole the results were fairly satisfactory. The balance over operating expenses in June was \$191.98; in July, \$5,155, and in August, \$2,195.

Service May Be Suspended in Concord.—At a recent public meeting held in the Town Hall of Concord, the present status of the Concord, Maynard & Hudson Street Railway, Maynard, Mass., was discussed. D. P. Abercrombie, Jr., vice-president and general manager of the road, explained that unless financial assistance was rendered by the residents of the towns between Concord Centre and Concord Junction electric railway service in Concord and to Maynard would be suspended. The company has for some time been operating in this section at a loss. The townspeople have already voted against extending financial aid to the railway.

Master Appointed to Conduct Sale.—Announcement was made on Oct. 13 by United States District Judge Julius M. Mayer of the appointment of Francis M. Scott, former justice of the Appellate Division of the Supreme Court, as master in the sale at auction of properties owned by the New York Railways. The sale is the result of a suit instituted by the bondholders' committee. Joseph P. Day will auction the real estate holdings of the company on Nov. 9. Included in the offering is the carhouse property bounded by Fourth and Lexington Avenues and Thirty-second and Thirty-third Streets; the carhouse at Madison Avenue, Eighty-fifth to Eighty-sixth Streets; a large parcel of property on Front Street, and several on East Tenth and Eleventh Streets, near Avenue C, including a large warehouse.

City to Use Depreciation Fund.—The depreciation fund of the Municipal Railway of San Francisco is to be drawn upon to the extent of \$250,000 so that the work on the city's Hetch Hetchy water-supply project can go on, according to reports of a meeting of the Board of Supervisors of that city held on Oct. 4. This action by the Supervisors was made possible through a resolution providing for the sale of \$250,000 worth of Hetch Hetchy water bonds maturing from 1930 to 1932 and carrying 4½ per cent interest. These bonds are to be placed to the credit of the Municipal Railroad depreciation fund as a financial investment for the street railway, while the \$250,000 cash will be applied

to the credit of the Hetch Hetchy project. Acting Mayor Ralph McLeran made the statement that the depreciation fund now totals about \$600,000. He considered the transaction a good investment for the railroad and at the same time a great benefit to the water project as, in the absence of immediate cash to finance the bills, all operations would have to be abandoned pending the outcome of the taxpayers' suit against the cost-plus fee contract with the Construction Company of North America which is still under advisement in the court.

I. T. S. Subsidiary Financing.—Emery, Peck & Rockwood, Chicago, Ill., recently offered \$650,000 of five-year 8 per cent bond-secured convertible gold notes of the Danville, Champaign & Decatur Railway & Light Company at 100 and interest. The proceeds of the issue are to be used to reimburse the company for extensions and additions and for the retirement of underlying bonds. The notes are guaranteed unconditionally, principal and interest, by the Illinois Traction Company. The Danville, Champaign & Decatur Railway & Light Company controls through stock ownership the properties operating substantially all the electric light and power, gas, steam heating and electric railway systems in the Illinois cities of Danville, Champaign, Urbana and Decatur. The company has outstanding \$730,000 of 6 per cent cumulative preferred stock, \$3,688,000 of common stock, \$3,318,000 of collateral trust 5's, \$650,000 of five-year 8 per cent secured notes (this issue). In addition there are outstanding \$1,980,000 of underlying bonds on mortgages which are now closed.

Intercorporate Claims Adjusted.—A decree has been entered by Presiding Justice Tanner in the Superior Court, whereby the Providence & Danielson Railroad, Providence, R. I., is to pay Receiver Cornelius S. Sweetland of the United Traction & Electric Company \$60,000 in settlement of claims. The payment of \$60,000 is to be made from the \$200,000 damages which the city has agreed to pay the Danielson line in connection with the condemnation proceedings for the construction of the city reservoir. Decrees were entered for the purpose of obtaining releases from receivers of various transportation roads interested, so that future suits could be avoided. Receiver Sweetland will hold the \$60,000 in trust for the Union Railroad, Pawtucket Street Railway and the Rhode Island Suburban Railway, all included in the system of the United Traction & Electric Company. The remainder of the \$200,000 city payment is to be split, \$100,000 to the Federal trustees and \$40,000 for the Providence & Danielson Railroad. The \$60,000 payment is to be in lieu of all claims against the Danielson line by all the companies involved for losses and deficits incurred by operation of the Danielson road by the Rhode Island Company receivers from the beginning of the receivership to and including Sept. 6, 1920.

Traffic^{tim} and Transportation

Cleveland Increase Soon

City Council Authorizes Two-Cent Advance in Company's Operating and Maintenance Allowances

The City Council of Cleveland, Ohio, has granted the Cleveland Railway a total increase of 2 cents a car-mile in its operating and maintenance allowances. The Council took action at the urgent request of John J. Stanley, president of the company, who late in August notified the city authorities that the interest fund would fall below the minimum of \$300,000 on Aug. 30. The increase in allowances for operation and maintenance presupposes an automatic advance in fare to a 6-cent cash basis, with nine tickets for 50 cents and 1 cent for each transfer.

The advance in allowances dates from Oct. 1 and was granted for six months only. The expected higher fare will probably not be for longer than that period, according to Street Railroad Commissioner Fielder Sanders. The fare rise may not come before the middle of November, or it may come during the present month when the September interest figures are established.

REFUSES 4.5-CENT ADVANCE

The increased allowances were made necessary by expenditures of over 4½ cents a car-mile more than the allowances in the last three months, the commissioner informed the street railway committee of the Council. Commissioner Sanders refused to sanction a 4.5-cent increase. The six months' limit was fixed, the commissioner explained, because he anticipates a drop in prices which would reduce expenses, make a high allowance unnecessary and probably bring back the present fare.

Commissioner Sanders, commenting on the Council's action, said:

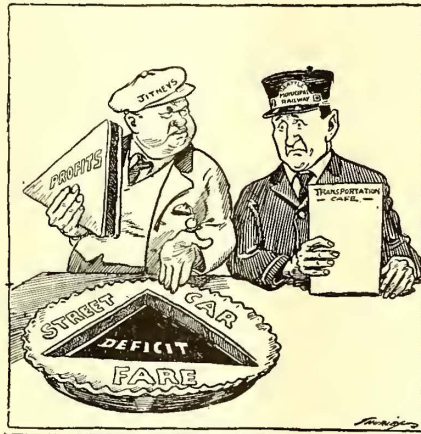
This means the interest fund will go down and the fare will inevitably go up. I say to you, frankly, I don't believe this railroad can be operated much longer on a 5-cent fare. Whether the break will come in two weeks or six, I do not know, but revenues the last two or three weeks have not been holding up and the maximum fare may come sooner than was expected. We are only doing the just thing in raising the allowances.

The Council also granted the company authority to reimburse itself for the deficiency incurred up to Oct. 1, at the rate of not less than \$25,000 a month, the exact sum to be left to the discretion of the commissioner. The deficit from the first of the year to Sept. 1 was \$332,534. It resulted from costs being higher than the allowances, which were 28 cents a car-mile for operation and 10 cents a car-mile for maintenance. The new allowances will be 29 cents for operation and 11 cents for maintenance. The interest fund, which is the fare gauge, is figured on allow-

ances and not actual expenditures. When the fund drops below \$300,000 the fare goes up automatically. It was \$316,000 Aug. 1. If the drop for September maintains the average of the previous six months the interest fund is below the turning point. The city will seek to enjoin the company from collecting the maximum fare unless the fund is more than \$71,813 below \$300,000. This \$71,813 is the sum the company paid its stockholders during the controversy over an increase in the rate of dividend from 6 to 7 per cent, later defeated at the polls. The city is trying to get it back.

Seattle \$500,000 Behind

In the second public speech within a week on the question of the municipal railway, Mayor Hugh M. Caldwell of Seattle, Wash., suggested as a possible alternative to a further advance in fare an increase in the city's general fund tax levy to provide addi-



From the Seattle Daily Times
"THE HOLE IN THE TOKEN"

tional money for the operation of the railway. He said that the road has been operating at a loss. The Mayor read a list of ten cities with fares ranging up to 8 cents, as compared with 6½ cents charged in Seattle. He submitted figures which indicated that only during one month of the past year have the receipts of the road exceeded the expenditures. On Sept. 30, the railway was more than \$500,000 "in the red."

During August of this year, a total of 9,964,000 people rode on the cars, as compared with 11,942,000 during August of last year. Mayor Caldwell asserted that he had not formed a definite opinion as to what was the best thing for the City Council to do in regard to the railway problem, but that he was anxious to have it discussed and considered by the people of the city, so that their wishes in the matter might be crystallized.

Eight Cents Asked in Lincoln

The Lincoln (Neb.) Traction Company has applied to the State Railway Commission for authority to raise its cash fare to a basis of at least 8 cents as an emergency measure. The company asks permission to sell four tokens for 30 cents. It now charges a 7-cent cash fare with three tokens for 20 cents. The higher fares are requested pending the fixing of permanent rates by the commission.

The company also asks for an increase in its allowance for maintenance and depreciation. This latter charge as fixed by the commission is 7.2 per cent. It asks that this be increased to 9 per cent of the valuation of depreciable property as heretofore fixed by the commission. This will add \$40,000 a year to the operating expenses of the company.

The company represents in its application that on a 7.2 per cent basis for maintenance and depreciation the deficit at the end of the year will be \$21,292. With the \$40,000 added this will make a total deficit of \$61,000 for the year. The report of passengers carried from 1915 to Sept. 1, 1920, shows a falling off of approximately 6 per cent for 1920 as compared with the year 1919. It alleges this is entirely due to the increased use of the automobile. The report shows the main decrease is on lines where automobiles are largely used. Another reason for asking for an increase in the present emergency rate is the increase of \$1.80 a ton in the cost of coal for fuel since Jan. 1, 1920, and an increase in freight rates on all material since Sept. 1.

Recount Asked on Duluth Vote

The Duluth (Minn.) Street Railway on Oct. 15 filed with the Federal District Court at Duluth a petition for a recount of the votes cast in the special referendum election on Oct. 4 in which the company was refused an increase in fare from 5 cents to 6 cents. The company charged irregularities and errors in the counting of the ballots. The official count showed that the proposition to allow the company to raise its fare had been rejected by 635 votes.

Following the announcement by Herbert Warren, general manager of the company, that the service would be materially cut to allow a 10 per cent increase in wages to the employees, City Attorney John E. Samuelson has given an opinion that the City Council has the right to order changes in the schedules as it sees fit and proper. On Oct. 11 the company laid off several of its crews and discontinued all owl cars, contending that it had no funds with which to meet the demands of the men for higher wages and that it would be necessary to cut the service. No complaint has yet been made to the City Council of the cut in service and to date no action has been taken to force the railway to put on more cars.

Seven Cents in Philadelphia

Temporary Rate Fixed by Commission Pending Determination of Valuation—Tickets at Six and a Quarter Cents

The Philadelphia Rapid Transit Company was directed on Oct. 18 by the Public Service Commission of Pennsylvania to file with that body not later than Oct. 29 a tariff to become effective on Nov. 1, providing for a 7-cent cash fare and a 6¼-cent rate of fare where coupon tickets in blocks of four are purchased, with the present transfer and exchange ticket privileges remaining in force. The new rates are to continue for a period of six months unless the commission directs a different rate of fare prior to that time. Tickets are to be put on sale by the railway at its offices and are to be sold by conductors. The company is to file with the commission monthly reports of its receipts and expenditures. The company has agreed to accept the order.

THE order of the commission is simply a temporary finding. That body will not undertake to fix any permanent rate of fare until the valuation of the railway has been completed. This work will take several months and the testimony presented at the hearings showed that unless the railway received immediate relief by having provision made for more revenue it could not continue to operate and would suffer such financial embarrassment as would prevent its giving proper service. In the opinion of the commission this would be a catastrophe to the community at large. In consequence the commission announced that it was prepared to permit the company to file a new schedule which would provide more revenue.

On June 1, the company filed a tariff providing for the elimination of free transfers and the extending of the 3-cent exchange charge to all points in the city at which free transfers had theretofore been honored. At the public hearing in Philadelphia before the commission the city of Philadelphia presented objections to this new schedule.

ASKED CHARGE FOR TRANSFERS

At the suggestion of the commission, this tariff was voluntarily suspended and later, by order of the commission, dated July 26, 1920, the company was directed to make no change in its tariff, effective prior to July 1, 1920, until the commission should take final action. The company later withdrew the tariff and the commission revoked its order of July 26, in so far as it related to the rates.

The company then sought the consent of City Councils of Philadelphia to a change in the rate of fare under the 1907 contract. This consent the City Council did not give, and on Oct. 4 the company asked to be permitted to file a new schedule to become effective upon one day's notice, which schedule provided for the elimination of all exchange tickets and all free transfers and for a 5-cent straight fare.

Considerable testimony was taken in connection with this petition and a very careful investigation of the matter was made by the Bureau of Engineering of the Public Service Commission. As a result of its study of the matter the commission is convinced that to eliminate all exchange tickets and free transfers would result in a discrimination against certain sections of the city and

would impose upon a large number of the car riders a burden which would not be fair and equitable.

WAGE INCREASE DEFERRED

At the hearings T. E. Mitten, president of the Philadelphia Rapid Transit Company, testified that the company had been unable to pay its employees the rate of wage agreed upon between the company and the men and that they voluntarily waived payment of the increased wages until such time as the revenues of the company could be increased to an extent that would warrant the payment of the increased wages. On this point the commission said:

That the wages should be paid and that better service should be given by the Philadelphia Rapid Transit Company to the citizens of Philadelphia is beyond question. The Philadelphia Rapid Transit Company has been directed to file with the commission an inventory of its property, in order that the commission may determine the fair value of its used and useful property as a basis for the proper, permanent rate base.

The Bureau of Engineering of the Public Service Commission, by direction of its chief engineer, will, in association with the engineers of the Philadelphia Rapid Transit Company and the engineers of the city of Philadelphia, make a thorough investigation looking to the improvement of the service rendered by the company, necessary extensions to the system and needed additional equipment to enable the company to give better service to the car-riding public. It will promptly submit to the commission recommendations for the elimination of skip-stops that are unduly burdensome and dangerous to the public.

Asks Seven-Cent Fare

The International Railway, Buffalo, N. Y., has asked the City Council of Niagara Falls to approve a 7-cent fare for the company's lines in that city. A 5-cent fare is now being charged. In a letter to the municipal authorities, H. G. Tulley, president of the International, says that if the company is expected to make large capital expenditures for paving and track improvements in Niagara Falls some relief must be obtained from the conditions which now exist. It is suggested that action be taken by the city looking to the submission to the Public Service Commission the question of whether the company is entitled to more revenue to meet this and other necessary expenditures in its public service. The

municipal authorities have asked the company to spend approximately \$50,000 for track improvements and paving between its rails in certain Niagara Falls streets.

Ten Cents in Connecticut

The Connecticut Public Utilities Commission on Oct. 22 authorized the Connecticut Company, New Haven, to charge a 10-cent fare. The new rate is to apply throughout the company's system. The company has been operating at a 7-cent fare since early in August. The members of the commission approved the increase by a vote of two to one.

At a hearing before the commission on Oct. 1 Lucius S. Storrs, president of the railway, and other company officials testified that the 7-cent fare had proved entirely inadequate and that a fare of 10 cents was needed if the system was to remain intact. Evidence was introduced at the hearing to show that total receipts for the first eight months of 1920 amounted to \$12,715,017. The estimated expenses of the company to Dec. 31, 1920, were placed at \$15,657,222.

Transportation News Notes

Seven Cents in Hot Springs.—A 7-cent cash fare went into effect on the lines of the Hot Springs (Ark.) Street Railway on Sept. 25. The company has been charging a 6-cent fare since September, 1919. Prior to that time the fare was 5 cents.

Seven Cents in Selma.—The Selma (Ala.) Electric Railway on Oct. 1 raised its fare from 6 cents to 7 cents. At the same time rates for "owl" service were raised to 10 cents. The company recently increased the wages of its motormen and conductors.

One-cent Rise on Interurban.—The Hagerstown & Frederick Railway, Hagerstown, Md., will raise its interurban rates from 7 cents to 8 cents in each zone, beginning Oct. 1. Tickets will be sold at the rate of thirteen for \$1. City fares in Hagerstown and Frederick will remain at 7 cents cash, with five tickets for 30 cents.

Seven Cents on Houghton Lines.—Fares on the lines of the Houghton County Traction Company, Houghton, Mich., have been raised from 6 cents to 7 cents in each zone. Four tickets are sold for 25 cents. The new rates were authorized by the Michigan Public Utilities Commission, and were put into effect on Aug. 16.

No Advance in Scranton.—The Pennsylvania Public Service Commission has denied the petition of the Scranton Railway for an increase in fare to 10

cents on its Scranton city lines. The commission declined to permit an advance in fare at this time owing to the fact that the valuation of the company's property had not been completed.

Wants More in Kingston.—The Kingston (N. Y.) Consolidated Railroad has petitioned the State Public Service Commission, Second District, for an increase in fare. The company asks the commission to fix such a rate which, after investigation, it shall find just and reasonable. The present fare is 6 cents.

Eight Cents in Ashtabula.—An 8-cent cash fare took effect in Ashtabula, Ohio, on Sept. 10. The City Council had previously approved a recommendation of Federal Judge D. C. Westenhover that the Ashtabula Rapid Transit Company be permitted to raise its rates. Four tickets are sold for 30 cents. The fare was formerly 5 cents.

Fares up on Interurban.—Fares on the interurban lines of the Peninsular Railway, San José, Cal., have increased 20 per cent by authority of the State Railroad Commission. The new rates took effect on Oct. 16. The round trip rate, including war tax, between San José and Palo Alto is now 78 cents, Los Gatos 52 cents, Campbell 30 cents. The company has never paid a dividend.

Will Vote Again on Denver Fare.—Citizens of Denver, Col., will again be called upon at a special election in the spring of 1921 to decide the question of the fare to be charged by the Denver Tramway. An initiated bill providing that the fare be reduced from 6 cents to 5 cents was recently presented to the City Council. The Council, after consideration of the proposal, decided to submit the matter to a popular vote.

Cities Fight Fare Advance.—Steps have been taken by the city authorities of Louisville, Ky., and New Albany and Jeffersonville, Ind., to oppose an increase in fares by the Louisville & Northern Railway & Lighting Company, New Albany. The company proposed to raise its fares between Louisville and the cities of Indiana from 7 cents to 10 cents on Oct. 31. The sale of commutation tickets is to be discontinued.

Asks Rise on Kansas Line.—Application has been made to the Kansas Court of Industrial Relations by the Manhattan City & Interurban Railway, Manhattan, for permission to raise its fare on its lines in Manhattan from 5 cents to 10 cents. The company proposes to sell four tickets for 30 cents. It is also proposed to raise the fare on the interurban lines from a basis of 2.4 cents a mile to one of 3 cents a mile.

Will Argue Jitneys' Rights.—Final arguments on the petition of the Public Service Railway, Newark, N. J., to have thirty-one operators of motor buses competing with its lines ruled off the streets will be heard in the Court of Chancery in Jersey City on Dec. 13. The busmen recently filed their answers to the railway's complaint. They contended that the inter-

est of the public demanded the continuance of the bus service.

Ten Cents on Suburban Line.—The Connecticut Public Utilities Commission has authorized the Waterbury & Milldale Tramway, Waterbury, to raise its fare to 10 cents. At hearings before the commission the company showed that in 1918 it operated at a net loss of \$12,597. Its operating deficit for 1919 amounted to \$25,505. The commission denied a petition filed by patrons of the road asking that the fare increase be refused.

Seven Cents in Plattsburgh.—The Public Service Commission, Second District, has authorized the Plattsburgh (N. Y.) Traction Company to increase its maximum fare between any two points on its line within Plattsburgh from 5 cents to 7 cents. The city authorities recently waived a franchise restriction limiting the fare to 5 cents, provided the commission found that the increase was justified. There was no opposition to the company's application at a hearing before Commissioner J. A. Kellogg.

Suspends Everett Increase.—The Washington Public Service Commission has suspended for a period of ninety days a proposed increase in rates by the Puget Sound International Power Company, Everett, operating the electric railway system in the city of Everett. This action was taken when a complaint was received by the commission from the city attorney of Everett, against the rates, which were to have gone into effect on Oct. 1. The company proposed to replace the present 5-cent fare with one of 10 cents.

More Buses for Wilmington.—The Wilmington & Suburban Transportation Company has been incorporated under the laws of the State of Delaware to operate a line of motor buses in Wilmington. The company is capitalized at \$50,000. It proposes to begin operation before the end of October. Each bus will seat twenty-eight persons and will be fitted with cross seats and a vestibule. Officers of the new company are: President, Leslie R. Casperson; treasurer, Harry Butler; secretary, George McGee.

City Lines on Mileage Basis.—A petition asking an increase in fares has been presented to the Indiana Public Service Commission by the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis. The petition asks a passenger fare of 3 cents a mile in Indianapolis with a minimum charge of 10 cents. The present fare is 5 cents. The company also asks the commission to grant an increase in express and freight rates. The company operates more than fifteen miles of line within the city on various divisions.

Wants More on Interstate Line.—The Steubenville, East Liverpool & Beaver Falls Traction Company, East Liverpool, Ohio, has filed a new tariff with the Interstate Commerce Commission, the Ohio Public Utilities Commission and the Pennsylvania Public Service

Commission under which a zone system is to be installed. The increase sought will be about 33½ per cent. The company operates a line between Vanport, Pa., and Steubenville, Ohio. It also asks for an increase from 5 cents to 8 cents on the city line in East Liverpool.

Asks Higher Commutation Rates.—The Schenectady (N. Y.) Railway has made application to the Public Service Commission for the Second District, for a modification of orders of the commission to permit it to abolish certain reduced fare rates and to increase its fifty-four-trip commutation ticket book rates. The company alleges that notwithstanding the increased fares allowed in July the revenue of the company is insufficient to meet increased wages and other increased costs. The reduced fare rates are on all divisions.

New Railway Guide.—A new pamphlet has been issued by the publicity department of the San Diego (Cal.) Electric Railway for free distribution to the public. It contains general information about the city, beach and suburban railway lines of San Diego. It tells an interesting story to residents of the city and is a valuable guide for strangers. A map is enclosed in the folder showing the exact location and extension of the railway lines. Copies of this "where-to-go" folder can be obtained at any information bureau.

Compromise on Higher Fare.—Announcement that the Youngstown & Suburban Railway, Youngstown, Ohio, would give up the franchise under which it was granted an increase in fare from 5 to 7 cents was made on Oct. 8 after a conference between officials of the company and Mayor Fred J. Warnock. The action will permit repeal of the ordinance at the next session, of Council, which, in turn, would call off the referendum on the ordinance set for Nov. 2. In recent negotiations with patrons of its lines the company offered to incorporate in a new ordinance a provision for the sale of 100 tickets for \$5.50.

Would End Commutation Tickets.—The Pacific Electric Railway, Los Angeles, Cal., has applied to the State Railroad Commission for permission to discontinue the sale of commutation tickets between Pasadena and Alhambra and Los Angeles. The company also asks authority to abrogate the transfer privilege between its interurban lines and its local line in the two former cities. The prospect of motor-bus competition is given by the railway as the reason for its petition. Two petitions are now pending before the commission for authority to operate bus lines in competition with those of the railway in Alhambra.

Suburban Line Needs More.—Application has been made to the Public Service Commission for the Second District by the Hudson Valley Railway, Glens Falls, N. Y., for authority to charge 10-cent fare within each local zone outside Glens Falls and Saratoga

Springs, excepting in the zone within Troy, and that in the latter zone such rate of fare be established as may be just and reasonable. The company alleges that notwithstanding the fare now in effect the revenue obtained does not yield an adequate return and that it has not received since Nov. 25, 1918, reasonable compensation for the service rendered.

Wants Parlor Cars Revived.—William C. Culkins, Street Railway Director of Cincinnati, Ohio, has suggested the renewal of the use of parlor cars by the Cincinnati Traction Company. He points to the fact that delegates attending conventions in the "Queen City" and who are desirous of seeing the outlying districts could charter parlor cars, which could be given the right of way and go over the various scenic routes in the city. Until recently such cars were frequently used in Cincinnati. The convention and publicity department of the local Chamber of Commerce is advocating their reintroduction.

Six Cents in Aberdeen.—The Gray's Harbor Railway & Light Company, Aberdeen, Wash., has raised its fare from 5 cents to 6 cents within the city limits of Aberdeen, Hoquiam and Cosmopolis, and from 10 cents to 12 cents on its lines between any two of the three towns. The new rates were authorized by the State Public Service Commission. In the petition the company asked for a 7-cent fare. With an allowance of 5 per cent decrease in traffic because of the higher fare, the commission finds that the company should be able to earn 7.4 per cent on its investment if its operating expenses repair the same as in 1919.

Service Withdrawn Because of Jitneys.—Electric railway service between Danbury and Bethel, Conn., was suspended on Oct. 18. Traffic is being handled by the jitneys and steam trains. The discontinuance of electric railway service will continue until the City Council of Bethel passes an ordinance barring the jitneys from the highways where electric railway cars run. The Board of Aldermen of Danbury on the night of Oct. 18 passed an ordinance barring all jitneys from the streets traversed by the cars of the Danbury & Bethel Street Railway. The railway had announced that it would stop all service in Danbury on Nov. 1 unless jitney bus traffic was restricted to the side streets not used by the trolley cars.

Will Hear Rate Appeal.—The Interstate Commerce Commission has ordered a hearing in Salt Lake City, Utah, on Nov. 1 of the appeal taken by a number of railroads from the decision of the Utah Public Utilities Commission with regard to increased freight and passenger rates. The petitioners in the proceeding are the Bamberger Electric Railroad, Salt Lake City, the Deep Creek Railroad, A. R. Baldwin, as receiver of the Denver & Rio Grande Railroad, the Tooele Valley Railway, the Los Angeles & Salt Lake Railroad, Oregon Short Line Rail-

road, the Salt Lake & Utah Railroad, the Southern Pacific Company, and other steam and electric roads handling intrastate traffic.

Suburban Rates Go Up.—Tariffs have been filed by the Twin City Rapid Transit Company, Minneapolis, Minn., providing for a 20 per cent increase in the fares on the company's lines to Stillwater and Lake Minnetonka. As the rates remain within the limit of 2 cents a mile provided by the Minnesota law, the company is not required to file a petition for the advance with the State Railroad and Warehouse Commission. The new rates became effective within ten days of Oct. 7. The advance amounts to 1 cent for each 5-cent zone. In an effort to improve its service in Minneapolis as a result of the recent granting of a 6-cent fare on the city lines, the company has placed in operation thirty additional cars since Aug. 16.

Wage Rise Brings Fare Plea.—The Cincinnati, Newport & Covington Railway, Covington, Ky., the employees of which were recently granted a 20 per cent increase in pay by a board of arbitration, has started a campaign to have the cities of northern Kentucky allow it to raise the fare from 5 cents to 8 cents. Under the provisions of present franchises granted by four Kentucky towns several years ago the company must transport passengers for 5 cents. The franchises also stipulate that cars shall be operated past a given point at least every fifteen minutes. The company has been supplying a three-minute service and threatens to revert back to the schedule provided in the franchises if an increase in fares is not allowed.

Opposes Service at Cost.—Dr. Henry Jameson, chairman of the board of directors of the Indianapolis (Ind.) Street Railway, declared at a recent hearing before the Indianapolis City Council that he was opposed to the adoption of a service-at-cost plan in Indianapolis. Dr. Jameson several months ago expressed himself as in favor of a flexible rate of fare as affording the best prospects of relieving the company's financial condition. At the hearing before the Council he stated that his change in attitude had resulted from a study of the plan as applied in other cities. Dr. Jameson also expressed opposition to the passage of an ordinance under which it is proposed to reroute the company's lines in the business district of the city.

Repeals Higher Fare Grant.—The City Council of Findlay, Ohio, has repealed an ordinance under the terms of which the Toledo, Bowling Green & Southern Traction Company, Findlay, was given permission to raise its fare from 5 cents to 10 cents on its local lines. The Council took this action after the company had refused to accept the fare ordinance except on conditions which the city would not grant. The Council authorized the company to raise its fare after the latter had made application for permission to abandon

service on the ground that operation of the cars did not pay. The Council refused this request, allowing the increased fare as an alternative. The 10-cent rate was never put into effect. The company has since applied to the Ohio Public Utilities Commission for permission to cease operation.

Ten Cents in New London.—A 10-cent fare was placed in effect on Oct. 15 on the New London, Conn., Division of the Connecticut Company. The New London lines, formerly operated by the Shore Line Electric Railway, were returned to the Connecticut Company some time ago under a court order. The Connecticut Public Utilities Commission has received a petition of protest from the citizens of New London against the 10-cent fare. The petition declares that the new rate is unreasonable. The New London Common Council backed up the citizens in their appeal to the State Commission. The petition asks the commission to conduct a hearing on the subject and that the Connecticut Company be directed to show cause for the increase in fares.

Will Raise Northampton Fares.—A new schedule of rates will be placed in effect on the Northampton (Mass.) Street Railway on Nov. 8. On the Easthampton line the unit of fare will be raised from 7 cents to 8 cents, making the fare between Northampton and Easthampton 16 cents. Special tickets, good on all lines other than the Easthampton line, which have been sold at a rate of five for 50 cents, will be sold at a rate of five for 55 cents. The unit of fare on all but the Easthampton line remains at 7 cents. By the use of tickets or combinations of tickets and cash fares the following rates will be in effect: Between Northampton and Williamsburg, 29 cents; between Northampton and Leeds, 18 cents; between Northampton and Haydenville, 22 cents, and between Williamsburg and Haydenville, 11 cents.

New Publications

Proceedings of the National Safety Council for 1919

Paper, 1457 pages. Published by National Safety Council, Chicago, Ill.

This publication contains the detailed history of the eighth annual Safety Congress, held at Cleveland, Ohio, in 1919. There are 41 pages devoted to the Electric Railway Section, covering a discussion of safety devices and methods.

The Engineering Index for 1919

Published by the American Society of Mechanical Engineers, New York City.

The American Society of Mechanical Engineers took over the publication of

the "Engineering Index" at the close of 1918 and has since been publishing the index monthly as a part of *Mechanical Engineering*. The present volume is the first to be compiled by the staff of the society and the arrangement of references has been changed to render them more readily accessible. Whereas the items have been previously grouped under divisions of engineering, such as civil, electrical, mining, mechanical, etc., in this volume the alphabetical or dictionary arrangement has been employed. Each item contains the exact title of the article indexed, the author's name, the name of the periodical in which the article appeared, the volume number and date of publication and the page numbers and numbers of figures in the articles. Each item concludes with a brief note summarizing the article indexed.

This index contains more than 12,000 items referring to articles in nearly 700 engineering and allied technical publications. A reference list of the publications, giving exact titles, place of publication and frequency of issue, is included. The thoroughness of the work is indicated by the fact that in preparing the items the engineering staff of the society has reviewed approximately 1,100 periodicals, reports and other publications regularly received by the Engineering Societies Library. These are printed in ten different languages.

Proceedings of the American Electric Railway Engineering Association for 1919

Published by the American Electric Railway Association, 8 West Fortieth Street, New York, N. Y. 400 pages.

The proceedings cover the activities of the association from 1916 to 1919, including a complete report of the seventeenth annual convention, held at Atlantic City in 1919.

Transactions of the Institution of Civil Engineers of Ireland—Vol. 44

Published by the Institution, 35 Dawson Street, Dublin, Ireland.

This volume is of particular interest to electric railway men as it includes a paper on "Modern Tramway Track" by Robert B. Holt. Mr. Holt outlines the European methods of constructing street railway track, practically none of which include the use of the customary American crosstie. In regard to the wear of rails, it is stated that speed is far more destructive to rails than traffic density. Particular emphasis is placed upon the contention that rails should be designed with a convexity of tread of about 12-in. radius, as this is approximately the shape which will ultimately be assumed under wear. It is said that much unnecessary wear is caused by the use of the flat "coned" tread design.

In reference to rail joints, the thermite welded joint is said to be the standard on the majority of English tramways. Some space is devoted to a discussion of rail corrugation, and it is concluded that this evil can be mitigated to a very considerable extent by raising the elastic limit of the steel.

Personal Mention

Mr. Yungbluth Promoted

Former Store-Keeper, Pittsburgh Railways, Now in Charge of P. R. T. Supplies Department

B. J. Yungbluth, formerly store-keeper of the Pittsburgh (Pa.) Railways, has been appointed supervisor of purchasing and supplies of the Philadelphia (Pa.) Rapid Transit Company. In his new position Mr. Yungbluth will have charge of the purchasing, supplies and printing departments of the P. R. T. System. Mr. Yungbluth resigned his connection with the Pittsburgh Railways last January to become connected with the Mitten Management Corporation, Philadelphia, for which he has been engaged during the past few months in a study of the general subject of materials and supplies. His new appointment took effect on Oct. 1.

Mr. Yungbluth was born on August 29, 1882, in Marquette, Mich. Upon

ment, which had up to that time received little attention, was completely reorganized and was put on a sound basis. Mr. Yungbluth was one of the first to apply steam railroad methods of store-keeping to the electric railway field. As a result of his efforts the stores department of the Pittsburgh Railways is recognized as one of the best of its class in the country. Mr. Yungbluth has contributed a number of articles to the *ELECTRIC RAILWAY JOURNAL* dealing with the efficient handling of problems arising in this branch of the service.

George W. Bowie has resigned as superintendent of transportation of the Augusta Division of the Androscoggin & Kennebec Railway, Lewiston, Maine.

M. L. Ross has resigned as president and superintendent of the Vincennes (Ind.) Traction Company. Mr. Ross has announced no plans for the future. He began his railway experience in 1906 as timekeeper with the Jackson Railway & Light Company, Jackson, Tenn.

Ivy L. Lee has been retained by the board of directors of the Pennsylvania Railroad to act in an advisory capacity in matters of publicity and public relations. In the conduct of this work Mr. Lee will report to the president and the vice-president and will co-operate with the publicity department of the company.

William H. Clarke has resigned as a vice-president of the Byllesby Engineering & Management Corporation, Chicago. Mr. Clarke has been identified with the Byllesby organization for a number of years, his duties being connected for the most part with the bond department. He will continue in the investment banking field.

Joseph A. Phelan, formerly manager of the Gloucester Division of the Eastern Massachusetts Street Railway, Boston, Mass., has been appointed general superintendent of the Rockford City Traction Company and the Rockford & Interurban Railway, Rockford, Ill. Mr. Phelan succeeds C. R. Simcox, resigned. He was born at Lynn, Mass., on July 13, 1886. He began his traction experience as a conductor in the employ of the Bay State Street Railway, then the Boston & Northern Street Railway, in 1904. In October, 1906, he was appointed night operating foreman of the West Lynn carhouse and was subsequently promoted to inspector. In the fall of 1917 he was assigned to the office of the traffic department at the main office of the company in Boston, and in February, 1918, was promoted to chief inspector of the Bay State System. On July 7, 1918, he was appointed superintendent of the Quincy Division.



B. J. YUNGBLUTH

leaving high school in 1899, he entered the employ of the Duluth, South Shore & Atlantic Railway, at Marquette. After serving in various capacities in the stores department for about a year, he entered the purchasing department of the Mineral Range Railway, at Hancock, Mich., where he acted as accountant and store-keeper until 1905. He then resigned to become chief clerk to the general store-keeper of the Lake Shore & Michigan Southern Railway at Cleveland, Ohio. Under the same management he served for three years as store-keeper of the Lake Erie & Western Railroad at Lima, Ohio.

Leaving the steam railroad field in 1910, Mr. Yungbluth entered the employ of the Pittsburgh Railways, where he served on the general manager's staff as general store-keeper for ten years. Under his direction the stores depart-

Philip H. Gadsden Heads American Association

William G. Gove Elected President of Engineering Association—
Ray P. Stevens, Traffic and Transportation—J. J. Landers,
Accountants'—John J. Reynolds, Claims

The new presidents of the American Electric Railway Association and its affiliated organizations, elected at the recent meeting in Atlantic City, are all well known to the industry at large, in which all of them have been active for many years. This is particularly true of Mr. Gadsden, whose work has long been of a national character. As regards the officers of the affiliated associations, however, their work naturally has come more particularly to the attention of the members of the associations with which they are immediately affiliated. On account of the significance of the positions to which Messrs. Gadsden, Gove, Stevens, Landers and Reynolds have been advanced and the need which goes with each office for co-operation with the other affiliated bodies, it has been deemed expedient to review the careers of all of the new presidents, both inside and outside of the industry. The portraits of all of the new presidents were published in the Convention Report Issue of the *ELECTRIC RAILWAY JOURNAL*, with the exception of that of John J. Reynolds of the Claims Association.

PHILIP H. Gadsden is president of the Charleston Consolidated Railway & Lighting Company, Charleston, S. C. A year ago Mr. Gadsden, after serving as chairman of the American Electric Railway War Board, was elected vice-president of the United Gas Improvement Company, Philadelphia. In this capacity he took charge of a new department of national public relations of that organization. The United Gas Improvement Company is owner and operator of a number of public utilities throughout the country, including railway, gas and power properties. The establishment by such an important company as the U. G. I. of a public relations organization under a vice-president, and his appointment to that office, should be of great assistance to Mr. Gadsden in the work to which he has put his hand in helping to improve the status of utilities.

Mr. Gadsden represented the American Electric Railway Association on the Federal Electric Railways Commission. Mr. Gadsden himself was largely responsible for making the commission's report of assistance to those trying to adjust relations so that railways may function properly. He is now chairman of the committee on national relations of the national association.

Mr. Gadsden was born in Charleston fifty-two years ago. He was educated in the public schools of that city, and afterward in the South Carolina University, at Columbia, which university has conferred upon him the degree of Doctor of Laws. A man of broad reading and experience, Mr. Gadsden is professionally a lawyer, and has practiced at the bar for fifteen years. He was a member of the South Carolina Legislature for six years, elected by the people for three successive terms. He is one of the charter members of the League to Enforce Peace, and is given credit for putting the word "Enforce" in its name, without which the league would have merely the title of a pacifist organization.

As a consequence of his work in behalf of public utilities during the war, Mr. Gadsden is constantly being sought to make speeches, and because of the national prominence he has attained in

his study of the difficulties of public utilities, he is now being urged to explain these difficulties by writing articles for publication in popular magazines.

William G. Gove, elected president of the Engineering Association, is superintendent of equipment for the Brooklyn (N. Y.) Rapid Transit System, and engineer of car equipment for the New York Municipal Railway. He has been identified with the Engineering Association since its inception and was largely responsible for the work of its organization. After leaving college Mr. Gove began work in civil engineering on irrigation projects on the Pacific Coast. In July, 1896, he became assistant engineer of roadways for the Cincinnati Street Railway, and in March, 1899, joined the force of the Boston Elevated Railway as an assistant engineer.

From January, 1900, to May of the same year, Mr. Gove had charge of the construction and equipment of the trial trains that were used in a competitive test in the old Tremont Street subway, Boston. These tests of train operation mark an epoch in electric railway development as pointing the way to train operation with multiple unit equipment. After the tests had been completed and a decision reached as to the type of equipment to be used, Mr. Gove drew up the specifications and worked up the designs for the first elevated cars used in Boston. Later he was associated with Messrs. Winsor and Lindall in the construction and equipment of additional cars for their service.

In June, 1903, Mr. Gove joined the Brooklyn Rapid Transit Company as assistant mechanical engineer, and in December, 1905, he became superintendent of equipment for that company.

In April, 1913, he had the duties of engineer of car equipment of the New York Municipal Railway added to his duties of superintendent of equipment for the Brooklyn Rapid Transit Company. The design, construction, and equipment of the new subway cars for use by this corporation were carried out under Mr. Gove's direction. This type of subway car has proved most

efficient in the handling of passengers in a very exacting service, and their construction embodied many new features. The reputation of this car has traveled around the world, as is evidenced by its influence on the new London underground cars and those proposed for the Sydney suburban electrification. The New York Municipal Railway has now provided 900 of these cars at a total cost of \$18,000,000 and the necessary reconstruction of shops and equipment to take care of their maintenance cost several millions more.

Mr. Gove is probably best known among his railway associates for devotion to the standardization of equipment, and the far-reaching results which he has accomplished in this direction for his company. This enthusiasm for standardization was reflected largely in the work of the committees of the Engineering Association with which he was then connected, and the early start which this association has made in standardization and the far-reaching results which have already been accomplished are largely due to Mr. Gove's untiring efforts.

In addition to the work of standardization, Mr. Gove was a pioneer in adopting steel wheels for electric railway service. At present the B.R.T. has 50,000 steel wheels on its system, which is by far the largest number in use by any electric railway property. Mr. Gove has consistently advocated the use of steel wheels for electric railway service, and the adherence to the association standards as adopted, and today he has no other wheels in use but those of association standards.

As a member and official of the Engineering Association, Mr. Gove has participated in the work of many of its committees. In addition to his work with the American Electric Railway Association, Mr. Gove is a member of the executive committee of the New York Electric Railway Association and chairman of its committee on equipment. He is also an active member of the American Society of Civil Engineers.

Ray P. Stevens, who heads the Transportation & Traffic Association, is president of the Republic Engineers, Inc., New York City, of the Pennsylvania-Ohio Electric Company, Youngstown, Ohio, and the Youngstown Municipal Railway Company, and is vice-president of the Republic Railway & Light Company and a member of the executive committee of the Cleveland Electric Illuminating Company. He has been prominent as a railway operator and executive for the past twenty years, and during this time he has been called several times from one property to another, each time to assume more responsible duties.

Mr. Stevens was born in Maine in 1877. He was graduated from the University of Maine with the degree of Bachelor of Electrical Engineering in 1898. He immediately engaged in work for the Bell Telephone Company, later for the General Electric Company,

and then in consulting engineering work in Chicago. His first electric railway connection was in consulting work at Everett, Wash., where he practically built an entirely new railway and power and light system, including power house and shops. Before he had finished this work he was persuaded to take charge of the railway and lighting properties in Everett, and under his management the earnings doubled in less than five years.

He next went to Auburn, N. Y., as general superintendent of the Auburn & Syracuse Electric Railway and the Auburn & Northern Electric Railway and as manager of the Skaneateles Lake Transit Company and remained there two years. His record during this short period was so notable that in 1907 he was offered and accepted the presidency of the Lehigh Valley Transit Company at Allentown, Pa., which company controlled at that time about 150 miles of track and practically all the light and power properties in the Lehigh Valley. He was then but thirty years old. Mr. Stevens' connection with this company lasted six years, when he resigned to join the Youngstown and New York properties, with which he is now connected. Mr. Stevens was president of the Pennsylvania Street Railway Association for two years and has always taken an active part in national association affairs.

J. J. Landers, elected president of the Accountants' Association, has been connected with public utility undertakings for the greater part of his business career, mostly in accounting work. Mr. Landers was born in 1876 in Bucks County, Pa. At an early age he removed to Philadelphia. He received his education at St. Joseph's College and shortly thereafter entered the employ of the Philadelphia Traction Company, later the Union Traction Company, as chief clerk to the superintendent of power. This position he held until 1899, when he went to Scranton as the chief clerk in the auditing department of the Scranton Railway. In 1903 he was appointed cashier of the Conneaut & Erie Traction Company, then under construction. When operations started he assumed the duties of treasurer and manager. In 1905 he was appointed superintendent of the Rock Hill (S. C.) Light & Water Company, and after two years in the South returned to Pennsylvania as auditor for the York Railways and subsidiaries. Mr. Landers has served three terms as vice-president of the Accountants' Association and this election is a promotion from the office of first vice-president.

John J. Reynolds, the new head of the Claims Association, is claims attorney of the Boston Elevated Railway. Mr. Reynolds is a native of Massachusetts. He received his early education in the Boston public schools and was later graduated from the Northeastern College School of Law. In 1902 he was admitted to the Massachusetts Bar and soon thereafter to membership in the American, Massachusetts and Boston Bar Associations.

His experience in railway work dates from his connection with the Boston Elevated Railway and its predecessors in 1885. He began as a horse-car driver and then became a driver and conductor on a coach line and later a starter. With the introduction of the electric car he became a motorman and during the rapid growth of the electric lines worked for about a year in the shop as a motor-car and wire repairman, after which he was appointed instructor of new motormen.

As soon as the electric railway was firmly established, Mr. Reynolds held successively positions as inspector, investigator and adjuster in the claims department, and then became claims attorney in 1902. Various offices of the Claims Association have been held by Mr. Reynolds and during his membership he has contributed to the association papers on the following subjects: Uniformity in claims department records, accident reporting by car crews,



J. J. REYNOLDS

training of men for car service, benefits of publicity, mechanical devices for prevention of accidents (in collaboration with M. P. Spillane), near-side stops, guides for claim agents, the importance of operating rules, the Claims Association, etc.

Daniel Connors has been appointed superintendent of the Weymouth and the Hingham-Hull Divisions of the Eastern Massachusetts Street Railway, Boston, Mass.

Guy McCallum has been appointed auditor of the Lowell Division of the Eastern Massachusetts Street Railway, Boston, Mass. Mr. McCallum was formerly connected with the main office of the railway in Boston.

Harrah K. Bennett, general claim agent of the Eastern Massachusetts Street Railway, Boston, Mass., has been appointed manager of the newly created Melrose-Woburn Division of the company. This division comprises the cities of Melrose and Woburn and a number of neighboring towns. The position of general claim agent has

been abolished, and the duties of that office will be performed by the legal department of the railway.

Floyd W. Parsons, who conducts the department "Everybody's Business" in the *Saturday Evening Post*, discussed the public utility situation in the issue of that paper for Oct. 9. Mr. Parsons is particularly well qualified to deal with a subject of this kind on account of his wide knowledge of engineering and industry. Before becoming connected with the *Post* he was editor of *Coal Age*, one of the papers included with the ELECTRIC RAILWAY JOURNAL under the McGraw-Hill management.

L. P. Hockett, for the past two years auditor and accountant of the Utah Utilities Commission, has resigned to accept a position with the Public Service Commission of the state of Washington. The attention of the Washington Commission was attracted to Mr. Hockett's work by his efforts to obtain betterments in the accounting systems of public utilities. He was instrumental in bringing about a recent conference at Boise, Idaho, attended by representatives of the accounting departments of the Washington, Oregon, Montana, Idaho and Utah commissions, at which a uniform system of accounting to be put into effect in the various states represented was taken up. Mr. Hockett joined the Utah Commission soon after his discharge from the Signal Corps of the United States Army. Previous to the war Mr. Hockett had spent many years in various branches of railroad service.

Obituary

Elisha S. Williams, vice-president of the United States Rubber Company, died on Oct. 8. Mr. Williams was born in Malden, Mass., in 1873. He became vice-president five years ago.

J. M. Means, assistant superintendent of transportation of the Georgia Railway & Power Company, Atlanta, Ga., was shot and instantly killed on Oct. 12 by a conductor whom he was reprimanding for infraction of company rules. This conductor, after attacking Mr. Means, shot himself, but not fatally.

Elvin L. McGrew, purchasing agent and general traffic manager of the Standard Underground Cable Company, Pittsburgh, Pa., died on Oct. 8 in New York City. Mr. McGrew was born in New Alexander, Ohio. He began his business career as a telegraph operator, and after entering the service of the Pennsylvania Railroad, became freight agent at New Cumberland, W. Va., where he remained four years. In 1900 he became connected with the Standard Underground Cable Company. He was a leader in the formation of the Purchasing Agents' Association of Pittsburgh and was its first president.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS FOR THE MANUFACTURER,

SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES

BUSINESS ANNOUNCEMENTS

Insulation Prices Reflect Lower Cotton

**Demand Has Slackened, but Good Business Is Seen for Next Year—
Prices May Go Lower**

Lower prices of raw material have reacted upon the market for insulation of all kinds, according to representative manufacturers in this line and jobbers. The price of tapes, webbing, sleeving, cambric, both varnished and plain, and silk material has dropped slightly owing to lower cotton. Varnish, too, is a little easier in price. On the other hand, insulating papers, pressboard, etc., show no signs of a reduction, and in some quarters it is said that even higher prices may prevail there in view of the great scarcity of paper. No fluctuation is evident on mica. Opinions differ as to the probable tendency of prices on that material. One distributor reports that prices quoted from England are being slightly shaded, but on the other hand it is said that European countries have entered into competition as buyers of mica in India so strongly that the supply does not exceed the demand. One large company which does considerable business in built-up mica used in fractional motors and automobile ignition sets states that there is little or no demand from that quarter.

FURTHER PRICE TREND UNCERTAIN

Questioned whether or not insulation prices have reached their bottom level most manufacturers state that the trend is almost entirely dependent upon raw material prices. It is pointed out in some cases that cotton has been contracted for some time in advance and that it requires from about eight to ten weeks before a drop in raw cotton is reflected in prices of finished insulation. For this reason some producers state that if cotton remains at its present low level or drops further some additional softening of prices may result, but this readjustment will come about gradually if at all. Demand, while fair at present, is considerably less than it was a few months ago, probably owing to price uncertainties, it is said. Some cancellations have been received, but outside of the automobile industry these have not been alarming. There have been requests for extensions of time on filling orders in a number of instances, however. Manufacturers agree that the present dullness is only temporary and that a good volume of business should develop after the first of the year. This optimistic tone seems to be quite prevalent in the field. One of the large interests reports that in spite of the re-

cent decrease in demand the present year will show a volume of business one-third greater than ever before. Even at present, though individual orders are smaller, this company reports that the actual number of orders and inquiries is increasing. The most active buyers of insulating material just now are said to be the repair shops, and cable manufacturers are also ordering varnished cambric fairly well. Foreign demand is conceded to be on the increase, and prospects for

orders from abroad are brighter. Inquiries are coming in from England, France, Germany, Australia and the Scandinavian peninsula, it is said.

Raw material, except for paper, is plentiful, but not all producers have been able to catch up with back orders, which in one representative instance are still piled up one to three months ahead. Deliveries are improving, however, and on some classes of material orders can almost be filled from stock, it is stated.

Favorable Conditions in Car Wheel Market

Demand Good, with Bright Prospects for Future — Deliveries Are Improved and Prices Steady at Present, Though Trend Is Dependent Upon Raw Material

Demand for car wheels on the part of electric railways has been good and is well up to the standard of other years, manufacturers report. In some quarters sales to traction companies are said to be on the increase and the general tone of producers is optimistic. Prospects for 1921 business are held to be excellent. This view in large part is due to an anticipated buying movement from steam roads and to hopes of better financial conditions with street railways. As yet the effect of higher rates upon orders of car wheels by steam railroads has not been felt strongly, but manufacturers take an encouraging view of this situation and say it is still too early to expect definite results. One large producer is receiving more orders for replacements, however, though buying on behalf of new cars has not increased. The general tendency of electric traction companies has been to make their car wheels, both chilled iron and rolled steel, run a greater distance without making replacements, it is stated. This tendency is not now so evident, however.

Conditions of production are generally improved compared with the past summer, when one of the representative mills reported being frequently closed down because of a shortage of coal and coke. The shortage of cars added its depressing influence at that time so that orders piled up for sixty days and deliveries ranged in the neighborhood of three months. At present the supply of rolled steel and chilled iron wheels is reported favorable. In several cases a thirty days' reserve supply of wheels is kept on hand for regular customers and deliveries can be made in good time. One manufacturer's representative in the far West reports that orders from that territory

can be filled in from thirty to sixty days. Furthermore, railways are anticipating their needs sufficiently to relieve the pressure of immediate delivery demands.

The supply of raw material is said to be much easier compared with a few months ago. Less complaint is heard of the coal and coke supply though existing prices in that line are considered high. There is, however, more or less of a scarcity of scrap wheels according to some wheel makers. These are very largely used in the manufacture of chilled iron wheels and during the war excess stocks of old wheels became depleted. Prices are holding steady and the opinion is quite generally expressed that quotations in this line have reached their peak.

Manufacturers seem to believe that present price levels will prevail for some time to come, but also add that some softening may be expected to follow, dependent upon the trend of raw material, coal, coke, wages, etc. Labor conditions in general are reported good, with an increasing tendency for more work to be accomplished per man in many instances. Cancellations, it is stated, have not been felt at all in the car wheel market.

Pittsburgh Railways Plans for 150 New Cars

Rehabilitation of the street car service in Pittsburgh is the object of a petition of the receivers of the Pittsburgh Railways to the United States District Court for permission to buy 150 latest model cars. The receivers, C. A. Fagan, W. D. George and S. L. Tone, plan to purchase 150 double-truck steel cars and other equipment, and also to build two new carhouses.

Purchase of the new cars will be on the allotment plan. The receivers, in their petition to the court, say that to carry out their plan 150 cars will be required, but for immediate use they need twenty-five. The receivers called attention of the court to the fact that since Jan. 1, 1920, they have been setting aside each month from the revenues of the system the sum of \$25,000, which they regard as a very conservative amount, as a reserve fund for the purchase of cars.

"In view of the delays we have encountered in connection with the purchase of 150 additional cars," declared C. A. Fagan, "we have decided that it will not be best to delay commencing purchase of cars until we are able to purchase the full 150, but we recommend that twenty-five of this number be purchased immediately, paying for them out of the fund we have created in order that the equipment may be increased and improved to that extent. By obtaining bids we have found that we can purchase twenty-five double-truck, low-floor steel cars, each equipped with four motors, air brakes, heaters, fare boxes, etc., to be built immediately, at an aggregate cost of \$375,000. This amount we can pay out of our reserve fund."

The program outlined by the receivers includes the first two of a number of new carhouses, replacing with new material all old trackage throughout the system, and a new system for cleaning cars in line with the receivers' plan for a perfect sanitary condition besides other important changes.

Wire Prices Closely Follow Raw Material Trend

Buying Is Light on Falling Market—Stocks Are Not Large and Deliveries Cover Wide Range

Demand for copper wire, both bare and insulated, is at a low level at present, according to manufacturers. This condition is attributed to the falling market, which automatically curtails buying until price readjustments are completed. Foreign demand is also light at present, though the exchange situation is partly to blame there. In some quarters it is stated that manufacturers are curtailing production in order to guard against overstocking.

As a result of lower cotton, rubber and copper prices, there has been a general easing off of prices on the whole line of bare and insulated wire. This reduction has been gradual and varies according to type and size. One producer estimates the extent of the price drop to be from about 10 to 15 per cent. Opinions differ as to whether prices have reached their lowest level. In many cases manufacturers have contracted in advance for cotton. Copper prices are also held to be close to the margin of producing cost. In view of these facts one large wire producer at least is buying copper at the present time. On the other hand, a

great many interests seem to feel that still lower wire prices may prevail, provided that raw materials remain at their present level or drop further. This view holds that lower raw-material cost, especially of cotton, has not yet had time to make itself felt fully. Bare wire base at present ranges from about 20 cents to 20½ cents, compared with about 22½ cents two months ago.

In general the view is expressed that demand will remain light for the rest of this year, but that starting next spring a good volume of business will develop. Buying may even start heavily before then, one manufacturer says, if copper and cotton should start to move upward. In the opinion of this company, a rush to place orders would then ensue that would tax the capacity of wire mills and leave many consumers who have waited "out in the cold."

FEW CANCELLATIONS RECEIVED

A number of cancellations and requests for extensions have been received, especially from automobile manufacturers, but outside of that industry the number does not seem to be great. The chief reason for cancellations is felt to be the overbuying that has taken place in an effort to insure deliveries. Stocks, on the whole, are not large. One company has unfilled orders ahead for three months on certain sizes of weatherproof wire, and another is quoting deliveries of from six to twenty weeks on some sizes of insulated wire and four to six weeks on bare. Many sizes are available from stock, however. Magnet wire stocks are generally short and deliveries cannot be made from stock. One representative producer is quoting eight to ten weeks. Another manufacturer presents the exception to the rule by reporting a good stock of fine insulated wire but a short supply of the large sizes, which in that case are meeting a stronger demand.

Prices generally are very unstable and, as one manufacturer puts it, are "all over the lot." No prices can be quoted on going to press which can reasonably be expected to hold over publication date.

Further Encouraging Word from St. Louis Car Company

Further word received from the St. Louis Car Company states that the company is not out of production, but is still building cars, as the capacity of the plant is but partially and temporarily interrupted. As stated in last week's issue the main car building section of the plant was saved. The lumber stock, dry kilns, foundries and foundry machine shops, automobile plant, west side mill, cabinet and erecting shops, tool room and stores department were not damaged, thus enabling partial production to be resumed immediately and which is expected to increase daily. The plant is resuming operation on three shifts of eight hours each, it is announced.

Rolling Stock

St. Petersburg & Gulf Railway, St. Petersburg, Fla., mentioned in the June 12 issue as ordering eight safety cars, has been promised delivery sometime during this month, it is announced. A strike delayed the fulfillment of the contract.

Twin City Rapid Transit Company, Minneapolis, Minn., will put twelve of the 300 cars being changed over to the front exit type, as announced in the Sept. 11 issue, into operation on Nov. 1 it is announced. The remainder will be in service by Jan. 1, it is said.

The Salt Lake & Utah Railroad, Salt Lake City, Utah, has recently put into service on its lines, thirty-six new open cars of an order of fifty, it is announced. The company has also secured the use of forty-five cars belonging to the Nevada Copper Belt Railroad, during the beet-hauling season which is now on.

United Railways of St. Louis, Mo., lost fifty trailers, valued at \$8,412 each in the recent fire at the plant of the St. Louis Car Company, it is announced. The car parts had been completed in the fabricating plant and were ready for assembling. Deliveries of two cars a day were intended to have begun next month. The program of the Public Service Commission which recently ordered the United Railways to add six cars a week to its equipment beginning Nov. 1, may now have to be held up for six months it is thought.

Georgia Railway & Power Company, Atlanta, Ga., besides the fifteen new center entrance cars placed in operation last spring, announces that it has 27 more in process of construction, divided among fifteen city, eight suburban and four interurban cars, the latter of which are for service on the Marietta line. The cost is said to be \$11,937.87 each, compared with about \$4,000 for the same cars some six or eight years ago. The company hopes for delivery to be made in the course of the next two or three months when the cars will be put into service.

Recent Incorporations

North Carolina Lines, Inc., Charlotte, N. C.—The North Carolina Lines, Inc., has been formed for the purpose of constructing an interurban line from Charlotte to Winston-Salem. The company is headed by Harry F. Hann, Winston-Salem. It has a tentative capital stock of \$500,000.

Track and Roadway

New York State Railways, Syracuse, N. Y.—There will be an early hearing by Public Service Commissioner Frank Irvine on the petition of the New York State Railways for permission to construct in Milton Avenue and on private right-of-way in Solvay loop tracks con-

necting with the main line and for approval of a local franchise given by Solvay. The loop track, it is understood, is for the use of employees of the Solvay Company.

New York State Railways, Rome, N. Y.—The Public Service Commission, Second District, has granted permission and approval to the New York State Railways to construct and operate an extension in Rome consisting of a single track line to connect with the present line in Expense Street at Thomas Street northerly along Expense Street, westerly in Bloomfield Street and north on Kent Street to Elm Street. The commission also approved the franchises which were granted by the city officials. There was no opposition to the company's application at a hearing before Commissioner Frank Irvine who holds that the construction of the extension and exercise of the franchises are necessary for the public service.

International Railway, Buffalo, New York.—Application has been made by the International Railway to the town board of Tonawanda for permission to construct, maintain and operate an additional track along the River road from the Buffalo city line to a point near the Wickwire-Spencer Steel Company's plant, a distance of 6,068 ft. The International now operates a line along the River road to the new frontier industrial district but increased traffic warrants the double tracking of this line. The City Council of Buffalo will oppose the application when it comes before the Public Service Commission on the ground that there is more urgent necessity to improve existing lines in Buffalo than to double-track a stub interurban line.

Trenton, Bristol & Philadelphia Street Railway, Philadelphia, Pa.—The Trenton, Bristol & Philadelphia Street Railway has been requested by the Borough Council of Tullytown, Pa., to relocate its tracks through the entire town in order that the State Highway Department might lay a concrete pavement for a distance of 7,180 ft. The railway will bear the expense of the relaying of the tracks from the middle to one side of the street.

Salt Lake & Utah Railroad, Salt Lake City, Utah.—The Salt Lake & Utah Railroad, an electric line, which operates between Salt Lake City and Payson, Utah, has built four new spur tracks to take care of the shipping of sugar beets this season over the company's lines.

Bamberger Electric Railroad, Salt Lake City, Utah.—Work upon the complete double tracking of the Bamberger Electric Railroad between Ogden and Salt Lake City has been begun by the company. Work upon that part of the line between Ogden and the site of the new U. S. government arsenal at Sunset, which is about six miles, is being rushed in order to handle the heavy traffic in connection with the construction and operation of this plant.

Trade Notes

The Ohio Brass Company, Mansfield, Ohio, announces that D. McLaughlin who has been superintendent of the Michigan Railways for several years, has joined the service organization of the company and will devote his attention principally to car equipment material.

C. J. Logan, for twelve years connected with the Railway Audit & Inspection Company, Inc., Philadelphia, Pa., announces the organization of "Logan Service," of which he is president. Mr. Logan will continue this new company for the handling of "service" to railway properties and industrial corporations.

The American Gear Manufacturers' Association, announces that as standardization and costs are closely related, these will be the principal subjects discussed at its semi-annual meeting to be held at Mohonk Lake, N. Y., Oct. 27, 28 and 29. Among the speakers will be P. G. Agnew, secretary of the American Engineering Standards Committee, whose subject will be "Standardization from the Point of View of the American Engineering Standards Committee"; Calvin W. Rice, secretary of the American Society of Mechanical Engineers, who will speak on "Standardization"; C. L. Collens, II, president of the Reliance Electric & Engineering Company and past president of the Electric Power Club, whose subject will be "Industry Organization," and Christopher Haigh, supervisor of costs, General Electric Company, who will describe the "Machine Rate Method of Distributing Expense." At an informal banquet to be held Thursday night, Oct. 28, Charles W. Woodward, vice-president in charge of personnel for the Hydraulic Pressed Steel Company, will be the principal speaker, taking as his subject "The Human Element in Industry." The American Gear Manufacturers' Association is making rapid strides in standardization and has received requests from Canada, England and Australia for copies of standards and recommended practices for the gear industry.

American Car & Foundry Company recently announced from its New York office that as part of its plan of extension in the Buffalo District, W. H. Sanford, for many years district manager of its Buffalo plants, had been appointed assistant vice-president and would be placed in charge of sales in that vicinity. Prior to the formation of the American Car & Foundry Company, Mr. Sanford was employed by the Union Car Company. When that company was absorbed he was appointed paymaster and cashier at the Depew plant. In 1902 he was appointed local auditor of the Buffalo district followed by promotion to the position of resident representative. Later, in 1912, he was made district manager in charge of the Depew as well as the Buffalo Plants.

Mr. Sanford will be succeeded as district manager by Andrew H. Gairns, now occupying a similar position with the company in Chicago and who has had an extended experience in steel car work and locomotive building. Announcement was made at the same time that the company's new plant now under construction in Buffalo will be used for building all-steel cars, with a capacity for turning out twenty to thirty cars per day. It will be equipped with the most modern machinery and labor-saving devices known. In addition to the new car-building plant a modern up-to-date office building will be erected on property recently acquired across Babcock Street. The soft foundry at the Buffalo plant has been completely re-equipped and is now engaged in quantity production. The Niagara Wheel Department has also been brought up to a high state of efficiency. The car company's plans thus outlined involve a total expenditure of \$3 500,000.

New Advertising Literature

Car Seats.—Hale & Kilburn Corporation, New York City, has issued a folder announcing its "Duplex Reversible Seat," which is designed for light cars.

Insulated Wire.—The Standard Underground Cable Company, Pittsburgh, Pa., has recently issued a forty-page bulletin describing its lines of insulated wire.

Motorman's Seat.—The J. G. Brill Company, Philadelphia, Pa., has issued bulletin No. 249, which describes and illustrates its new motorman's seat for standard Birney safety cars.

Hoists.—Sprague Electric Works, New York City, is distributing bulletin No. 48961 on type W, floor controlled hoists in capacities of 1 to 6 tons, both direct and alternating current.

Safety Cars.—The J. G. Brill Company, Philadelphia, Pa., is distributing publication No. 250, entitled "A New Point of View," which discusses editorial opinions of Birney Safety Cars.

Engineering Service.—Ford, Bacon & Davis, engineers, at 115 Broadway, New York City, have published a booklet called "Strength in Union," dealing especially with their valuation and report department.

Clamshell Buckets.—Blaw-Knox Company, Pittsburgh, Pa., is distributing two folders, one dealing with the "Blaw Bulldog Bucket," and the other with "lever arms, rated capacities and S-bends" as related to lever arm buckets.

Welding Apparatus.—The Bastian Blessing Company, Chicago, Ill., is distributing catalog No. 20, on "Rego" welding and cutting apparatus, with a booklet enclosed which is entitled, "A New Principle in Welding and Cutting Apparatus."