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ELECTRIC RAILWAY JOURNAL

EUCLID AVENUE, CLEVELAND

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B.C.Forbes *Said*

of the Chicago, North Shore and Milwaukee Railroad:

"COURTESY, service and sentiment have paid. Will other traction companies, railroad companies and all other classes of corporations please take note? With perhaps the best equipped suburban line in America, it is equally notable for its mechanical excellence and what might be called its human excellence . . . its unique cultivation of human relationships, of public good will."

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No. 25

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JUNE 19, 1926

Keeping Out of the Rut

MAINTENANCE practices, above all other electric railway activities, are constantly in danger of getting into a rut. Although there is a steady pressure to keep costs to a minimum, the average maintenance executive has comparatively little time to devote to the development of new methods for improving results and reducing costs.

It is only by taking advantage of every good idea developed by others, that those responsible for maintenance work can keep up in the race of cutting costs while at the same time improving the condition of the physical property.

Under the heading "Maintenance Notes" ELECTRIC RAILWAY JOURNAL conducts a clearing house for such ideas. These items represent the results of experience on many properties. They offer the maintenance executive weekly suggestions for keeping out of the rut.

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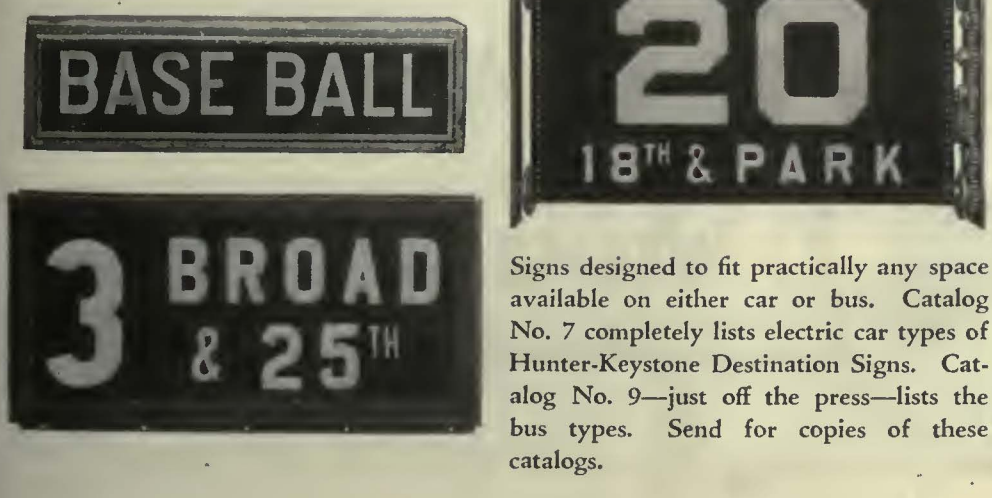

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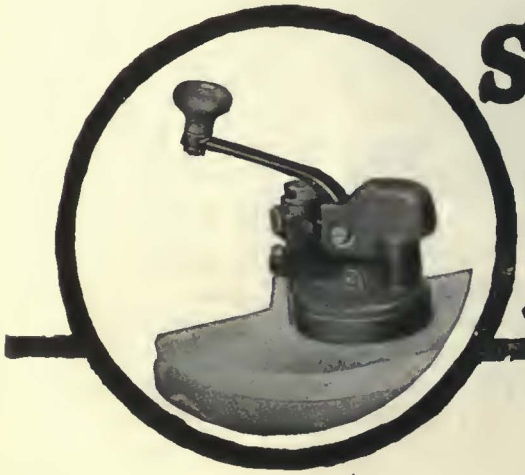

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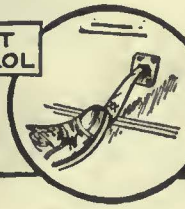

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WITH the American woman's ever increasing interest in the decorative and illuminating possibilities of portable electric lamps, there has come a new appreciation of quality and color harmony. in lamp cords.

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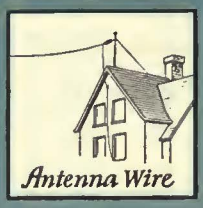
Rome mills, covering 20 acres of manufacturing floor space, are given over to the production of copper wires and cables. Every operation, from the rolling of the wire bar, to the application of the last insulation or protective covering, is under Rome supervision.

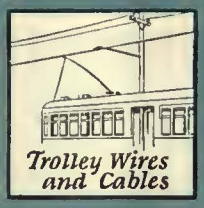
Type "PO" Parallel Lamp Cord

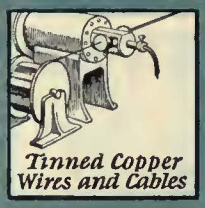
ROME WIRE COMPANY, ROME, N.Y.

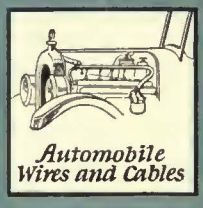
ROME WIRE

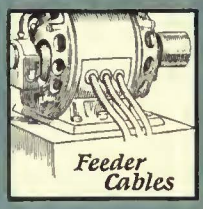
FROM WIRE BAR TO FINISHED COPPER WIRE

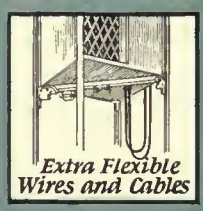


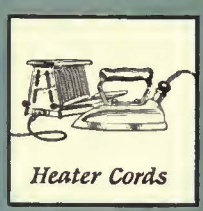


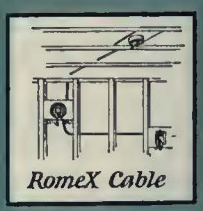


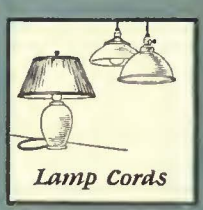


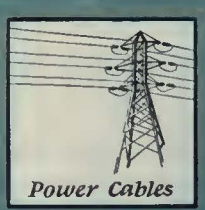












WHILE Rome Lamp Cords are built to harmonize with the most luxuriant surroundings, Rome Super Service Cords are built to stand the gaff of daily use in shops and mines. Each of the other Rome flexible cords—and there are many of them—are built to meet specific working conditions.

But, into every Rome cord, wire, or cable is built Rome quality.

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That is exactly the order given for building the Royal Cord Motorcoach. Exceptional engineering skill was combined with all the resources of the world's largest growers and manufacturers of rubber to make this tire the most economical long-mileage tire it is possible to build.

Here is *the modern tire for the modern motorcoach.* The name "Motorcoach" on the tire shows its *specific* purpose.

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Long experience, aided by necessary research, has produced a gearing of this properly balanced quality—ample hardness to resist wear, but without brittleness.

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For
Modern Equipment Standards

54C-35

GENERAL ELECTRIC

Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

Published by McGraw-Hill Publishing Company, Inc.

CHARLES GORDON, *Editor*

Volume 67 . . New York, Saturday, June 19, 1926 *Number* 25

Squeaks and Rattles Tell Their Own Story

ONE good thing there is about noise and only one—it tells when something is wrong. A car pounding its way over track or special work indicates that there is something wrong with the track and that it should be fixed. A noisy gear or rattling truck part says that destructive wear is taking place and that the car should go to the shop.

Every moving part on the car is a potential source of noise. The possibilities are that any one car will have many noise-producing elements. Consequently the only way to overcome the tendency to wear excessively and so increase the noise that will be produced is to maintain close fits, have the machine work accurate and the parts tight.

It was a wise Providence that so regulated our sensibilities that noise gets on our nerves. Were it not true it is quite possible we would blindly let the uneconomic wear go on until actual destruction occurred. But as it is, not nearly enough attention is paid to the warning that is given by the squeaks and rattles that develop in time even in the best of equipment.

Arrangement of Material in Storeroom Has Bearing on Its Efficiency

SOME remote corner of the car repair shops, too dark for satisfactory maintenance work, often is considered by the railway management as a good enough location for the storeroom. Row after row of wooden bins extending from floor to ceiling prevent the little light that enters from penetrating far. An atmosphere of gloom pervades the whole place.

The harmful effects of this practice are twofold. No one can do his best work among such surroundings. The morale of the storekeeper and his assistants suffers on account of the dismal appearance of their workshop. Worse than that, however, is the loss of time spent in searching for material tucked away somewhere at the back of a dark bin.

Good storekeeping requires that the quantities of materials and supplies on hand be known at all times. While this is largely a matter of keeping accurate records, it is also necessary to make more or less frequent physical inventories. Dark or inaccessible storage bins greatly hamper this process.

Wire screening in place of solid boards not only makes it easier to see the material in storage but also permits better penetration of light and air. White paint will do much to brighten up the average storeroom. The unit-piling system facilitates the making of inventories. Railways which have modernized their storerooms along these lines have found that the improvement is worth all it costs.

Executives' Conference Attendance Raises Some Questions

THIS is no time to mince words in the local transportation industry. Fundamental changes are taking place. The industry is in the midst of one of those periods of deep-seated readjustment which come to all businesses at one time or another. A strong current of changed conditions has set in. Those who recognize the trends and set their course accordingly will ride on to widened opportunity and greater accomplishment. But those who neglect to recognize the current of progress will be swept into the eddies of stagnation and their places will be taken by new and keener men.

In the discussion at the second Advisory Council conference held in New York on June 10 and 11, which is abstracted elsewhere in this issue, there was evidence of the rise of a broader and stronger current in the industry. Words were not minced. It was far from a mutual admiration session. Men high in financial and utility circles spoke plainly but constructively—and hopefully. There were few platitudes. There was little beating about the bush.

The primary purpose of these meetings has been to afford an opportunity for the frank discussion of current railway problems and an interchange of ideas on how to meet them. Men who control the destiny of many properties gave liberally of their time and thought for the good of the industry. They came both to talk and to listen to the managers' difficulties. An owner-manager conference—surely that is desirable. But of the executives who indicated their acceptance of the invitation to attend this latest meeting, considerably fewer than half attended.

One seeks in vain for an explanation of this lack of interest. Surely the industry has plenty of problems ahead. Why, then, the apathy toward such a meeting? Is there nothing to be learned from one's neighboring property? Have the absent managers no ideas which they wish to check or exchange with others in a similar situation? The present condition of the electric railway industry calls for vision, broadened thinking and determination to find ways of effecting improvements. Are some managements too well-satisfied with their own opinions? Or do they lack initiative or energy or confidence in their own business? Are they inclined to drift? Are they overlooking their responsibility for finding ways and means to bring about improvement

This is the issue in June that is devoted essentially to maintenance subjects

and to put their properties on a paying basis? Have they become so saturated in detail and precedent as to lose necessary perspective and vision?

In the answers to these questions there may be explanations for some of the industry's difficulties.

What Kind of Courage?

COURAGE, and whether the industry has it, seemed to arouse a bit of healthy discussion at the recent Advisory Council meeting in New York. Several speakers said we need courage to proceed. Others remarked that the exposition of courage in the past was an outstanding factor in the romantic history of the industry.

Both contentions are well founded. It takes courage to stick in the front line trench when the fire of battle rages around you. It takes courage to stick at a job when everything goes dead wrong. But another kind of courage is necessary on the part of the officer in charge when he decides that the tactics must be changed from defensive to offensive. When the executive of an industry finds that his product is not holding its own in popularity, it takes courage to look it over critically to determine what is wrong and then to strike at the heart of the trouble.

One is the courage to perform at all odds; the other to create. One, the task of the operator; the other, of the executive. Electric railway history of the past is replete with the former, but what we need today and are beginning to see is the courage to create anew.

Bringing Work to the Machine or the Machine to the Work

REPAIRS to electric rolling stock present a difficult problem. The time available for making them is limited, as most railways need all cars possible for service during the morning and evening peak periods. This makes it hard to keep down the number of nonproductive hours in the railway shop. Maintenance men realize that makeshift repairs are only a waste of time and that careful work is needed to keep rolling stock in revenue service for long periods and to prevent annoying delays on the road which disrupt schedules. These men would like to have the best machine tools provided for doing the work and plenty of time to do the jobs well.

Portable machines are being used in electric railway shops to a limited extent and for some classes of repair work they are proving satisfactory and economical. There seems to be quite a widespread feeling among master mechanics and shop superintendents, however, that better work will result if it is done on a stationary machine.

The advantage of portable machines is that repairs to equipment can frequently be made without dismantling it completely and no time is lost in carrying the parts to and from the machine shop or wood mill. As regards the actual repair work, it can be done quicker and probably better if the part is removed and taken to a machine.

The most satisfactory results will be obtained by laying out a definite repair schedule for work that is sure to be repeated regularly. Sufficient spare parts will insure that the schedule is maintained and that the needed time for repairs is available. By providing material-handling equipment and labor-saving devices a balanced production will be assured and best use can be made of the existing machine tools. To take care of emergency repairs, crippled cars, etc., which cannot be scheduled portable tools will be found of great value. This work must be done quickly and much of the work must be carried out in a manner that makes it impracticable to use machine tools. Hand labor predominates in this class of repairs and portable tools work in to greatest advantage.

Special Fixtures Assist in Keeping Machine Tools in Continual Use

MAINTENANCE men generally realize the value of modern methods for doing good work economically. These include carefully laid-out shops, improved facilities and up-to-date tools. They also include careful planning of the work for carrying it out on a previously arranged shopping schedule. Shop schedules properly developed and adhered to are an excellent means of disclosing weak spots in the shop operation and the machinery used. When the methods are not the best that can be developed with the tools available the schedule will lag; if new or more modern tools are needed this weak spot will be found.

A study of the shortcomings will show whether the present machine tool equipment is producing all that can be expected of it. If not, then perhaps the addition of some special fixtures and jigs will remedy the trouble. If the tools are producing all that they are capable of, then improved machines are needed.

Many improvements have been introduced in late types of machines, and new ways of performing machining operations have been brought out. Where a railway can obtain these new tools great economies will result, but where existing equipment must be used attention should be directed to increasing the efficiency of these as much as possible by employment of special fixtures and jigs. Except on large railway properties, electric railway shops will not be able to keep a particular machine tool in constant use on one class of work. To justify the investment in a modern machine it may be necessary to use it for jobs that might be done more economically on other machine tools if they were available. The efficiency of the machine for such work may be improved by fixtures that will reduce the time of setting up and make highly skilled labor less necessary.

From a check made to determine the machine tool equipment most used in electric railway repair shops, lathes were found to predominate. This condition was not unexpected, as lathes have always been considered a repair shop necessity, but the large number of special fixtures and jigs found for use with machining work on lathes indicated that they were being used for many operations usually considered as requiring other machine tool equipment.

It is common practice to bore many parts in lathes when boring mills are not available. Where both turning and boring are necessary on the same part, time and labor are frequently saved by performing both operations with a single set-up of the piece to be finished. Bearing work offers the most common example. There are few railway shops which do not have some form of self-centering chuck or special fixture for machining bearings.

Many out-of-the-ordinary jobs are done on lathes

by a careful study to provide ingenious jigs and other attachments so that the machine work can be done economically. Special fixtures and methods used for reboring motor shells and compressor cylinders on lathes were described in ELECTRIC RAILWAY JOURNAL for Feb. 24, 1923. Such pieces of equipment are too large to be turned in an ordinary lathe, and the work would probably be considered outside the range of this class of machine without careful thought and attention to the design of the fixtures needed. By clamping the large parts to the carriage and rotating the tools on a boring bar between the head and tail stocks the operation becomes quite simple and the work can be done economically and efficiently.

Shop practices of building up worn surfaces of parts by welding and remachining them are increasing. Many parts which otherwise would be scrapped can be reclaimed for further use by such methods, and much time and labor on machine work can be saved by using lathes to their best advantage. The many examples found where lathes are used with special fixtures for drilling, boring, reaming and milling machine work show that if necessary the usefulness of a lathe can be increased many times by analyzing the classes of work done in the repair shop and then by using the lathe wherever possible. This does not, of course, mean that the work can be done more expeditiously or at less cost than if a special tool were purchased. When the amount of work to be done is quite small the special tool is likely to be out of the question.

The Glory that Is Grand Rapids'

TWENTY-SEVEN modern street railway coaches were placed in regular service by the Grand Rapids Railway, Grand Rapids, Mich., last Sunday. It was a great event for Grand Rapids, but a greater event for the electric railway industry. These new vehicles represent modifications of the "Minnesota," "St. Louis" and "Ohio," model cars run for an experimental period. They are the last word in appointment. On that there is no need to dilate at this time. Their features have been laid before the readers of the JOURNAL before. There is, however, occasion to reiterate the change in attitude toward the transportation problem that the operation of the new cars reflects.

That is the broader aspect of the matter. Locally, the cars mean a great deal. So the Grand Rapids Railway was justified in going to unusual length in staging a parade and demonstration with which to introduce the cars. Here was a product of which the railway management could justly be proud. Here was the occasion for unusual advertising effort. The parade was excellent advertising—advertising in keeping with other progressive things this railway is doing. What could carry a more compelling message than the appearance in the line of march of cars of various vintages from 1880 to the present day? As a publicity idea this is not new, but the new coaches in Grand Rapids afforded a study in contrast never before achieved. In this respect the parade was new.

But that story is told in detail elsewhere in this issue. Only one phase of the new development remains to be enacted. That is the proposed funeral pyre to be made of the old equipment with the public as the invited guest of the railway. In the printed word and on the film the parade and funeral pyre will be broadcast over the land. Patrons of trolley lines all over the country will reflect upon the glory that is Grand Rapids'—a glory well deserved.

New Forms of Transportation Will Drive Railways Into Business

PERSONS who have been predicting the early demise of the railways, both steam and electric, due to the advent of road vehicles, will do well to ponder carefully the words of that veteran transportation man Samuel M. Vauclain, spoken before the American Railway Association at its Atlantic City convention last week. Far from causing the downfall of the railways, he holds that in the next ten years the bus and the truck will feed them a business so enormous that unless they increase their facilities very much they will be unable to handle it.

This view is so sound that it is difficult to see why it has not been accepted by every railway man, both steam and electric. As president of one of the great locomotive manufacturing companies, Mr. Vauclain is vitally interested in the growth of the railroad business. He refuses to be perturbed in the slightest degree. But he does point out that it is necessary not to find fault with the new things which appear as competitors, but to embrace them, enter into them and get the best out of them. That always has been and always will be the secret of progress.

Mr. Vauclain welcomes the automobile as a blessing to this country, because of the opportunity it gives the worker and his entire family to get an enlarged outlook on life. That in itself is one of the greatest blows to radicalism that could be struck. It must be remembered, however, that by the same token the demand of the worker has been increased, not only in wages but in standards of living. Transportation of the old sort is not sufficient. He is willing to pay the cost, whatever it is, for the sort of transportation he has educated himself up to. It is for the transportation man to measure up to this demand and furnish a service that will attract and satisfy the customer. The cost will take care of itself.

American Gears and Pinions Found Satisfactory in English Operation

RESULTS obtained with American gears and pinions as maintained in British shops indicate that they hold up well as compared with the British product, according to an article in this issue by A. E. Roberts. Likewise his story is a good message to American maintenance men as showing the value of the great care used to maintain bearings and accurate centers between gears and pinions. In this way the gears and pinions always mesh on the original pitch line.

British engineers have long maintained that it was necessary to manufacture gear and pinion teeth to very accurate dimensions. Mr. Roberts rather reluctantly admits that even though he is a Britisher he finds that the ten years experience with 356 American made gears on the Southern Railway of England has proved that despite the somewhat less accurate dimensions the American product has proved most satisfactory in service. The careful checking of gear and pinion centers every 100,000 miles insures good alignment and allows the surfaces to wear to accurate dimensions and to take on a very high polish along the pitch line.

Opportunity Lies Ahead in Local Transportation

At Second Sectional Conference in New York, Prominent Executives Point to Opportunities that Have Developed from Recent Difficulties—Broadened Vision and Increased Courage Needed to Grasp Significance of New Order of Things Brought About by Evolution in Transportation

THE local transportation industry has been satisfied too long with the crumbs. Out of past difficulties have grown broadened opportunities which call for expanding vision, a fresh viewpoint and increased courage. There has been no greater evolution in any phase of modern life than in transportation. But with the coming of the automobile has come a new public demand for rides, and by grasping the opportunity thus offered, the local transportation industry can be built up on a broader and sounder basis. In overcoming some of the difficulties of the past decade there will be reared a more comprehensive local transportation service than has been visualized in the past. Transportation men have been engrossed in the effort to cut the last possible penny from operating costs instead of bending their efforts to obtaining adequate revenues. A 10-cent base fare is more than justified. New and improved cars are essential. But all of these objectives require vision, initiative and courage.

FROM this will rise a new local transportation organization—not a street railway company but a local transportation agency with a street railway department. Easy-going, shiftless methods of the past must give way to a comprehensive approach to the new situation. Broad financial, franchise and organization problems lie ahead, but in the light of this new thinking there is the opportunity for recasting entirely the present status of transportation franchises and the popular conception of local transportation service.

Broadened View of Future Portrayed

This, in substance, is the view of the future portrayed by leading executives at the Second Advisory Council Sectional Conference held at the Engineering Societies Building, in New York, on June 10 and 11. "Appreciation of a new situation in business usually lags behind current development," said General Guy E. Tripp, chairman of the board of Westinghouse Electric & Manufacturing Company. "When business is confronted with an entirely new thing, it is usually either ignored or tacked on to current activity without an adequate appreciation of its significance. There has been no more fundamental evolution in any phase of modern life than in transportation. It is not surprising, therefore, that the coming of automotive transportation has not been accompanied by an adequate appreciation of the new era which is opening up."

Here General Tripp saw an opportunity for building a new local transportation structure out of which will grow a new service to people in modern communities. "Mere purchase and co-ordination of buses does not suffice," he declared. "The situation requires an adequate conception and acceptance of the new order. It affords the opportunity for arousing in the public mind an enthusiasm for such broadened service. From this will rise a new local transportation organization—not a street railway company but a local transportation agency with a street railway department. Easy-going, shiftless methods of the past must give way to a comprehensive approach to the new situation. Broad financial, franchise and organization problems lie ahead, but in the light of this new thinking there is the opportunity for recasting entirely the present status of transportation franchise and the popular conception of local transportation service."

"The electric railway industry needs courage," said W. F. Ham, president Washington Railway & Electric Company. "It has been too long satisfied with the crumbs. The time has passed for talking 6 or 7-cent fares or for following a penny-splitting policy toward revenue. A 10-cent base fare is more than justified, and electric railways should go after it. If this produces an excessive revenue in any particular situation, the slack may be taken out by various combinations of token fares under the base. At the present time, however, there are not many properties that need to worry about excessive earnings. Electric railway investors are not getting a fair return and they are entitled to a definite stand by managements for an adequate fare. Electric railways haven't spent the money to make their service attractive. They have been engrossed with economies and have given too little attention to obtaining adequate compensation which would enable improved service to be given. The industry needs new and attractive cars. Under the conditions which have existed for the past twenty years local transportation has been on far from a sound basis. The time has come for a new point of view and a courageous demand for conditions that will permit the development of local transportation service on a sound basis."

Thomas N. McCarter, president Public Service Company of New Jersey, said that although the in-

dustry is still surrounded with many pressing problems and difficulties, he could begin to see definite signs of improvement in basic conditions and that the future looked more hopeful than had been the case in 23 years.

Greater co-operation among electric railways and railway executives is needed for the improvement of basic conditions, according to Edward Dana, general manager Boston Elevated Railway. H. M. Addinsell of Harris, Forbes & Company, New York, declared that the investment banker can help little until improvement is made in the basic conditions surrounding the industry.

The policy followed by the Cleveland Railway for improving service was outlined by John Stanley, president. Although no new financing has been undertaken since 1907, there have been 500 new cars added to the service of the Cleveland Railways, and several extensions in track. Authority has recently been obtained from the City Council to scrap 100 cars that have become obsolete for service. To illustrate the importance of the street car in Cleveland, Mr. Stanley said that a recent poll of retail store patrons showed that 78 per cent had come by street car, 18 per cent by autos, and 4 per cent had walked.

"There has been too much apathy about their business among transportation men themselves," declared R. B. Stearns, vice-president and general manager Eastern Massachusetts Street Railway. Although there has been an improvement in the financial status of many railway properties, he pointed out, electric railway bonds on a good earning basis go begging.

"In the years just preceding the world war," said James H. McGraw, president McGraw-Hill Publishing Company, Inc., "the public began turning away from the electric railways. This was partly attributable to the fact that the railways failed to keep up with the times and began showing up in an unfavorable light. The rapid growth of the automobile merely intensified the situation. We can look back now and understand the developments which we were unable to understand then. Naturally railway securities were affected and the vicious cycle thus set up became cumulative.

Broader Vision Needed Now

"But, today, the public is gradually awakening to a new idea. Electric railway service is an essential which cannot be dispensed with and which is vital to the development of modern communities. At this point, railway managements need to recognize the new opportunity afforded them. First, the transportation machine must be put in order. The physical equipment must be made capable of rendering that character of service for which the American public is ready to pay.

"A broader vision and the courage necessary to carry it out are needed by the industry. The electric railway man has not learned adequately to use his local newspapers. Intensive cultivation and well directed advertising can make them a powerful, constructive force. New cars, new methods and a new viewpoint are the need of the hour."

Commenting on the subject of fares, Robert I. Todd, president and general manager Indianapolis Street Railway, said that experience with increases had shown that the volume of riding goes down as the fare goes up, but Joseph K. Choate, vice-president J. G. White Management Corporation, maintained that a 10-cent base fare gives less difficulty than do fractional intermediate fares. He indorsed the need for exercise of courage and vision in going after adequate revenues for local transportation service.

> ELECTRIC railways haven't spent the money to make their service attractive. They have been engrossed with economies and have given too little attention to obtaining adequate compensation which would enable improved service to be given. The industry needs new and attractive cars. Under the conditions which have existed for the past twenty years local transportation has been on far from a sound basis. The time has come for a new point of view and a courageous demand for conditions that will permit the development of local transportation service on a sound basis.

More Co-operation Needed

A plea for greater cohesion between the various elements in the industry and greater co-operation and accord in dealing with common problems was made by Lucius S. Storrs, managing director American Electric Railway Association. "Courage is needed in several directions," he said. "First, is the courage to approach the public with confidence in the justice of the railways' case. Combined with this is needed the courage to scrap old equipment that has become obsolete, to find ways of raising money for the acquirement of new cars, and to abandon unprofitable lines which in many instances were unjustified at their inception and have little economic value."

R. P. Stevens, president Penn-Ohio Edison Company, declared that electric railways have operating forces as efficient as those of any industry, but that the problem of the moment is largely a question of a state of mind. Once the industry itself thoroughly believes that it can be put on a profitable basis, a material improvement in present conditions will be effected. With re-established confidence, ways can be found for building riding and increasing fares to a point justified by the character of the service rendered. According to Mr. Stevens, the industry has failed to utilize adequately for the building of traffic the more than a million employees in street railway service.

Other speakers included B. C. Cobb, vice-president Hodenpyl, Hardy & Company, Inc., and chairman of the Advisory Council; G. A. Richardson, vice-president and general manager Chicago Surface Lines; A. C. Blinn, vice-president and general manager Northern Ohio Traction & Light Company; E. J. Dickson, vice-president United Electric Railways, Providence, R. I.;

T. A. Kenney, Hodenpyl, Hardy & Company, Inc.; J. K. Punderford, president and general manager the Connecticut Company, and Leslie Vickers, economist American Electric Railway Association. In a discussion of some of the fundamentals of electric railway economics, Mr. Vickers pointed out that taxes collected from street car fares are discriminatory in that street car riders are largely wage earners and consequently least able to pay this indirect form of taxation. Railway managements have not adequately utilized the popular appeal of this condition in discussing the general subject of excessive local transportation taxes.

Copper Used in Electrification of C., M. & St. P. Railway

The Amount of Copper per Mile Used in This Electrification Shows the Important Part Which This Metal Bears in Any Electrification Undertaking

By R. Beeuwkes
Electrical Engineer Chicago, Milwaukee & St. Paul Railway, Seattle, Wash.

ELECTRIFICATION of the Chicago, Milwaukee & St. Paul Railway extends from Harlowton, Mont., to Avery, Idaho, a distance of 438 route-miles, and from Othello to Tacoma, a distance of 209 route-miles. All power is purchased and is delivered to the railway's 100,000-volt transmission system at certain substation locations. The transmission system in Montana and Idaho is 364 miles long, and the transmission conductors each consist of a No. 00 B. & S. gage, six-strand copper cable. The transmission system between Othello and Tacoma is 186 miles long, including 138 miles of No. 00 B. & S. copper cable similar to that used for the section between Harlowton and Avery, and 48 miles of No. 0 B. & S., six-strand copper cable. Between Harlowton and Avery this transmission line serves fourteen substations, and between Othello and Tacoma eight substations, and in each of these stations there are installed transformers and motor-generators by means of which the current received from the transmission system is transformed to 3,000-volt direct current for use on the trolley system.

The trolley system consists of the trolley wires, contact with which is made by the collecting pantograph on the locomotive, and of the feeder system to which the trolley wires are connected at suitable intervals. The trolley wires over the main track consist of two No. 0000 B. & S. grooved copper trolley wires, hung side by side, and on side tracks of a single No. 0000 B. & S. grooved copper trolley wire. The feeder system consists of one or more 500,000-circ.mil or 750,000-circ.mil copper cables.

In addition to the copper which is used for the four main electrification facilities as herein described, there is also used a very considerable amount for the wires or alternating-current signal system. These wires are mounted on the same poles as those carrying the trolley and feeder wires, and consist of two No. 4 B. & S. copper. These wires furnish current to transformers, relays, track, impedance bonds, and other signaling apparatus, which also contain a considerable amount of copper of which no direct figures are available.

There is also mounted on the trolley poles a so-called power indicating and limiting circuit, consisting of two No. 8 B. & S. wires, which extend practically the entire length of the electrification and which are for the purpose of energizing certain apparatus which has for its purpose the regulation of maximum power demand used by the railway.

The following tabulation has been prepared to show the amounts of copper used in the different facilities involved in the C., M. & St. P. electrification systems:

ELECTRIFICATION—HARLOWTON, MONT., TO AVERY, IDAHO		
Miles main line electrified	437.6	
Miles yards and sidings electrified	141.9	579.5
Miles transmission line		363.6
Substation Apparatus	Pounds	Pounds
Motor-generator sets	400,000	
Transformers	288,000	
Switchboards	48,000	736,000
Locomotives		
10 passenger	274,900	
26 freight	768,300	
3 switching	22,800	1,066,000
Transmission System		
No. 00 conductor		2,382,000
Trolley System		
Trolley wire	3,478,000	
Feeder wires	5,841,000	
Rail bonds	598,000	9,917,000
Signal System		
Primary circuit	599,000	
Secondary circuit	43,000	642,000
P. I. & L. Circuit		
Pilot wire		221,000
Total—Rocky Mountain and Missoula Divisions		14,964,000
ELECTRIFICATION—OTHELLO TO TACOMA, WASH.		
Miles main line electrified	211.1	
Miles yards and sidings electrified	69.8	280.9
Miles transmission line		185.9
Substation Apparatus	Pounds	Pounds
Motor-generator sets	234,000	
Switchboards and transformers	127,000	361,000
Locomotives		
5 passenger	336,000	
16 freight	472,500	
1 switcher	7,500	816,000
Transmission System		
No. 00 conductor	906,000	
No. 0 conductor	252,000	1,158,000
Trolley System		
Trolley wire	1,699,000	
Feeder wires	2,926,000	
Rail bonds	350,000	4,975,000
Signal System		
Primary circuit	281,000	
Secondary circuit	21,000	302,000
P. I. & L. Circuit		
Pilot wire		106,000
Total—Coast division		7,718,000
Grand total, Rocky Mountain, Missoula, Coast Division		22,682,000

From the accompanying table it will be noted that the electrification of the 438 miles between Harlowton and Avery involves a total use of copper per mile of approximately 17 tons, and between Othello and Tacoma of about 18¼ tons, or an average of the whole territory per mile of about 17.4 tons, not including a comparatively small amount of copper used for various minor miscellaneous purposes such as lighting circuits in substations, etc., and, as previously noted, for certain portions of the signal system.

The amount of copper used for the different facilities will, of course, vary with the traffic and other conditions that have to be considered in a particular case, but the amounts given in the table as used in the C., M. & St. P. Railway electrification are amply sufficient to allow for future normal expansion of business.

These figures, it is believed, will demonstrate better than any other way the importance of the metal copper in connection with railway electrification work.

Skokie Valley Line of the Chicago, North Shore & Milwaukee Railroad Joins and Crosses the Libertyville Branch at a Wye at South Upton Junction

This section of four-track right-of-way suggests the ultimate appearance of the line into Chicago, as provision has been made eventually to have four tracks for the entire route. Overhead wires that control cables for the interlocking plant are carried on steel bridges. On the double-track portions single bridges are used.

Skokie Valley Route Gives North Shore Line Widened Territory and Improved Facilities

Ten Million Dollar High-Speed Cutoff of the Chicago, North Shore & Milwaukee Railroad Represents Economical Combination of Railroad and Power Line Right-of-Way, Catenary Overhead Construction, Full Automatic Substations with Supervisory Control, Modern All-Electric Interlocking Plants and High-Speed Roadbed Provided on 22½-Mile New Route

New Skokie Valley Route of the North Shore Line Is from 2 to 4 Miles West of the Original Shore Line

This line leaves the older line at Howard Street, traverses the Niles Center branch to Dempster Street, from which point it runs directly north to the Libertyville branch, and thence east a short distance to join the main line along the North Shore at a point just north of North Chicago. Nine stations have been located along the line for local passenger service. However, at present the line is used for the high-speed Chicago-Milwaukee trains and for freight service. Ultimately, it will be a four-track road from the Chicago "Loop" to Milwaukee city limits. The new route will allow for a running time between Chicago and Milwaukee of one hour 58 minutes, which is eighteen minutes faster than the fastest train on the Shore Line.

DUPLICATE rights-of-way between Chicago and Waukegan are possessed by the Chicago, North Shore & Milwaukee Railroad since the completion of the Skokie Valley line. The old line through the cities and suburbs along the lake is now called the Shore Route, while the new route, some 2 to 5 miles west, is called the Skokie Valley Route from the name of the stream which traverses this valley. This new line represents the most modern practices in high-speed trunk line railroad construction. Its location furnishes a right-of-way with low grades and eliminates the necessity of complicated construction work. In this respect, it is in contrast to the Niles Center division, where many difficult forms of railroad construction were necessitated by the topography and the obstacles encountered.

The new Skokie Valley Route is a continuation of the Niles Center branch, leaving this line approximately ¼ mile south of the Dempster Street terminal. It continues north for a distance of 22½ miles to join the old main line of the Chicago, North Shore & Milwaukee Railroad at a point just north of North Chicago.

Economic Value of Location

Two outstanding points mark the new Skokie Valley route as a practical bit of railroad location and engineering. These are, first, the economic features of its location and, second, the intensive use made of the right-of-way. The line extends along the west side of the Skokie Valley, in the territory between the solidly built-up communities along the lake shore on the east and the towns already established along the Chicago, Milwaukee & St. Paul Railway on the west. The territory is near enough to Chicago so that it is expected that a large commutation business will be built up through the construction of this line. At the same time the road is admirably located to provide freight service for handling materials which will be shipped in for improvements in the territory.

The line traverses a territory through which high-speed operation is possible. This enables the Chicago-Milwaukee limited service to be operated at a speed which reduces the running time between these two towns by approximately eighteen minutes. It also permits high-speed service between Chicago and Libertyville and Mundelein, communities which are developing rapidly. Of course, as the communities along the line grow, conditions probably will change and it will be necessary to meet such conditions by grade separations and other improvements. When that time arrives, how-

ever, the business of the road no doubt will have grown to the point where this will be justified.

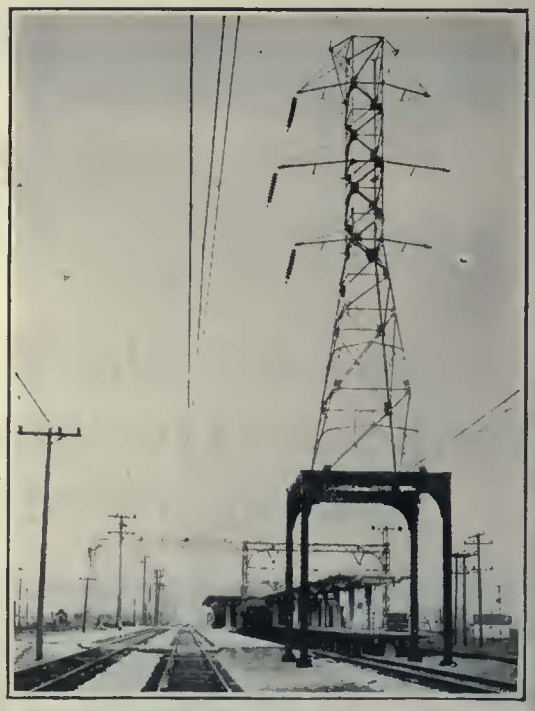
Joint use is made of the right-of-way by the North Shore Line and the Public Service Company of Northern Illinois. The ultimate plan calls for two lines of transmission towers together with supplementary lines of lower voltage, which on account of clearances required because of high voltage make necessary a right-of-way of 135 ft. On account of the spacing of the transmission lines with respect to each other and the adjoining land, it was found possible to locate on the same right-of-way a four-track railroad system. Such a right-of-way, if used alone for railway purposes, would have been at least 100 ft. wide. Thus the use of the 135-ft. right-of-way jointly has resulted in a saving of a 100-ft. strip or approximately 12 acres per mile. Taking into consideration the value of property through that territory, this saving has been considerable. Items common to the two utilities, such as fencing, drainage, and other miscellaneous details, have also been greatly reduced.

In regard to the construction of the line, the same policy has been followed as was done in the case of the Niles Center section. Everything has been carried out in a permanent manner with the exception of the rails, which through the greater portion of the line are 80-lb. relayer steel installed to meet the conditions due to settlement for the first two or three years after construction.

The design meets all requirements for a high-speed line, connecting the city limits of Chicago and Waukegan without traversing the densely populated suburbs along the lake shore. In view of all of the things that would have had to be done to the Shore Line route to make it comparable with the new Skokie Valley Route, the expenditure of $10,000,000 is a very economical investment. Grade separation on the old Shore Line to make it possible to increase facilities through the various towns would have entailed prohibitive expense. In order to increase the capacity of the original line between Chicago and Milwaukee, to meet the needs of the constantly growing traffic, the most economical solution of the problem was to construct a line on an independent right-of-way near enough to the existing right-of-way to provide for the proper connections between the two lines. Such a location was found in the Skokie Valley, where the new line has been constructed.

Substantial Line Equipment Is Used on the New Skokie Valley Route

Overhead supporting bridges are of the double expanded steel truss type carrying the catenary messenger on top, which in turn supports the secondary and contact wires. The high-tension tower is used as one supporting leg of alternate bridges. As these towers are 500 ft. apart the catenary supporting bridges in this particular vicinity are spaced at 250 ft. centers.



Power is furnished by five automatic supervisory controlled substations. Four of these are 1,500-kw. rotary converter stations, while the fifth is a 1,000-kw. mercury arc rectifier installation. All stations are of the semi-outdoor type similar to the one shown. High-tension taps are taken from the Public Service 33,000-volt, 60-cycle line which parallels the railroad. No feeder cable is used on the distribution side of the substation the catenary construction providing a conductivity equivalent of 1,200,000 circ.mils per track. These stations are 3¼ miles apart.

Dempster Street Station, used as the terminal of the Chicago Rapid Transit line, showing the island platform for the rapid transit trains and also the grade platform for the North Shore Line trains.

ROADBED BUILT AT LOW GRADES

Construction of the roadbed provided a right-of-way at low grade. Very few cuts were necessary, although considerable fill work was required at low points in the valley. Material for these fills was obtained from a borrow pit on purchased land. This pit will be made

One of the Nine New Combined Stations and Agents' Residences, Which Are of Spanish Design

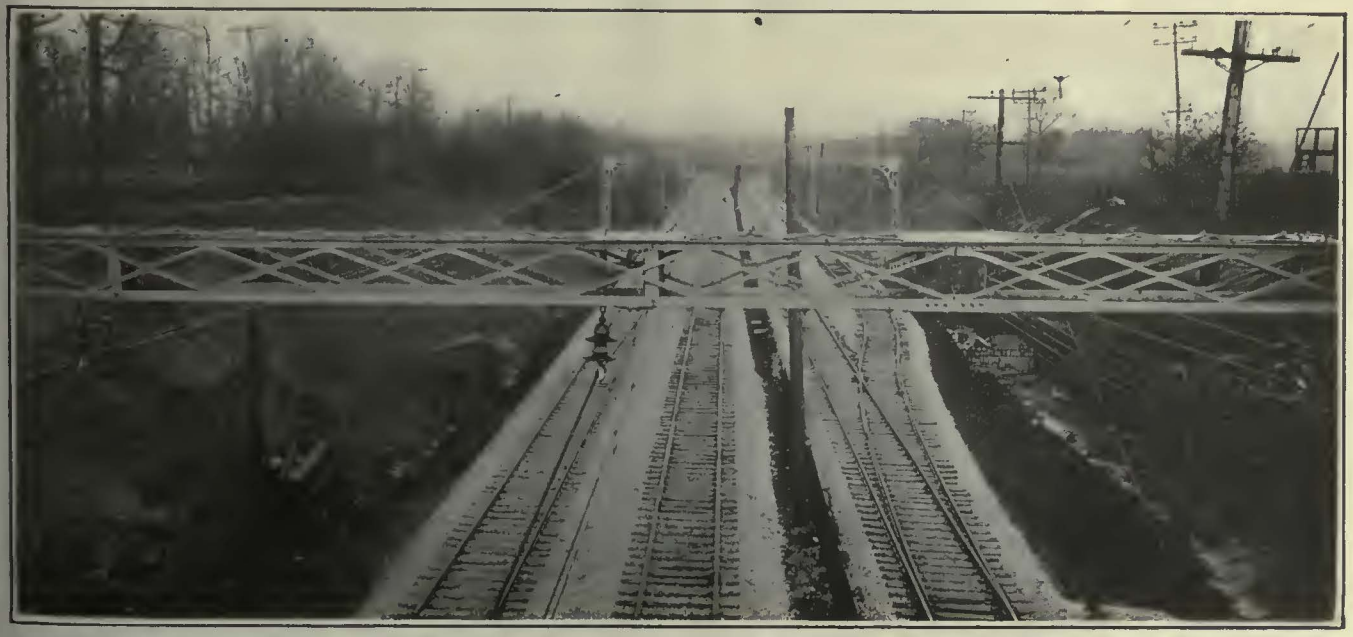
This station consists of waiting room and house for the agent, who acts as representative of the company in maintaining and protecting its property. The building is of permanent construction and may be used as a home after the waiting room facilities have been outgrown by moving it from its present site onto adjacent property. This station cost about $9,500 to build.

into an attractive lake of credit to the neighborhood. From this land approximately 550,000 cu.yd. of fill was obtained. The only extra cost in getting this material was in the construction of a dam for impounding the water and a concrete spillway in this dam. A lake of 43 acres area and a maximum depth of 12 ft. was excavated.

On top of this right-of-way are laid two tracks carried on creosoted red oak ties. Ultimate standard construction of the track will utilize 100-lb. A.R.A. rail supported on tie plates. Because of the eventual settling of the roadbed the present construction is of 80-lb. relayer rail. All curves are for high-speed operation with super-elevation, which permits an operating speed of 70 m.p.h. The grades do not exceed 0.5 per cent, which permits economical freight operation as well as high-speed passenger train service.

The total length of construction amounted to 46 track-miles. Of this amount 42 track-miles is in new construction on the Skokie Valley division and the remaining 4 miles is additional trackage on the Libertyville branch. In addition to this new work the entire Libertyville branch line was rehabilitated for high-speed traffic.

A feature of the construction is the elimination of curves at the crossing of the Lake Bluff cut-off of the Chicago & North Western Railway. Here a change of 4,600 lineal feet of track of the Chicago & North Western Railway was necessary in order that the electric line and the steam line would cross on tangent tracks. However, the crossing is made at such an angle as to necessitate the use of movable crossing frogs. While this adds to the mechanism of the interlocking plant, it insures an exceptionally smooth crossing for speeds of 45 and 50 m.p.h., which are permissible through this particular plant. Similar changes were made in the alignment of the Libertyville branch in order that the crossing of this branch and the main line to Milwaukee would be on tangent tracks.



Where the New Skokie Valley Line Parallels the Old Libertyville Branch Line. The Overhead Bridges Span Four Tracks and in Some Cases Have a Length of 99 Ft.

All streams are crossed by means of creosoted timber bridges. This construction was considered economical in view of the fact that before the life of the bridge expires conditions in this section of the country may have changed to such an extent that the creeks and streams will either be eliminated or will be reduced in size to permit the use of a culvert where now a bridge is necessary.

In connection with the construction of trestles, it was found advantageous to divert the channel of the Skokie Creek so as to place it entirely on one side of the right-of-way. This eliminated a number of crossings which would have entailed considerable expense, inasmuch as this particular waterway has been deepened and widened by order of the government. The diversion work amounted to 4,000 lineal feet and necessitated 17,000 cu.yd. of excavation and the construction of 3,000 sq.yd. of rip-rap wall.

Summarizing the amount of construction work, it is found that the total trackage in the valley line construction, including the rearrangement and alignment of branch and auxiliary lines, and the Chicago & North Western Railway, amounted to 57 track-miles requiring 601,000 lineal feet of rail weighing 8,080 tons. The total amount of ballast used on this trackage, including cinders on the branch line auxiliary and temporary track, was 4,886 carloads. This trackage is carried on 165,275 crossties, which is the equivalent of 3,700 carloads.

Stations Are of Artistic Design

Beauty and utility have been combined in the design and construction of the nine stations along the route. These follow very closely the Spanish type of architecture. Inasmuch as the adjoining country is at the present time but sparsely settled, it was thought desirable to have a representative of the company live at each of the stations in order to maintain and protect the property. The agent at each station has a modern dwelling that has been built in connection with the station. The room adjacent to the loading platform is the station proper. Back of this is a modern five-room house containing all modern facilities and conveniences for living quarters. A dining room, living room, kitchen and two bedrooms and bath form a very attractive home for the agent.

Even in the construction of these houses, which represent an expenditure of $9,500 each, consideration was given to economy. When the station facilities have been outgrown and it is necessary to erect a large building devoted exclusively to that purpose, the house may be moved to adjoining property and serve as a home. At the present time it serves as a stimulus to those purchasing property in the immediate vicinity to pattern homes after it, not so much in the style of architecture, but in high-class design and construction. Property along the route has risen in value to such an extent that it is almost assured that high-class, expensive homes will be built in the vicinity.

Automatic Substations Include One Mercury Arc Rectifier

Power is furnished to the catenary trolley by five new substations built along the right-of-way. In addition, the new line is tied in with three substations supplying the Shore Line, the Niles Center division and the Libertyville branch. They are 3¼ miles apart and are full automatic in operation. Four of these stations contain 1,500-kw. rotary converter units and one a 1,000-kw. mercury arc rectifier. The stations are of the semi-outdoor type and are all equipped with General Electric Company selector-type supervisory control. The substation design is in keeping with the artistic buildings erected along the right-of-way by the North Shore Line and conform with the latest practices in such construction.

Due to the fact that the right-of-way parallels a high-extension line of the Public Service Company of Northern Illinois, it was unnecessary to erect such a line for the railway. Taps at all stations cut in on the 33,000-volt 60-cycle line of the power company, thereby furnishing the necessary energy for the operation of the stations. The high tension is all handled outdoors in an inclosed yard to the rear of the station building.

Distribution of the 600-volt direct current is made directly to the overhead catenary constructed trolleys. No feeder copper is used, the overhead construction being of sufficient conductivity to maintain the proper operating voltage. The catenary consists of a primary copper messenger 1.047 in. in diameter having a brass core. It has a tensile strength of 39,000 lb. Below this is suspended the secondary, consisting of a 300,000-circ.mil copper cable. The contact wire is grooved No. 0000 wire having a 65 per cent conductivity. The combined conductivity per track amounts to 1,200,000 circ.mil.

This overhead construction is supported by means of bridges, some placed at 250 ft. centers and others at 300 ft. centers. The 250 ft. spacing of the bridges was caused by the use of a high-tension power line tower as one supporting leg for each alternate bridge where the railway parallels the power line. However, where the right-of-way leaves the power line, the overhead bridges are spaced 300 ft. The trolley bridges are constructed of Bates double expanded steel. The two uprights and the horizontal member are identical in construction, being joined by heavy gusset plates and bracing. The messenger is supported by an insulator mounted on the top of the bridge. Every 4,600 ft. there is an anchor bridge where the messenger is permanently anchored. This bridge will support the entire overhead construction from that point if messengers should break on one side. The weight per foot of this construction is approximately 4¼ lb.

One of the interesting pieces of construction work in connection with the overhead catenary was the suspension on 4 deg., 7 deg. and 11 deg. curves. On both the 4 and 7 deg. curves the overhead was erected with displaced messenger without pull-offs. In some places on these curves the messenger had a displacement of as much as 106 in. An accompanying illustration shows an example of this special work. On these curves the supporting bridges were especially designed to withstand the side strain.

Track Well Bonded

All track is bonded with 400,000-circ.mil Una bonds which are of the copper arc-weld type. Crossovers and special work are bonded through with copper arc-weld bonds, using long cables to which were welded pigtail bonds. The interlocking plants being controlled by alternating-current track circuits required the installation of heavy impedance bonds at the ends of such circuits.

In addition to the power facilities, the electrical department also installed a 30-pair telephone cable along the entire right-of-way. Telephones were installed in all passenger stations, substations, towers and in a booth at each crossover.

Interlocking Plants Are of Modern Construction

Three modern interlocking plants constitute part of the equipment of the line. The one at Dempster Street at the junction of the new line and the Chicago Rapid Transit terminal is mechanical in operation. The second, 16 miles north of this, is at Skokie Junction. Here the Lake Bluff cut-off of the Chicago & North Western Railway crosses at grade. The third and largest of the plants is at South Upton, where the new line crosses the Libertyville branch, and this branch in turn crosses the main line of the Chicago & North Western Railway. It is at this point that a "Y" was constructed to facilitate the movement of trains in several directions. The plants at Skokie Junction and South Upton are all-electric in operation and are of the latest type of the Union Switch & Signal Company.

At Dempster Street the Chicago Rapid Transit Company, which leases trackage rights over the Niles Center division, has a terminal station with two stub-end tracks alongside an island platform. The new tracks leave the tracks used by the Chicago Rapid Transit Company at a point approximately ¼ mile south of the terminal. Here a manually-operated interlocking plant was installed. The plant consists of a 24-lever machine controlling the diamond crossover for the Chicago Rapid Transit trains and the leads between the C.R.T. tracks and the North Shore tracks. Dwarf signals indicate line-ups both with and against traffic. This plant allows for the by-passing of the station of North Shore Line trains and is in continuous operation during the 24 hours of the day.

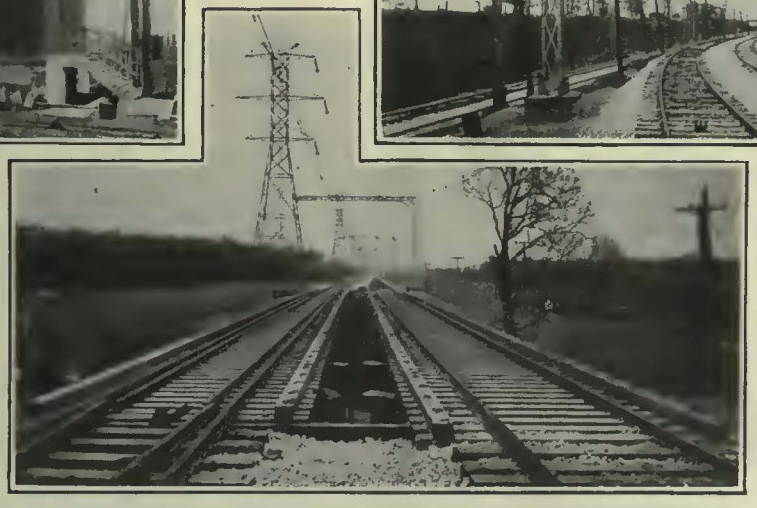
At Skokie Junction the Lake Bluff cut-off of the Chicago & North Western Railway crosses the North Shore Line right-of-way and joins the main line of the Chicago & North Western Railway within the jurisdiction of this plant. The steam railroad formerly had a mechanical plant to handle the movement through its junction. This was replaced with an all-electric plant having 26 working levers on a 31-lever frame. This machine handles both the junction and the North Shore crossing. At this particularly high-speed crossing movable point frogs are used. This necessitated the use of more switch machines than would be necessary with fixed-point equipment. The entire plant is controlled by a.c. track circuits divided into annunciator, home and distant signal circuits. On the steam railroad semaphore signals are used, as this is standard practice on this property. However, on the North Shore Line two-position color light signals are used. Derails protect all line-ups, either with or against traffic. The North Shore Line built the artistic and attractive tower at this location. It is operated jointly with the Chicago & North Western Railway in 24-hour service.

A feature of this plant is its safety in operation. The lever man must put the home signal to normal while the train is in the home block a distance of 500 ft. If this is not done, the machine is automatically locked against further manipulation until a time release allows for further changes in line-up. This time release, which in this particular case is set at two minutes, must be operated to return the home signal to normal if the towerman fails to take the route away while the train is in the circuit. In this installation, the annunciator signal is 4,000 ft. in advance of the distant signal, which in turn is 4,000 ft. ahead of the home signal.

In the interlocking plant installations all wires with the exception of those to the track machines are carried in a marlin-laced cable, carried on messenger, supported

Above is a typical interlocking tower built by the North Shore Line at Skokie Junction and at South Upton. These conform in design and construction with the North Shore standard practice.

On curves of small radius, the overhead construction is carried by displaced catenary without pull-offs. In this particular instance, on a 7 deg. curve, the catenary is displaced 106 in.



Creosoted timber bridges are used to span all streams and highways. This construction has the economic advantage of a small investment, allowing for the bridge location to be changed as conditions in the territory change. The life of these bridges is figured at 25 years, at the end of which time changes may be such as to justify the installation of permanent concrete or steel structures.

by the trolley wire catenary bridges. Power for the operation of the plant is furnished by a motor-generator set in connection with a battery. This arrangement is of the standard 110-volt d.c. type with 12-volt a.c. track circuit.

South Upton Junction plant is the largest and provides for the greatest number of train movements and line-ups. This type "F" electric interlocking machine has 50 working levers in a 55-lever frame. Twenty working levers are for 32 signals and 30 for four single switches, two single slips, and 22 derails. The frame has two rows of lever lights equipped with 6-8-volt bulbs. The magnets operate on 110-volt d.c. On the wall above the machine is an illuminated track model of the spot-light type. This model has 26 painted sections with 60 lamps, 50 of which are white, eight red and two green. A similar type of track model is also in the Skokie Junction tower.

At Upton Junction it is possible to route trains in a number of directions. Traffic north from Chicago may be sent either to Milwaukee or to Libertyville. From Milwaukee, trains may be directed to Libertyville or Chicago. From Libertyville, three line-ups are possible —to Lake Bluff on the branch, or to Milwaukee or Chicago on the main line. However, trains from Lake Bluff can only be sent straight through the plant to Libertyville. In addition to these switching operations on the North Shore Line, the plant also controls the two-track crossing of the main line of the Chicago & North Western Railway. The plant, equipment and operation, is identical with the Skokie Junction plant. It is all-electric with semaphores used on the steam line and two-position color lights on the electric line.

New Cars Arrive in Time for Opening

Additional rolling stock in the form of 20 new cars of the standard type have been received by the Chicago, North Shore & Milwaukee Railroad for use in limited service between Chicago and Milwaukee. These have arched roofs, smoking compartments, toilet facilities, and are of steel construction, carried on high-speed trucks. Four 140-hp. motors are geared to give a free running speed of 72 m.p.h. This is approximately 7 miles per hour faster than the former equipment of the North Shore Line. The cars are equipped with poles having a trolley shoe through which contact is made with the catenary constructed overhead. Third-rail trolley shoes are also provided in order to allow the equipment to be run over the tracks of the Chicago Rapid Transit Company.

The interior of the car is finished in mahogany. The main compartment is equipped with interurban high-back seats, upholstered in green figured mohair. The smoking compartment has the same type of seat, covered with black leather. The weight of the car is approximately 100,000 lb.

Maintenance Costs Reduced in Fort Worth

Better Inspection and Use of Trolley Shoes and Regular Inspection of Trolley Wire and Supports Are Also Responsible for Fewer Failures in Overhead Construction

CONTINUED use of the sliding contact shoe in Fort Worth on both city and interurban cars instead of trolley wheels has effected important reductions in the cost of maintaining the current-collecting equipment on the cars, and the contact wire itself.

Trolley wire breaks on the 163 miles of city and interurban tracks of the Northern Texas Traction System have been reduced from the peak of 350 in 1921 to 23 trolley breaks for the entire year of 1925. Credit for this reduction is not entirely due to the current-collecting devices but to the rigid and regular inspection of overhead systems and the repair of badly worn places before a break occurs. A description of the early work done in Fort Worth in investigating the current-collecting troubles is given in the issue of ELECTRIC RAILWAY JOURNAL for May 17, 1924, page 767.

TABLE I—COMPARATIVE COSTS OF TROLLEY WHEELS AND SLIDES PER 1,000 CAR-MILES

	1919	1920	1921	1922	1923	1924	1925
City Division							
Trolley wheels..	$0.324	$0.236	$0.449	$0.306	.....	.....	.....
Trolley slides...	.....	.....	.....	$0.228	$0.237	$0.239	$0.153
Interurban Division							
Trolley wheels..	$0.312	$0.615	$0.896	.....	.....	.....	.....
Trolley slides...	.....	.....	1.639	$1.070	$0.709	$0.507	$0.151

Accurate costs of operation have been kept since 1919 to date. Up to 1921 both the city and interurban divisions were operating with trolley wheels. During 1921 the interurban division had installed a number of Miller trolley shoes. In 1922 this replacement was completed and the city division was changed over. Since the beginning of 1923 all cars have been equipped with Miller shoes.

As will be noted from the individual tables and charts, the cost of trolley slides has been reduced on both the city and interurban divisions so that it is now costing a trifle more than 15 cents per 1,000 car-miles on both divisions. Turning to the total cost of material used in maintaining the current-collecting equipment, including the collecting equipment on the cars, the ears,

TABLE II—DETAIL COST BY YEARS OF MATERIAL USED FOR MAINTAINING CURRENT-COLLECTING EQUIPMENT AND OVERHEAD CONSTRUCTION, EXCLUDING POLES, FEEDERS AND SUPPORTS

	1919	1920	1921	1922	1923	1924	1925
City and Interurban							
Current-collecting equipment	$6,723.01	$6,735.27	$6,545.27	$5,408.50	$4,107.31	$3,529.90	$980.89
Ears, sleeves, etc	2,470.86	5,690.83	3,298.65	2,301.23	2,504.26	2,472.00	2,289.92
Trolley wire	14,182.77	16,748.64	13,983.93	6,264.67	3,654.54	3,680.54	1,877.19
Total	$23,376.64	$29,174.74	$23,827.85	$13,974.40	$10,266.11	$9,682.44	$5,088.00

TABLE III—RECORD OF TROLLEY BREAKS AND COST OF REPAIRS

	1919	1920	1921	1922	1923	1924	1925
Number of trolley breaks	.....	260	350	191	80	49	23
Total car-miles	8,229,243	9,044,829	8,782,208	8,422,863	8,485,715	8,671,596	8,740,396
Cost per 1,000 car-miles	2.84	3.23	2.72	1.66	1.21	1.12	0.58

sleeves, etc., of the overhead construction, and the trolley wire, it is noted that the total cost for the property has been reduced from the high point of $29,175 in 1920 to $5,088 in 1925.

The contact wire is greased on a systematic basis once every 90 days in outlying sections and every 60 days in the downtown sections under which are operated the greatest number of car movements. When new wire is strung it is immediately greased. Experience has shown that the cost of greasing trolley wire has been $0.959 per mile of wire on the city division and $1.25 per mile on the interurban division.

Trolley slides are rebuilt on a mileage basis. Formerly, the shoes were allowed to wear down to a certain predetermined depth and were then rebuilt. The shoe now comes down at every overhauling and is rebuilt by welding new material on the worn section. The welded runner is ground to shape and made smooth. The cost for rebuilding shoes averages 16 cents each.

Results obtained during the early trial period from part wheel and part slide operation over the same wire were not good. The wheel formed pits on the wire that increases the wear on both wires and slides. When slides are used on all cars they soon wear down these pits and smooth operation is obtained.

Another noteworthy result is the reduction of noise in the car because the sliding contact avoids the drumming action on the car roof.

Some trouble has been experienced on some roads due to backing up operation. In Fort Worth the one-man operated cars are never backed up without first reversing trolleys. When necessary, interurbans are backed up slowly in a satisfactory manner, with the conductor holding the trolley rope. With the small amount of reverse operation required on the property little difficulty has been experienced from this source.

Insurance Labels for Cars

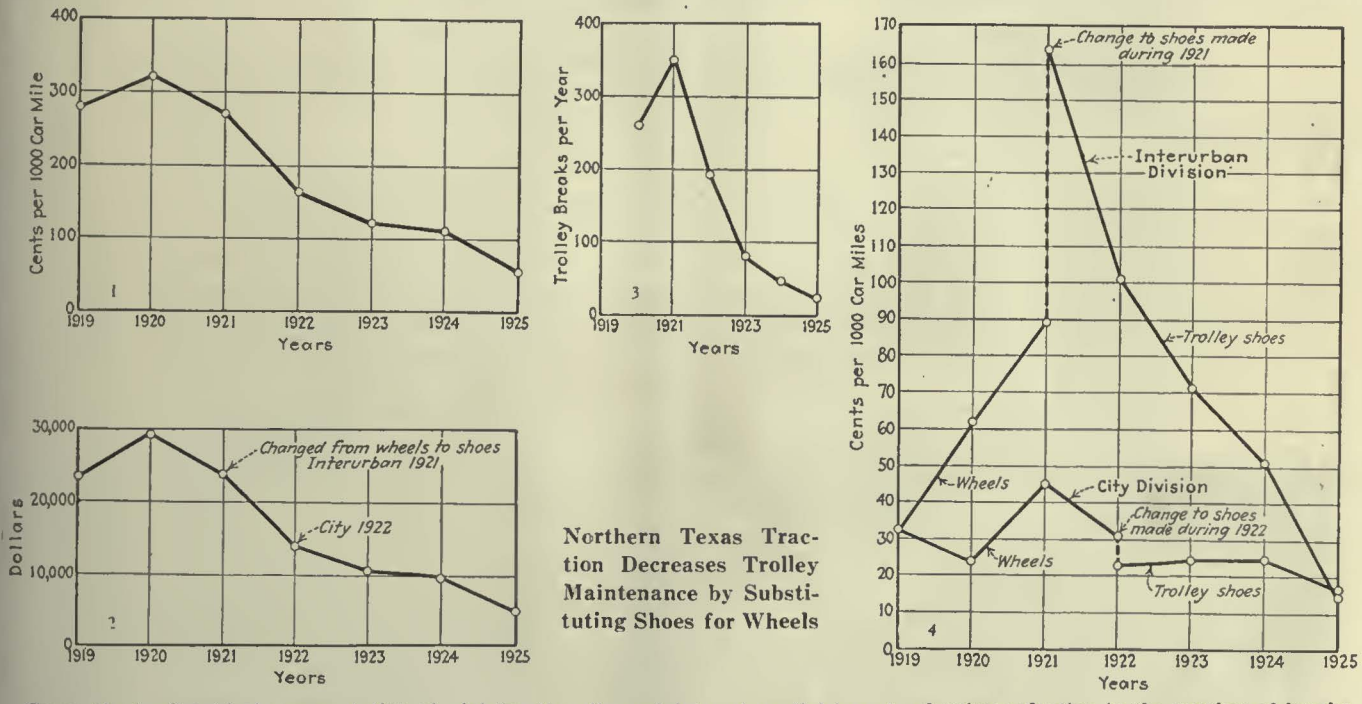
Now Available to Indicate Complete Conformity to Underwriters' Standards—Cars So Labeled Will Have the Benefit of Lower Insurance Rates

THOSE who have not been following fire insurance regulations closely within the last year may not realize that standard labels are now available for complete cars that have been built and equipped under the regulations of the National Board of Fire Underwriters. It is only within the last few months that any cars actually have been so labeled and so have the benefit of the maximum reduction in insurance premium.

The result mentioned is the outcome of some fifteen years of hard work by the insurance companies and the insurance and maintenance departments of the railways. During the history of the movement several committees representing each of these interests have worked individually and together, and their activities finally brought about the 1925 regulations of the National Board of Fire Underwriters for electric railway carhouses and cars.

After the formal acceptance of these regulations by the National Fire Protection Association and the American Electric Railway Association, the question was raised whether the labels of the Underwriters' Laboratories, Inc., would not now be available for complete cars. The fire insurance rating authorities agreed to permit this on all cars whose wiring fulfilled the specifications, and whose equipment, such as wire, switches, fuses and lamp receptacles, was of an approved listed type, and whose heaters had individual labels. The ruling did not require the label for the heavy equipment, such as the controllers, grid resistance and motors.

The first cars to be thus labeled were some recently



Northern Texas Traction Decreases Trolley Maintenance by Substituting Shoes for Wheels

Curve No. 1—Graphical representation of cost per 1,000 car-miles of trolley breaks on the entire system, showing reduction in cost of repairing trolley wire made possible by the use of sliding shoes instead of trolley wheels. Substitution was made during the years 1921 and 1922.

Curve No. 2—Cost of maintenance material for the city and interurban division of the Northern Texas Traction Company showing the saving effected by the use of Miller sliding shoes on both city and interurban divisions.

Curve No. 3—Number of trolley breaks per year on the 163 miles of wire operated by the Northern Texas Traction Company, showing reduction in the number of breaks caused by the use of sliding shoes substituted in 1921 and 1922.

Curve No. 4—Cost of trolley wheels and Miller shoes per 1,000 car-miles. Note the reduction after the substitution. Worn shoes are now rebuilt every time the car comes in for overhauling.

ordered by the Georgia Railway & Power Company for its Atlanta system. They were inspected in part at the shops of the Cincinnati Car Company, where they were being built, and in part in the carhouses at Atlanta. In this case the heaters were tested as installed because the specifications for the cars were drawn before the institution of the label service on completed car heaters, but in future cars the heaters as well as the rest of the equipment will have to bear the Underwriters' label to secure the complete car label. Obviously, it will not be possible to inspect old cars for labels unless the concealed wiring is uncovered, so that it may be viewed by the inspectors having jurisdiction.

Eventually, it is expected, a considerable credit in the fire insurance rate will apply on cars bearing this label, as the insurance interests will accept only the labels of the Underwriters' Laboratories as evidence of standard wiring and heater installations.

Cars Remodeled on Central London Railway

WHEN the Central London Railway, running from the heart of the city to the western outskirts, was opened for traffic in July, 1900, the cars were regarded as sumptuous, but they were all trail cars, electric locomotives being used to haul them. In consequence of complaints of vibration from the tenants of houses above the route, though the railway is at a great depth, the heavy locomotives were superseded by multiple-unit trains. The complaints then disappeared, but in recent times the call has come for improving the cars. A result now is that 250 cars are to be remodeled and refitted throughout to provide the same standards of comfort and efficiency as are now afforded on the Hampstead and City lines. The improvements include more comfortable seats, pneumatically controlled doors, better lights, better ventilation and faster running.

One car has been rebuilt on these lines and the results of a trial run in service have been so satisfactory that the "Underground" will proceed at once to remodel all the rolling stock on the line.

The manually operated gates at the ends of the cars have been removed and the platforms completely inclosed. Passengers step immediately into the compartment instead of having to make a right-angle turn as at present. Entrance and exit are effected through air-operated doors, four being provided to each car. These are spaced equidistantly. Passengers are near to an exit wherever they may be seated and a more uniform loading of the car is the result. Control of these doors can be achieved from any part of the train. On a seven-car train the rear guard controls the doors in the rear part and the front guard the remainder. The safety devices on the air doors provide that during the last 6 in. of stroke of the door engine the pressure is retarded almost to zero so that the door can be easily pushed back by hand. The door edges, further, are cushioned with broad rubber tubing. An ingenious electrical interlocking device secures that the starting signal cannot be given until all doors are closed.

The lighting has been materially improved and is more evenly distributed. A new type of lamp bracket is employed and all lamps are shaded. More ventilators are fitted and a new and simple type of drop window, which can be regulated by passengers, affords still better ventilation. Well sprung seats upholstered in moquette replace the old seats of pegamoid, rattan and wood. The interior decoration is in green and mahogany, giving the car a bright, cheerful appearance. The exteriors of the cars are painted red and cream.

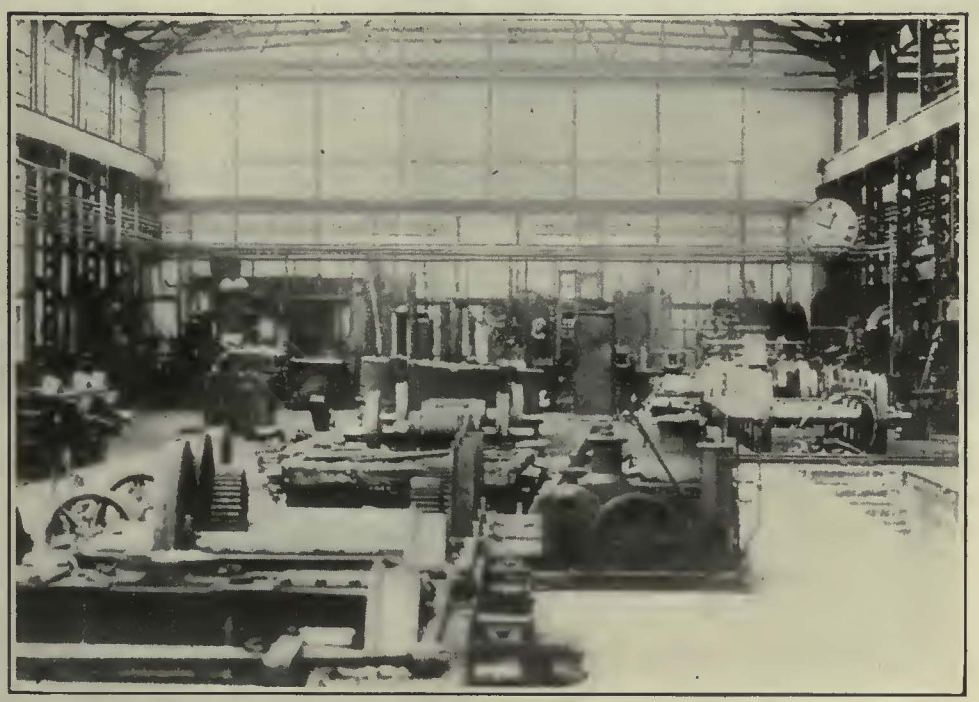
The improved rolling stock will be capable of high speeds. Experience gained with cars of similar type on the Hampstead and City lines shows that at busy points the station stopping times have been reduced from 50 seconds to 25 seconds. On the Central London tube this will mean a saving of considerable time in the through journey. Instead of four motors on the six and seven car trains there will be six motors. This increase will give better acceleration and it is estimated that at least four minutes will be saved.

Cars of the Central London Railway Have Been Remodeled to Conform with the Standards of the Underground System

High Standard of Bearing Maintenance Gives Long Gear Life

After an Average Service of 595,000 Miles per Gear, the Maximum Tooth Wear Found Was 0.008 In. and the Majority Showed Wear Between 0.002 In. and 0.005 In. on Electrified Lines of the Southern Railway, England

By A. E. Roberts
Rolling Stock Engineer Southern Railway,
Wimbledon Park, England



Overhauling Shop of the Southern Railway, Where Gearing Is Maintained

MAINTENANCE of a high standard with respect to armature and motor axle suspension bearings has resulted in a surprising mileage obtained from gearing in service on the southwestern section of the Southern Railway of England. The gearing of this equipment is never allowed to get far out of mesh, and the bearings are brought back to their original standard clearance every 100,000 miles. The clearance allowed for new armature bearings is 0.012 in. and for motor suspension axle bearings approximately 0.014 in. In changing armatures or wheels, no attempt is made to keep the gears and pinions paired.

The gearing of these cars was put into passenger service in 1916. A careful inspection recently made as the equipment was going through the shops failed to locate any teeth with wear more than 0.008 in., and the majority showed a reduction of from 0.002 in. to 0.005 in. The condition of the gears is excellent at the pitch line. Below and above the pitch line the teeth are quite dull. The pinions are naturally more polished on the pitch line than the gears, but none was found with greater wear than 0.008 in. to 0.01 in. The root and crown of the teeth are still quite dull, and some showed that they have not yet obtained the bearing surface across the face of the teeth.

None of the gears have been removed for any cause, but nine pinions were removed for apparent fatigue of the structure back of the hardened outside skin. Eight of these pinions were in service for more than four years, and were taken out because they commenced to crumble at the ends of the teeth. The ninth pinion failed in the first year of service; the failure was no doubt due to a crack which developed during the heat treatment. A complete fracture of the tooth for a length of 2 in. from the end resulted.

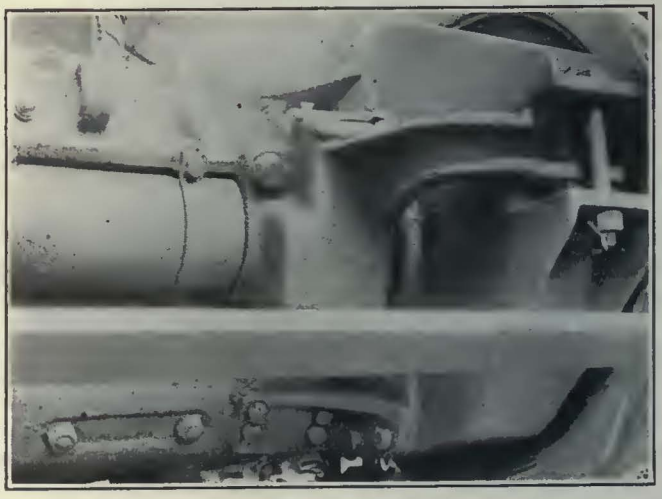
These gears and pinions were manufactured by the Cincinnati Tool Steel Gear & Pinion Company in the United States. They are heat-treated and are not ground. English manufacturers of gearing have considered that extreme accuracy for railway gearing is essential and the results obtained from American gearing, which is much less accurately constructed, have been watched with great interest. Inspection of the American gears at the time they were placed in service showed that they had cumulative errors over a series of teeth amounting to 0.008 in. Many of the pinion

teeth varied as much as 0.005 in. across the face. These variations are no doubt due to the method of manufacture and to heat treatment distortion. However, in spite of their inaccuracies, they have proved very reliable and as silent in operation as any gearing manufactured in England.

On the eastern section of the Southern Railway, 496 sets of gears and pinions of British manufacture have been installed, and an interesting comparison of the service obtained from these will be available some time in the future. These British gears are of high-grade steel and of such high tensile strength that only manufacturers with the highest class of gear-cutting machinery could generate the teeth. The pinions are of a lower grade of steel, cut, heat-treated and ground after treatment. They are extremely accurate in all respects, the teeth being within 0.001 in. and the cumulative errors over five teeth being not more than 0.002 in.

Close-Up Views of American Gears and Pinions After Ten Years of Service
Figs. 1 and 2 show gears and Figs. 3 and 4 pinions after 595,000 miles

It may appear somewhat difficult to reconcile such extreme accuracy in railway gearing, which after being cut requires pressing onto axles. The pinions are forced onto a tapered shaft, which in its turn is fitted to a bearing with 0.012 in. clearance. The bearing is forced into its housing, which in turn is fastened to the motor case. The commercial manufacturing tolerances for all of these fits will, of course, cause spreading of the gearing at the pitch line. Since the gear is pressed on an axle and the meshing of the gear and pinion depends not only on the armature bearings and their housings, but also on the motor axle bearings which support the motor, it may readily happen that the pinion may be in mesh or out of mesh to the total cumulative tolerances and clearances of 0.030 in. or more.



Gear Case Suspension Used. Top and Bottom Center Brackets Were Added to the Original Design

The problem of keeping gears and pinions in proper mesh is one of extreme interest, and although the writer is British, the opinion formed, based on many years of electric traction experience, is that the rough rugged gearing made by American methods is sufficiently accurate for operation in railway service where other factors of clearance and tolerance are quite pronounced.

Not only has the particular make of the American gearing referred to above given exceptional service but gearing on the Metropolitan Railway from 1905 to 1913, which was supplied by the R. D. Nuttall Manufacturing Company of Pittsburgh, showed that no other gears or pinions gave such good results. These were of stub-tooth form and seemed to have an endless life. Conclusions indicate that while extreme accuracy may be desirable in gearing for stationary machinery, it is not necessary for electric railway work.

Some figures as to the service in which our gearing has been used may be of interest. The maximum train weight is 31 tons per gear, and the minimum train weight is 25 tons per gear. Maximum accelerating loads are 325 hp. with driving wheels of 43 in. diameter. A schedule speed of 27 m.p.h. is maintained with an average distance between stops of 1.3 miles, and with occasional service runs that have a distance between stops of 3.2 miles. The free running speed of trains is 54 m.p.h., and coasting at 65 m.p.h. is common.

Gears and pinions are lubricated with small quantities of yellow grease and lubrication depends on the grease thrown on the sides and top of the case falling back on the gear teeth. The 356 sets of American gears in service have a 6-in. face. The teeth are involute with 2 diametrical pitch, the gears having 29½-in. pitch diameter with 59 teeth, while the pinions have 21 teeth.

Bevel Gear and Worm Drives on Cars

Several Two-Axle Designs Have Been Developed Using Both One and Two Motors—Experiments Are Being Carried On by Several Railways

CARDAN-DRIVE developments on German street cars are discussed in an article by H. Japp, chief engineer Ruhrort District Street Railways, Duisburg, Germany, published in the Feb. 12 and Feb. 19 issues of *Verkehrstechnik*. He notes that General Manager Albrecht of the Dortmund Street Railways patented a cardan drive as early as October, 1918, but his first car was not in operation before June, 1921.

As shown in Fig. 1, the Albrecht drive includes two motors which are suspended from the car flooring. These motors drive a large spur gear through insulated flexible couplings. The outer disks of the same couplings are used for the operating brake.

The movement of the spur gear is transmitted to a cardan shaft on each side. Cardan elements are mounted alongside both the spur gear and the bevel gearing connected to the driving wheels. The combined gear reduction between motors and driving wheels is 9.16:1.

The axles are of Albrecht radial type with 4 m. (13.1 ft.) wheelbase. Tests at Dortmund showed that the car so equipped could negotiate a curve of 21 m. (68.9 ft.) at 35 km. per hour (21.7 m.p.h.) without perceptible shock or noise.

The advantages of the foregoing drive are given as follows:

Complete insulation of the motors against grounding.

Transfer of unsprung motor weight on axles to spring-borne weight suspended from the body.

No bearing trouble to cause falling armatures.

No entrance of foreign matter into motors because of rundown bearings.

Motor weight saving because greater gear reduction permits higher motor speed.

Less shock to motors during acceleration.

Larger gear life because they run in an oil bath and are fitted with greater precision.

Elimination of the tire wear and heavy brake rigging incident to wheel braking.

Easier retardation by means of the disk brake.

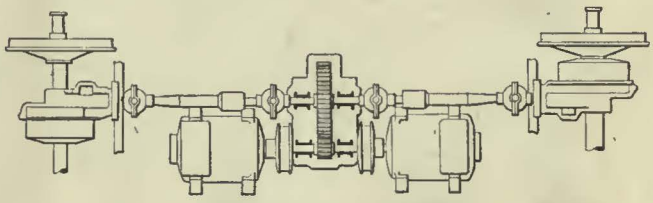


Fig. 1—The First Example of Albrecht-Krupp Cardan Drive Car as Used at Dortmund, Germany

Reduction of unsprung weight increases the life of the track.

Finally, radial axles permit quieter running and easier operation over short curves through the possibility of using a longer wheelbase.

Following 50,000 km. (31,000 miles) operation of the test car, Dr. Miller of Gerthe read an experience paper in the spring of 1924 before a group of operators at Elberfeld. The results were considered so favorable that a number of managements agreed to purchase 25 cars of Albrecht-Krupp cardan drive with the view of interchanging further test data. The first of these cars went into service during January, 1926.

The present cost of a car fitted with Albrecht-Krupp

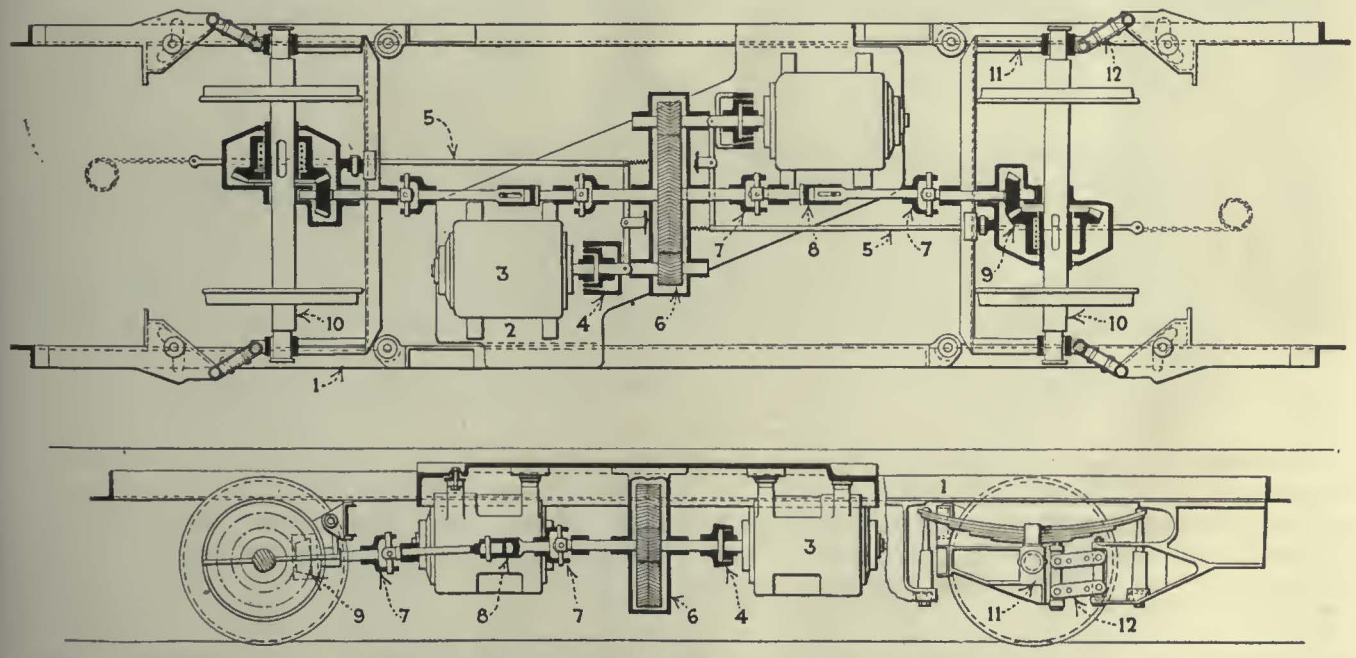


Fig. 2—Plan and Elevation of Cardan Drive Car, Second Type

1—Longitudinal sill.
2—Base plate of motors.
3—Motor.
4—Coupling.
5—Service brake rod.
6—Gearing.
7—Universal joint coupling.
8—Slidable longitudinal coupling.
9—Bevel gearing.
10—Radial axle.
11—Axle frame.
12—Links.

cardan drive and Albrecht radial axles is approximately 10 per cent greater than that of a standard drive and rigid-axle car of equal capacity. It is believed that the lower upkeep cost and other advantages of this drive will more than offset the higher initial cost. The cardan car uses only one controller. Instead of being in line with each other, the motors of the 25-car installation are staggered as shown in Fig. 2,

Because of lack of extensive experience with this construction, the parts were built with a greater factor of safety than appears necessary; but it is believed that later cars could be built 1,000 kg. (2,204 lb.) lighter than the design used hitherto.

In September, 1924, the Berlin Street Railway system equipped car No. 3102 with a combination of plain bearing motors and individual-axle automobile drive,

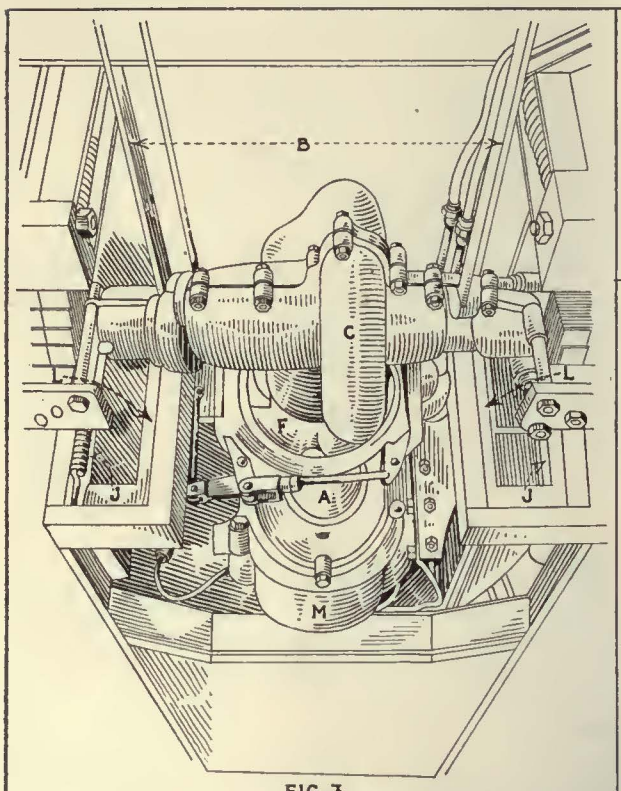


FIG. 3

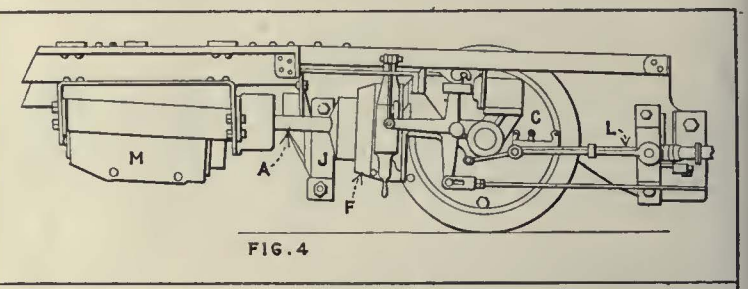


FIG. 4

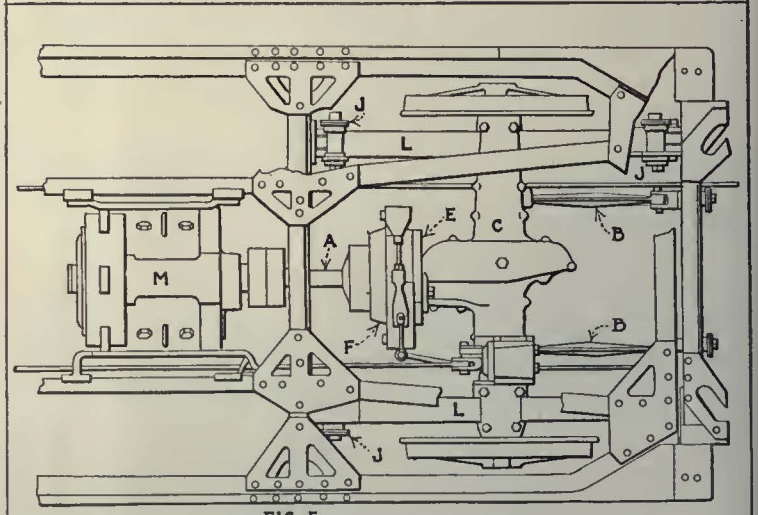


FIG. 5

Paris Car with Cardan Drive: Fig. 3, Seen from Below; Fig. 4, Side View; Fig. 5, Plan
A—Main driving shaft. *B*—Anchor rods for housing. *C*—Gear housing. *F*—Braking drum on main shaft. *J*—Spring hanger. *L*—Leaf springs for body. *M*—Motor.

so one drive remains available if the other fails. The hand brake is equalized to exert the same force on the braking disks of both motors, although this does not so appear in Fig. 2. The emergency brake is of the usual short-circuiting type common in German practice.

The truck, known as the Nolden-Japp type, was designed with particular regard to easy accessibility for all parts of the drive. Pressed-steel framing and a heavy base plate were used, therefore, to avoid cumbersome cross-members. The body is framed so that its end members overlap the truck, thereby avoiding end stiffening members for the truck itself. The body side sills are also clamped around the longitudinal members of the truck as protection against distortion.

The truck carries two Siemens-Schuckert D-340 motors rated at 37 kw. or 50 hp. on a one-hour basis. Each weighs 600 kg. (1,320 lb.) and runs at 1,300 r.p.m. at 550 volts. The first gear reduction is 1:3.84 and the second is 1:2.38.

The wheelbase is 4,000 mm. (13.1 ft.); diameter of driving wheels, 860 mm. (33.9 in.); over-all length of truck, 5,600 mm. (18.4 ft.). The base plate clears the paving by 8 in. when the car is without load. Roller bearings are used wherever possible.

In maintenance, one of the great advantages is that the various parts are more accessible than in the ordinary drive. It is also asserted that the framing plan gives the car greater resistance against collisions.

the latter supplied by the Neuen Automobil-Gesellschaft. The A.E.G. motors, which give 45 hp. at 820 r.p.m., operate through a combination of spur and bevel gearing in one housing to give a total reduction of 1:6.1. The ratio of the spur gearing is 16:40 and of the bevel gearing 14:34. The motors are suspended from the body frame. Disk brakes are used. The wheelbase is 2.8 m. (9.2 ft.) and the driving wheel diameter is 28.4 in. Ten more of this type have been ordered, following satisfactory experience with the first car.

The individual drive scheme of the Berlin car permits the use of shorter wheelbase without too much disadvantage to the cardan drive principle, but the author holds that a long wheelbase is preferable for the sake of easier riding, greater life and lower energy use.

No experiment has been made in Germany with single rather than double-reduction gearing, since this would necessitate the use of heavier, slower and costlier motors without avoiding the need for say a 1:5 reduction. On the other hand, the Albrecht-Krupp drive shows 96 to 97 per cent efficiency in the spur gearing and 95 to 96 per cent efficiency in the bevel gearing. This high combination efficiency permits the use of light, economical motors operated at 1,300 r.p.m. It is held that this efficiency will continue for years, since the Dortmund gearing showed no perceptible wear after 90,000 km. (55,800 miles) of service.

The differences in weight and price of 550-volt motors

of various speeds is apparent from the following table compiled in the fall of 1924:

Hourly Rating, Hp.	Speed, R.p.m.	Weight, Kg.	Price in Gold Mark
50	1,300	600	2,550
45	820	750	3,000
47	550	1,000	3,600

The first cardan car of the Paris street railway was built in October, 1921. Since then some 500 cars have been built according to the designs shown in Figs. 3, 4 and 5. The new cars permit, for practically the same dimensions and motor capacity, a reduction in car weight from 14,000 kg. (30,800 lb.) to 11,500 kg. (25,300 lb.) and of the unsprung weight from 2,800 kg. (6,160 lb.) to 1,900 kg. (4,180 lb.).

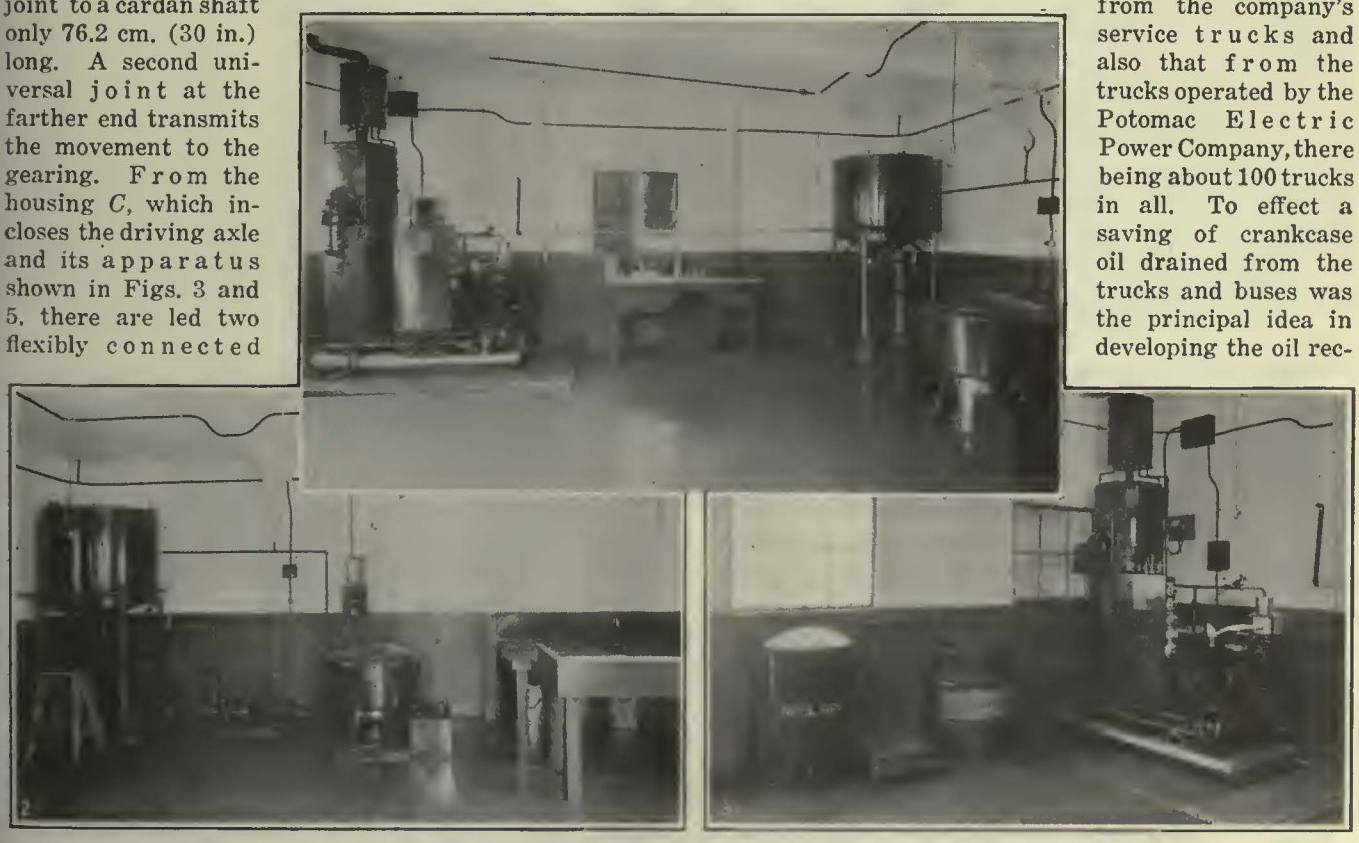
In a Paris cardan car 10.65 m. (34.9 ft.) over all with 3.6-m. (11.8-ft.) wheelbase and 850-mm. (33.4-in.) driving wheels, individual drive is used with one 45-hp., 800-r.p.m. motor per axle. The gear reduction is approximately 1:8, which the author considers too great for good meshing and long life. German operators hesitated to use such a great single reduction, also, because of the lower efficiency.

Each motor is connected by means of a universal joint to a cardan shaft only 76.2 cm. (30 in.) long. A second universal joint at the farther end transmits the movement to the gearing. From the housing *C*, which incloses the driving axle and its apparatus shown in Figs. 3 and 5, there are led two flexibly connected rods, *B*. The function of these rods is to transmit the driving power from the wheels to the car body. Large leaf springs, *L*, and intermediate helical springs (to absorb the lighter shocks) cushion the body against the stresses in the underframe. The springs are graduated for a deflection of 10 mm. (0.4 in.) to the metric ton (2,204 lb.). A special spring suspension is also used to prevent transmission of thrust from the axles to the car body when entering curves. The thrust of the axle causes a contraction of the springs, thereby permitting the axles to assume the proper radial position. Following this action, the expansion of the springs causes the axles to return to their normal position.

Car and Crankcase Oil Reclaimed in Washington

New Oil and Waste Reclaiming Plant of Washington Railway & Electric Company Reclaims Crankcase Oil for 14 Cents per Gallon and Car Oil for 5 to 6 Cents per Gallon

ON THURSDAY, May 11, a group of street railway and bus operating officials representing several large Eastern systems inspected the new oil reclaiming department of the Washington Railway & Electric Company, Washington, D. C. This department is located at the company's repair shops and is housed in a separate 30-ft. x 30-ft. one-story building erected and equipped especially to reclaim oil and waste used to lubricate the electric cars operated by the company and to reclaim crankcase oil used in the 30 buses which are in operation. In addition, the plant handles the oil drained from the company's service trucks and also that from the trucks operated by the Potomac Electric Power Company, there being about 100 trucks in all. To effect a saving of crankcase oil drained from the trucks and buses was the principal idea in developing the oil reclamation department, but since it was shown that at small additional expense the equipment could be adapted to reclaiming the car oil and waste as well, a complete recovery plant was finally decided upon.



Oil and Waste Reclaiming Equipment Installed by Washington Railway & Electric Company

1. At left, oil reclaiming outfit with fume condenser. In center, table for test products. At right, tank for dirty car oil.
2. At left, car oil tank. In center, pump for handling car oil and centrifugal waste extractor. At right, waste picking tables.
3. At left, storage cans for reclaimed gasoline and oil. At right, oil reclaiming equipment.

The principal unit in this recovery plant is a No. 300 De Laval crankcase oil reclaiming outfit with fume condenser. This is a complete unit, containing all the equipment necessary to restore used crankcase oil to its original state of efficiency. The outfit consists of a

centrifugal oil purifier, for removing from the oil such impurities and water as it may contain; a wash tank, for chemical treatment and washing the oil in order to remove colloidal carbon; a motor-driven pump; electric oil heater, for keeping the oil at proper temperature during the process of purification; air blower and evaporating tower to restore the oil to its proper viscosity; strainer; sight-flow glass; electric control board and all piping and valves.

Reclaimed Oil Used Same as New

Crankcase oil reclaimed by this outfit is used in exactly the same manner as new oil, being put into drums and sent to the garage for use as needed, there being no effort made to refill with oil containing a certain percentage of new oil mixed with the reclaimed product. Oil recovery amounts to about 80 per cent, the 20 per cent loss consisting of dilution and solid impurities or water. The fume condenser furnished with the De Laval crankcase oil reclaiming outfit condenses most of the gasoline evaporated from the oil, so that in reality the losses are even lower than the above figure would indicate. This reclaimed gasoline is used for washing purposes, and it is stated that the men in the shops prefer it to new gasoline, since it contains a small amount of light oil and consequently does not dry out their hands.

The cost of reclaiming crankcase oil is approximately 14 cents a gallon. The outfit handles oil in batches of 50 gal. each and the average time required to complete the process is eight hours. This time element, however, depends very largely on the amount of dilution in the oil, since the removal of dilution is by far the longest step in the process.

Oil is reclaimed from waste by means of centrifuging in a 26-in. motor-driven De Laval extractor. This machine is equipped so that steam under approximately 5-lb. pressure is blown through the waste while it is being spun, producing a fairly good washing action. This spinning with steam is continued for ten minutes, after which the steam is shut off and the extractor is allowed to run ten minutes more at full speed in order to wring as much water out of the waste as possible.

The same oil purifier used with the crankcase oil reclaiming outfit is employed to centrifugalize solid impurities and water out of the oil reclaimed from waste.

Old Axle Oil Used for Rough Lubrication

The reclaimed car axle oil is not used again for its original purpose as the company uses a large amount of low grade oil for rough lubrication, and finds it economical to end the reclamation process at a point where the oil is suitable for this rough use rather than carry it on to a point where it would be suitable for reuse in the car journals. In this way a couple of cents a gallon is saved on the cost of reclamation without adding anything to the cost of new oil. Car axle oil can be reclaimed at from 5 to 6 cents a gallon.

The company uses a good grade of wool waste which is high in cost but economical to use when a suitable reclaiming process is employed. Recovery of waste averages about 85 per cent and the process costs about 4 cents a pound. The recovered waste is mixed about half and half with new waste and is used again on all bearings. No washing process is employed for waste recovery, the product coming out of the centrifugal extractor grit free and with the colors bright, although somewhat smudgy in spots. That this smudging is not considered detrimental is proved by the fact that the reclaimed waste is used even on motor bearings.

Other equipment in the plant consists of a 225-gal. De Laval tank in which dirty car axle oil is stored, heated and settled before purification, a 1¼-in. De Laval pump handling the car axle oil, a waste picking table, a combination picking and drying table for waste and a metal covered bench for samples, tools, etc.

One man operates the entire oil reclaiming plant and is often able to spend a good part of an eight-hour day at work in the repair shop proper. It is planned eventually to reclaim compressor oil from the cars and the light oil used about the shop for flushing purposes. At this time the waste-saturating operation which is now performed in the repair shop will probably be moved to the oil reclaiming plant and the waste will be washed in purified flushing oil as a pre-saturating step. When this is done the oil plant will probably require the constant attention of the man in charge.

European Studies of Rail Corrugation

IN A PAPER presented at a meeting of the French Electric Railway Association in Lyons last October, an account was given of studies on the nature of rail corrugation by Mr. Clère, way engineer of the Paris Tramway Company. Briefly, Mr. Clère's studies led him to the conclusion that corrugation would best be resisted by a tough, medium-hard steel rail with high elastic limit. In consequence, several sections of rail have been installed on the Paris Tramways under similar conditions of service but with different compositions and physical characteristics. As yet these sections have not been in use long enough to give definite results.

Tests of a different nature on the same subject, conducted under the direction of some of the rail mills in Germany, are described in a recent issue of *Verkehrstechnik*. Cylindrical disks or rollers of steel, whose peripheries were in contact with each other, were revolved under pressure. When these disks were of the same hardness, only the upper one showed any tendency to corrugate. When the upper disk was softer than the lower one, light corrugations could be noticed to appear and disappear on the upper disk as the metal wore away. In the opinion of the investigators, the primary cause of these corrugations was the vibration of the springs used to provide the pressure on the disks. It was also found that the greater the pressure the greater the corrugation on the softer disk, whereas the harder disk did not become corrugated until a pressure of 100 kg. (220 lb.) had been applied for a long time.

Later tests with similar disks by another observer were conducted to determine the effect of different amounts of slip between the revolving disks. As the slip was increased by ½ per cent gradations from ½ per cent to 2½ per cent, the corrugations became more pronounced. There was also an increase in the wear of the metal of from 350 per cent to 400 per cent between the ½ per cent and the 2½ per cent slip.

The author of the article in *Verkehrstechnik* concludes that while none of these tests gives a clear answer to the cause of corrugation, there is hope that the problem will be solved by correlating a large number of scientific tests rather than working from results obtained from rough observations.

Dick Prescott Gets a Summons

And Makes a Trip Downtown

ABOUT a week after Dick Prescott, engineer of equipment of the Consolidated Railway & Light Company, had presented his report to Thomas Mullaney, general foreman, showing the saving that could be made by scrapping the old 200 class cars instead of rebuilding them, he was again called to Mullaney's office.

"Good morning, Mr. Mullaney," said Dick as he entered the general foreman's office.

"Hello, Dick," replied Mullaney pleasantly. "I've got some good news for you. I took up your report at the staff meeting yesterday and Mr. Milburn, the general manager, wants to see you downtown at 11 o'clock."

"Today?" queried Dick a little nervously.

"Yep. The whole staff is sold on your idea and the boss wants to go over your report with you."

"Gee! That's fine. It was mighty good of you to give me credit for the suggestion."

"Not at all. The whole plan is yours and Mr. Milburn is pleased with the way you handled it. You can go ahead with your work until about 10 o'clock and then I'll go downtown with you."

Dick started back toward his office. On the way he stopped in the carpenter shop to see his friend Steve White, the foreman, who had helped in working out the report on car maintenance.

Steve was delighted to hear the good news. "There you go, old boy!" he exclaimed, clapping Dick on the back. "Your days in this shop are numbered. They need men like you downtown, and that's where you're headed just as sure as shootin'."

"Nonsense, Steve, Mr. Milburn simply wants to go over the details of the report."

"Yes, I know that all right, but you just bet your bottom dollar he wants to look you over carefully at the same time."

Dick laughed at the enthusiasm of the carpenter foreman. "I'll be around here for a long time to come, Steve. There's lot's of work for me right out here in the shop. Mullaney's going down with me this morning and I'm hoping we'll succeed in getting rid of those old battleships for you."

"That can't come too soon for me. If we had the right kind of accounts out here they'd have been gone long ago. This company never will know how much money it's sunk into some of those old cars. It'd certainly be a shame to rebuild them again."

Dick left his good friend and went on to his office. It was difficult, however, to keep his mind on his work.

"Is there anything in Steve's idea?" he wondered. "Is a wider opportunity about to open up?"

These thoughts kept buzzing in his mind despite his effort to shake them off. Finally, as the hands on his watch crept around toward 10 o'clock, he laid aside his work and started back toward Mullaney's office. He found the general foreman ready and the two men left the shop together to board a downtown car.

Maintenance Notes

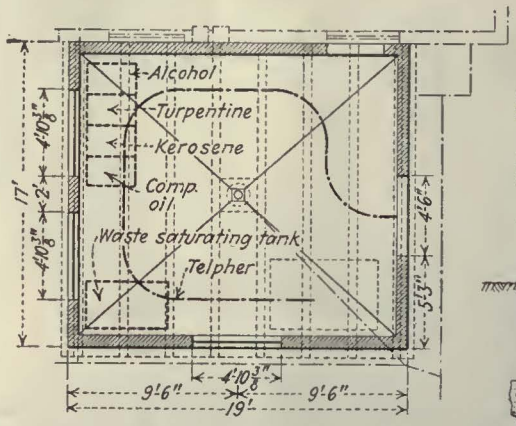
Oil Handling Facilities Improved

BY H. T. HURLOCK
Engineer Rolling Stock & Shops Eastern Massachusetts Street Railway

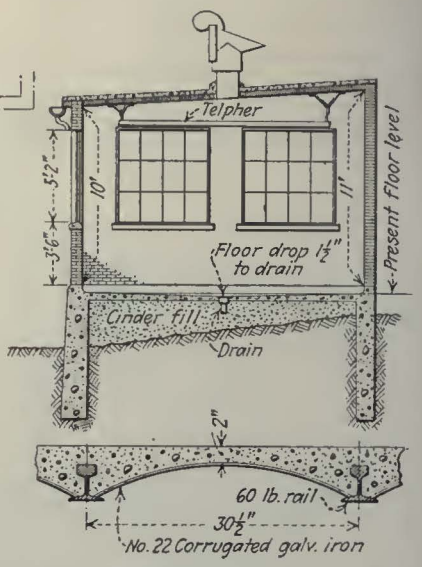
FACILITIES for handling car lubricants have been greatly improved at the Chelsea shops of the Eastern Massachusetts Street Railway by the addition of a new fireproof oil house, designed and built by the shop forces. An automatic waste-saturating machine has been installed which provides saturated waste for the seven divisions north of Boston.

A sheet metal waste tank with compartments for both dry and saturated wool waste has also been installed. This tank is equipped with a hinged cover and counterbalance, the counterbalance cable being provided with a fusible link. Prepared wool waste is put up in metal containers and delivery to the divisions is made once each week. Self-measuring pumps of 1-bbl. and 2-bbl. capacity have been installed to provide storage for the many kinds of oils and greases that are used for the various purposes on the system.

Light wiring is run in conduit attached to roof girders in accordance with the state laws and Fire Underwriters specifications. Lamps are provided with vapor-proof fittings. Steam heater coils are installed around three sides of the oil house and connected with the shop steam system. General dimensions of the new building are 19 ft. x 17 ft. Inside height is 11 ft. The foundation is of 1-2-4 concrete mixture reinforced with scrap iron. Walls are built of hard well-burned brick, using cement mortar, tempered with a small quantity of slaked lime. The floors are of 4-in. concrete, with ¾-in. wearing surface and a 1½-in. drop at the center. A hinged strainer set in the floor is connected to the shop drain which can be seen in the center of the floor.



Convenient Arrangement of Tanks in New Chelsea Oil House



At Top, Ventilation and Drainage Have Been Amply Provided For. Below, Segmental Arch Roof Construction

A segmented arched roof with 1:17 pitch has been constructed of second hand 60-lb. tee rail, set on 30½-in. centers. Corrugated galvanized iron, No. 22 gage, curved at right angles to the corrugations, was set between the rails and a 1-2-4 mixture of concrete poured to a depth of 2 in. above head of rails to form the roof. A coating of ⅛-in. elastic cement was applied to the roof for purpose of waterproofing.

A hand-operated telfer system runs from the receiving door around the oil house about 2 ft. from the walls. This is suspended from roof girders and equipped with a chain hoist for carrying oil drums to the several permanent tanks.

Two sliding fire-proof doors have counterbalances equipped with fusible links. There are three steel sash windows, each containing twelve lights of wire glass 14 in. x 20 in. Ventilation is secured by a 16-in. Acme rotary ventilator.

Construction of This Commodious and Well-Equipped Oil House by the Eastern Massachusetts Street Railway Has Greatly Facilitated the Handling of Lubricants

Aluminum Protection Saves Seat Ends

A Protected End Casting Made of Aluminum Has Proved of Advantage in Increasing Seat Life in Erie

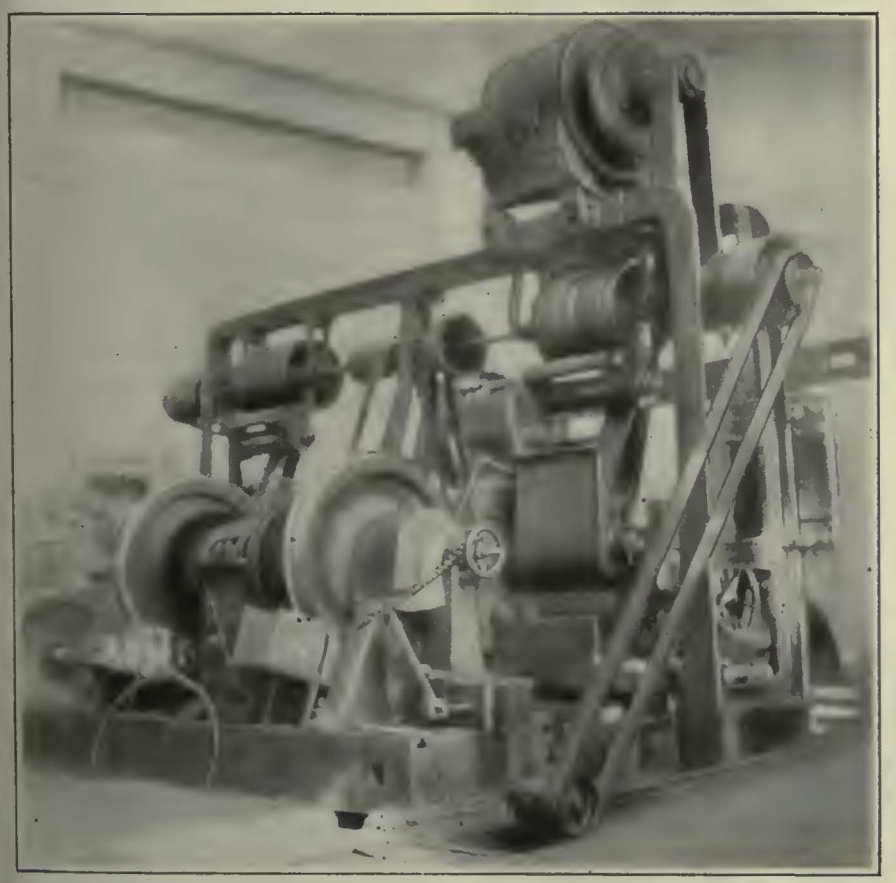
CANE-COVERED longitudinal seats in electric car service wear out first at the ends. In order to provide a protection for its longitudinal cane seats, the Erie Railways uses an aluminum casting. This fits closely over the end and extends down over the cane for a distance of about 2 in. The inside is beveled where it laps over the cane so as to provide a uniform surface. This has proved of great advantage in extending the life of longitudinal cane seats and in keeping them always neat in appearance.

A Million Mile Life for Wheels on Texas Electric

ORIGINAL wheels furnished with the cars purchased by the Texas Electric in 1913 were just replaced last year after twelve years of service. These cars have been running practically every day over the 271 miles of trackage except when held in for inspection and overhauling. On practically all steel wheels, at least 1,000,000 car-miles or more is obtained before the wheels are scrapped.

The method by which this long life is obtained is to build up flanges frequently by electrically welding high-carbon steel on the wearing side of the flanges and grinding both the tread and the flange to shape. Wheels are thus reconditioned every 30,000 to 40,000 miles, which on the Texas Electric Railway means every three to four months.

It has been found that the high-carbon steel used in the welding process has given an even greater life than the original steel flanges.



Grinding Equipment Used in the Shops of the Texas Electric Railway to Shape Treads and Flanges After Worn Flanges Are Built Up by Electrically Welding High-Carbon Steel on the Worn Flange Face. Very Light Cuts Are Made on the Tread

Easy Handling Features Paint Storage

Solvents for Paints Are Handled Quickly and Easily in the Convenient Paint Storage of the Department of Street Railways, Detroit, Mich.

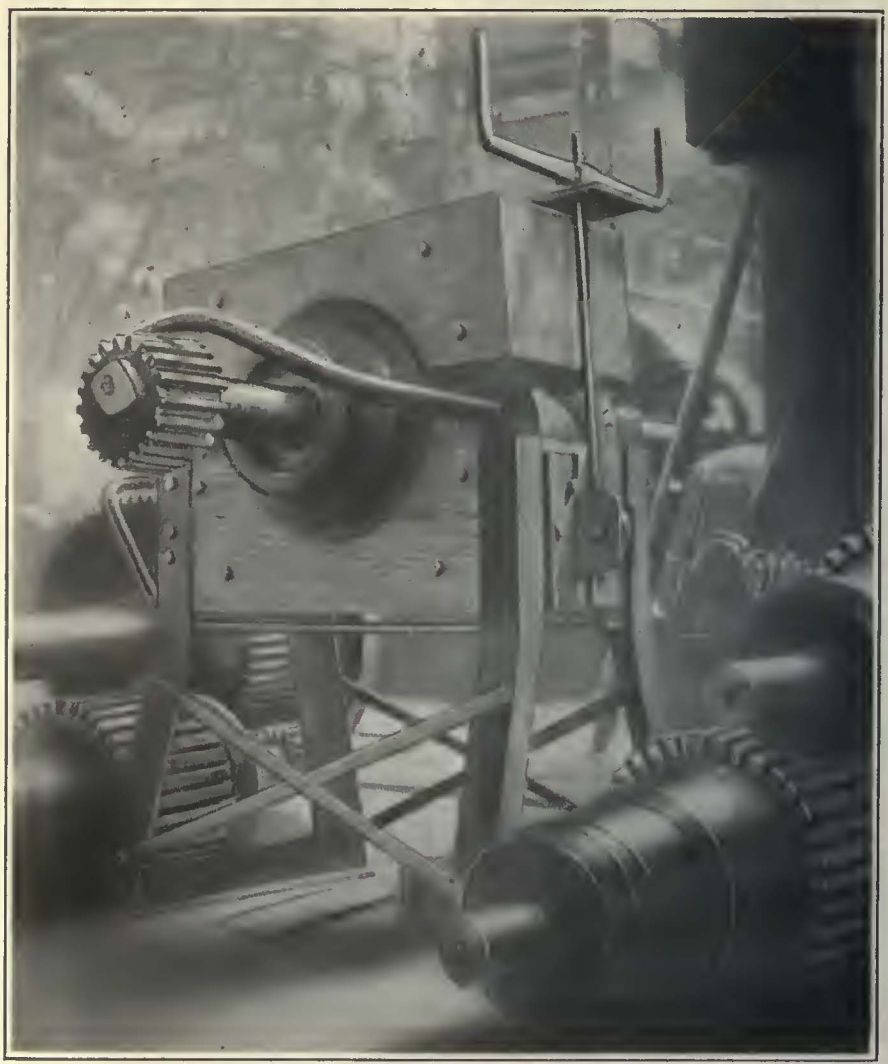
IT IS particularly desirable to provide for easy handling of solvents in connection with any paint storage. The arrangement used by the Department of Street Railways, Detroit, Mich., has proved a great time saver and the arrangement is an attractive feature of this well-planned paint storage. The central part of the room is occupied by a large steel bench; mounted on top of this are six 5-gal. tanks for the storage of various solvents, such as enamel oils, boiled oil, raw oil, japan, substitute turpentine and turpentine. These tanks are kept well above the surface of the bench, so as to leave a space underneath of about 2 ft. A sheet steel framework is arranged as a support. Each tank is provided with a gate valve at the bottom, which is arranged for quick opening.

The sheet steel bench provides for storage of other paint materials, one side being arranged with bins, which can be drawn out to give access at the top. Dry materials are stored in these. The other side is provided with three shelves for the storage of liquid material in cans and also to serve for a storage of open paint. This paint storage department is entirely fireproof and paint cans which are used in the paint shop are returned to the paint storage room each night.

Block for Testing Armature Core Slippage

CONSIDERABLE difficulty had been experienced by the International Railway, Buffalo, N. Y., with open circuits in motor armatures. In spite of frequent inspections the commutator leads would persist in breaking and it was determined that this condition was caused by a loosening of the armature cores, thus permitting the armature windings to slip and placing a severe strain upon the leads to the commutator segments. To detect these loosened cores a wood block clamp was designed to hold the armature firmly in place while the core was tested by means of a long bar used as a wrench.

After making a chalk mark across the core and end of the armature the wrench is engaged with the pinion on the armature shaft and a considerable turning torque is applied due to the ample leverage provided by the long pipe which serves as a handle for the wrench. If any slipping of the core within the armature occurs it may be detected by observation of the two sections of the white chalk line. Considerable facility in handling the motor armatures is obtained with this apparatus and practically any desired number may be tested in the course of a day. In the accompanying illustration the pipe handle of the wrench is not shown. The armatures are clamped in place by means of the hand screw shown at the top of the upper block.



Armature Testing Block Which Is in Frequent Use by the International Railway

Bonding by Zinc Coating Rail Ends and Joint Plates

A NEW method of bonding rails for the return circuit has been developed in Germany. Among the advantages claimed are low cost, good electrical conductivity and no permanent mechanical connection between the joint plates and the rails. In consequence, single rails can be removed easily and renewed. The process, which consists of applying a layer of zinc to the contact surfaces of the rails and point plates, is claimed to be equally suitable for exposed track and for track in pavement. An account of the method follows:

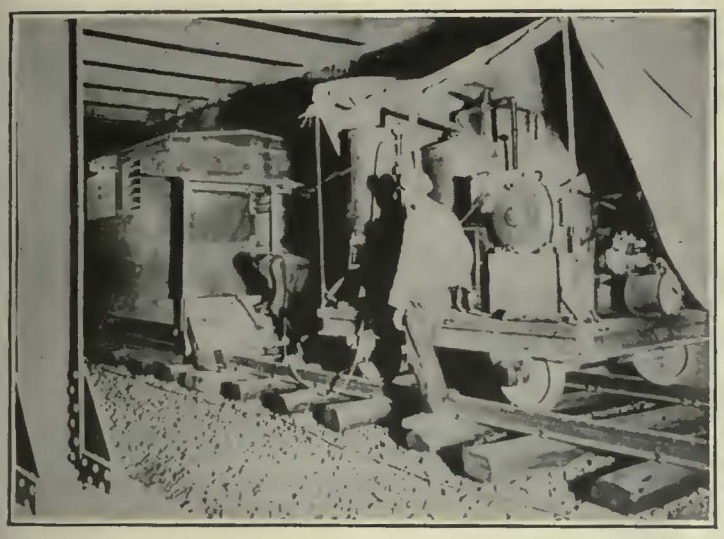
The ends of the rails are first cleaned by sand-blasting. This can be done before the rails are laid, or in place, by the use of a portable equipment. Immediately thereafter the cleaned surfaces are coated with a layer of metallic zinc. This has been accomplished by use of the Schoop process. In this process a small zinc wire is fed into a pistol-shaped tool, where it is melted in an oxyhydrogen or oxyacetylene flame. Concentric to the torch flame is an annular outlet for compressed air, which atomizes the molten zinc. The resulting powerful jet of liquid zinc may be deposited on any surface near by, and the minute zinc globules, it is claimed, imbed themselves therein. After the contact surfaces of the rails and joint plates are zinc coated in this way they are bolted up in the usual manner.

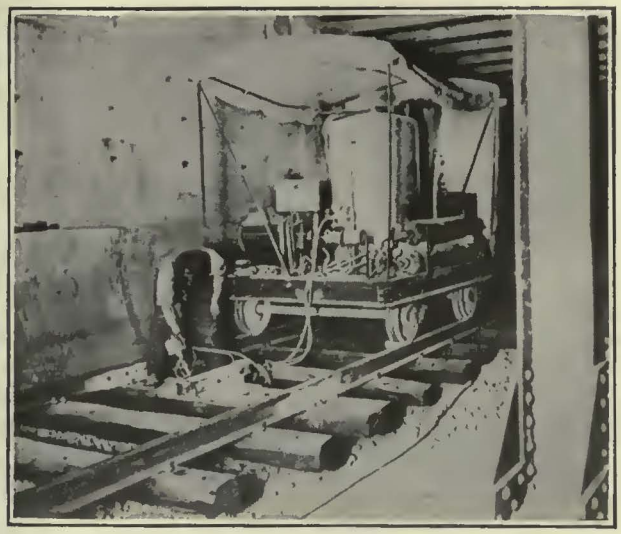
If a portable sand-blasting equipment is used, a considerable saving can be made by catching the sand used in the sand blasting, and using it over and over again. The portable set, as illustrated, comprises a motor, a compressor, the sand-blasting outfit, the Schoop spraying equipment and the gas tanks.

Electrical tests are said to show that the resistance of a joint made in this way is 25 per cent less than that of equal rail length and that as time passes the resistance tends to grow less rather than more. The following figures are given for a rail weighing 40 kg. per meter (or 80 lb. per yard). The copper bond mentioned, in English equivalents, would be of about 600,000-circ.mil cross section and 27.6 in. long.

Type of Bond	Resistance	Specific Resistance	Cost Ratio
1. 1 m. length of rail 40 kg.....	0.000064	1	.....
2. Copper bond 310 sq.mm., 700 mm. long.....	0.000061	0.953	14
3. Zinc treatment....	0.000049	0.765	6

According to this table, copper bonds of very considerable cross-section would have to be used to reduce the resistance of a rail joint to that of an equal length of solid rail. The resistance of a zinc-coated bond is shown as 23 per cent less and its cost less than one-half that of a copper-bonded joint. In addition the proponents of the zinc-coated joint





In This Method of Providing for the Return Circuit, the Ends of the Rails and the Inside Surfaces of the Joint Plates Are Sand Blasted. They Are Then Covered with a Thin Layer of Zinc, Which Is Deposited in a Spray

claim that it provides large contact surfaces, is electrically, mechanically and chemically indestructible, is easy to install even during traffic, and is theft-proof.

The German correspondent who supplied the information for this article did not state whether the method had been used up to the present time other than experimentally. No performance records are available.

New Equipment Available

Jack Principle Used for Pinion Puller

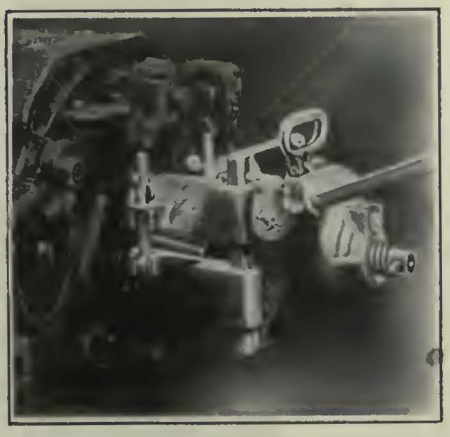
TO PROVIDE a uniform pull with a hand-operated device for removing pinions, the Duff Manufacturing Company, Pittsburgh, Pa., is marketing a new type of pinion puller. It was developed in collaboration with the engineers of the Westinghouse Electric & Manufacturing Company. Puller jaws extend down the back of the pinion to be removed and pressure is applied to the end of the armature shaft through a worm and screw.

The part of the puller which surrounds the pinion consists of two-part jaws held in position by bolts hinged with wing nuts. Particular attention has been devoted to make sure that the jaws line up truly. The jaws are relatively thin, but by employing high-grade material they are made exceedingly strong. The design provides jaws that will fit in a minimum space of ¼ in. between the motor housing and the side of the pinion. The jack part of the pinion puller slides into position in grooves in the front end of the jaws. The jaws and jack are thus distinct units. This makes the pinion puller simpler and makes it easier to attach and detach quickly.

With the pinion puller in position the operator turns up the screw by hand until it makes contact with the shaft of the armature. A few strokes of the jack lever bring the parts into extreme tension and additional strokes provide the pressure necessary for the pinion removal. After the pinion is loosened a few turns of the wing nuts which hold the jaws closed release the pinion so that it can be taken off quickly.

The housing and jaws are electric steel castings. The worm and screw are case hardened and ball bearings are used throughout. A particular feature is the provision made for bringing the end of the screw into contact with the pinion shaft quickly.

The puller complete weighs 50 lb. and is furnished with a 28-in. steel pinch-bar operating handle. Different size jaws are furnished to meet the requirements of varying sizes of pinions.



Puller in Position for Removing Pinions from Railway Motors

Direct-Current Relays for Feeder Circuits

DIRECT-CURRENT relays of a new line, filling a place not previously occupied in this field, have been developed by the Westinghouse Electric & Manufacturing Company, East Pittsburg, Pa. This new line includes resistance measuring, overcurrent, voltage, polarized and relays of other types. They resemble the Westinghouse induction-type alternating-current line.

The new relays operate on the magnetic-vane principle and are superior to previous direct-current relays in that their operating values of current or voltage and their time of operation may be determined with a greater degree of accuracy. They possess adjustable features so that the quantity operating them is adjustable, as well as their operating time. A new form of contact is used which is easily aligned, or removed in entirety for cleaning by the use of a screwdriver. The contacts are made of chemically pure silver.

The resistance-measuring relay, type XM, has been developed for automatic service-restoring circuit breakers and actually measures the resistance of the feeder. It recloses the breaker when indications are that the short circuit has cleared.

A particular feature of the XM relay is its time limit, which prevents the breaker from pumping rapidly when the trouble is of a recurring nature. This new line of relays is particularly useful in automatic substations.

Association News & Discussions

America on Wheels

Samuel M. Vauclain Attributes Prosperity of This Country to Tireless Energy of Transportation People—Buses and Trucks Will Make More Business for Transportation Interests

ENORMOUS increases in the transportation business are predicted by Dr. Samuel M. Vauclain, president of the Baldwin Locomotive Works. His prophecy was made in an address at the opening session of the seventh annual meeting of Division V—Mechanical, of the American Railway Association, held at Atlantic City June 9-16. After sketching a number of developments in European locomotive practice, Dr. Vauclain continued:

"Here in our country, what do we see? We see the greatest prosperity that any country has ever enjoyed. We see a nation built upon a solid foundation, a foundation built by its own people. We are a very autocratic government here. It is autocratic because it is government of the people. The people make their own laws, and then the people compel themselves to obey those laws. There is an autocracy that is apparent wherever you go in the humblest walks of life, or in the highest planes, which we enjoy in our present civilization.

"This present prosperity is due to what? It is due to the tireless energy of the transportation people of this country that had made it possible for the people of a great nation of more than 100,000,000 population to communicate with each other, to have business relations with each other in an almost unbelievably short space of time.

"We are all as though we lived on one lot, notwithstanding that this lot is 3,000 miles wide. No one thinks of distance. No one thinks of difficulties so far as they relate to the transportation of goods or of people. This transportation of the railways has incited additional transportation facilities. The gasoline man has come along with his automobile.

Auto an American Product

"The automobile is used, I might say, almost exclusively in the United States. Nearly 90 per cent of all the automobiles in the world are used in the United States. Almost every workman of any consequence has his flivver. And it is a God's blessing that he has this flivver, because his mind is on that and it is not on something that might give you or his employer trouble. One flivver in a man's family is enough to keep not only himself busy, but his entire family busy, in all the idle time that he may have. You must have something to keep the people employed, and therefore let it be a useful thing; let it be something that will change the radius of life in which he and his family live. The railways have changed the radius of life, so far as he can afford to pay railroad fares and Pullman acommodations, but the flivver has increased the radius of life of the ordinary individual because with a few quarts of gasoline he can go wherever he pleases.

"Automobile buses are the next thing that have come along. People have said, 'Why, these buses are going to drive the railroads out of business.' Gentlemen, don't worry about the automobile buses. It is going to drive you into business. In another ten years, the railroads will hardly know, unless they increase their facilities very much, how to handle this tremendous business that will be built up by the cross lines operated by automobile buses, automobile trucks, everything that can run anywhere without a rail, no matter what it costs.

"The American people don't care for the cost at all; what they want is to be on wheels. If it is not on car wheels or locomotive wheels, it can be bus wheels or automobile wheels.

"Now, it is for the young men in this convention, and the other men, members of it as long as I have been, to put their minds to work, not to find fault with those things which apparently are coming in to drive them out of business, but to embrace those things, enter into them, get the best out of them, apply them to the benefit of the principal business in which they are engaged, namely, railway transportation. We are not going to go out of the railroad business. We are not going to go out of the locomotive business. I expect that during the next 30 years of my administration of the Baldwin Locomotive Works we will have accomplished wonders and that the present locomotives, which we have on exhibit here today, and which represent, along with others exhibited by our friends who are in the locomotive business elsewhere, that which is the highest state of the art, will be a thing of the past before another ten years. And it will be you who will make it so. You will be the cause of it. This association will have much to do with it because these things will be discussed here.

"Don't worry about the future and do not have any regrets of the past. The man who thinks about what happened yesterday is not fit to tackle the problems of tomorrow. So what has passed, let it be passed. What have we today? What are we going to have tomorrow? And every day should bring to us something better. There should be something worth having. There should be something to keep a man busy and keep him at work.

"Let us go ahead and develop our own country. Let us develop our own facilities. Let us introduce the human idea into the work that we do. Let us take care of the man who has to work eight or ten hours every day or probably sixteen, the man at low wage. Let us do everything we can to increase his wage; make it higher. Give him more opportunity to enjoy life, so that he can provide greater privileges for his own family, but at the same time, by your own ingenuity, by the development of mechanical devices, reduce the cost of production so that we can all enjoy that which we have to deal with here in this great United States."

Central Accountants Meet in Chicago July 23-24

CHICAGO has been selected by the Central Electric Railway Accountants' Association for its next meeting, which will be held at the Drake Hotel on July 23 and 24. Following is the program.

Friday, July 23, 1926

Morning Session, Beginning 9 A.M.

Meeting of executive committee.

Address of welcome by C. E. Thompson, vice-president Chicago, North Shore & Milwaukee Railroad.

Problems in Bus Classification, by C. R. Mahan, auditor Chicago, North Shore & Milwaukee Railroad.

Discussion, led by F. A. Healy, auditor Indiana, Columbus & Eastern Traction Company, and A. E. Wafer, auditor Northern Ohio Power & Light Company.

Afternoon Session, Beginning 1:30 P.M.

Daily Reporting of Freight Accounts, by O. A. Small, auditor Chicago, South Bend & Northern Indiana Railway.

General discussion.

Discussion of items submitted in the agenda.

Saturday, July 24, 1926

Morning Session, Beginning 9 A.M.

Operation of the Budget System, by J. A. Seymour, assistant auditor Chicago Rapid Transit Company.

Discussion, led by L. A. Gould, auditor Chicago, Aurora & Elgin Railroad.

Reports of committees, general business and question box.

Americans Receive Membership in German Museum

ON THURSDAY, June 10, a luncheon was held at New York Chamber of Commerce Building in honor of Dr. Paul Rausch, retiring president of the Technical Museum in Munich, Germany. Dr. Rausch presented membership in the board of the museum to Judge Elbert H. Gary, Dr. Michael I. Pupin, E. W. Rice, Calvin Rice and John W. Lieb. Dr. George M. Kunz, president of the New York Museum of Industrial Arts, presided. Brief addresses were given by the recipients of this honor, who were all present.

Budgetary Control for Electric Railways*

Detailed Estimates of Receipts and Expenditures for the Year Prepared in Advance Make Possible a Close Check on Operations and Result in Large Savings

By H. C. Patten
Comptroller Toronto Transportation Commission, Toronto, Canada

NEVER in the history of electric railways was there more need for efficient operation, close executive supervision and departmental co-operation. The object of this paper is primarily to point out and discuss one way or plan which has proved to be extremely effective in accomplishing these results. The meaning and purpose that is intended to be conveyed by the term "Budgetary Control" is the way in which financial estimates (that is forecasts of the operations) of any electric railway can have not only a "directing influence" on the course it will follow but also, and note the word, a "restraining influence." In other words, the budget keeps it on the right course, where it will save money, and not a roundabout, wasteful or inefficient way. And finally, these same financial estimates will, in the last analysis, govern the results as to profits or losses when the company arrives at the end of the year.

Necessity and Advantage of a Budget

The need for some such means of control seems almost self-evident when one considers the present difficulties of operating. The value of the budget system as a guiding and restraining influence in the executive control of an electric railway which is here described is not based on theories in any sense. It is the result solely of practical experience with its actual working. In this case, for purposes of simplicity, the details are confined to its operation in the Toronto Transportation Commission.

In a manufacturing concern the factory production, purchases and all of its activities, in fact, are almost wholly determined and guided by sales expectations. Unless the management of an electric railway has some similar means of guidance, such as is furnished by careful estimates of revenue, how can it intelligently determine the amounts which the various operating departments should expend? Over-production is just as likely to occur in the electric railway business as in a manufacturing company, unless revenue and expenditures are properly related.

Just one more word as to the benefits to be derived from executive control by a budget. They can hardly be emphasized too much. Many commercial and manufacturing companies use this system. The vice-president of the Bankers' Trust Company of New York, a Canadian, by the way, and one of the most prominent bankers in New York says: "A budget is not only a money maker but the greatest money saver ever discovered."

He recently stated that one concern which had lost $29,000,000 in three years of operation prior to 1924 succeeded in showing a surplus of $2,000,000 last year, simply by having a new president and installing a budget system.

The executive head of Armour & Company of Chicago, in speaking of the budget system recently installed in that company, stated that in one year it saved them $10,000,000 in operating costs.

In the Toronto Transportation Commission our operating expenses have been reduced from $8,468,841 in 1922 to $7,390,000 in 1925, and while credit for this cannot all be attributed to the budget system, because much of the savings are the result of installing very necessary modern facilities, there is no question that savings of some hundreds of thousands of dollars have been directly due to the close executive control of every department, which is only possible by control through a budget.

General Principles of Budgetary Control

There are certain fundamental principles in regard to executive control by a budget which should be emphasized:

1. *Agreement with Balance Sheet.*—The budget must be complete and must tie in with the balance sheet of the company and the accounting records. It is a complete estimate of every item of revenue that the company receives and every item of operating expense and of expenditures for interest, sinking fund charges, depreciation, reserves of all kinds, dividends and surplus. If the budget does not set out such a complete statement in detail it loses practically all of its value as a guide to the executives, and as an incentive to the department to attain a definite objective for the year.

2. *Executive Control of Budget.*—The budget must be under the control of the highest executives in the company. No change should be made in the budget once it has been finally approved by the directors or executives, without authority from the same source.

3. *Responsibility of Department Heads.*—The budget must have the support of the department heads and in its details be prepared by the department heads, who must accept the responsibility for their estimates.

No department head is ever anxious to make estimates in detail of labor and material and overhead expense of the amount he proposes to spend during the year. Even if in the past he has been accustomed at the beginning of a year to figure out approximately his requirements, it is a very different thing if he knows that this estimate is to be submitted to the president, general manager, or board of directors and held over his head as a definite promise for the next twelve months.

The department head has been maintaining the power plant, the track, the rolling stock or the overhead system, as the case may be, and has been doing a good job, and doing it rather economically, he believes also. However, looking over his records he finds that, after all, his costs have not come down much for the last few years, and he begins to think that if the president is going to see his estimate, compare it with last year, and watch it month by month, it would certainly reflect more credit on him personally if he could attain a lower expenditure than he has had in the past year or two. It is surprising, when such a start is made, how easy it is to find a few places where economy is possible and yet the standard of maintenance be not lowered at all.

Take the maintenance of way man. He will realize as soon as he starts to make an estimate that it is something he cannot trust to some clerk in his department to prepare for him. Neither will he be inclined to take his track superintendent's word for it, or his foreman's as to the condition of certain sections of track. He will find also that it is not very safe to sit in a comfortable warm office with a map of the system in front of him and put down in real money how much he proposes to spend on those sections. It makes him get out on the street and walk around quite a few miles, not simply drive in his car over some stretch of track and decide that the joints need renewing this year, and that there may be a broken rail or two to be replaced. He will stop a little longer at some intersections and listen to the noise the cars make in going over them. In short, he will know his job a good deal better when he gets through his estimate if he is the right man for the job.

The superintendent of rolling stock

*Abstract of a paper presented before the Canadian Electric Railway Association, Quebec, June 2-4, 1926.

COMING MEETINGS OF *Electric Railway and Allied Associations*

June 21-25—American Society for Testing Materials, annual meeting, Haddon Hall, Atlantic City, N. J.

June 21-25—American Institute Electrical Engineers, annual convention, The Greenbrier, White Sulphur Springs, W. Va.

June 25-26—New York Electric Railway Association, annual meeting, Hotel Champlain, Bluff Point, N. Y.

June 28-July 2—Central Electric Railway Association, summer meeting, S. S. South American, Buffalo, N. Y., to Chicago, Ill.

July 8-10—Midwest Electric Railway Association, annual convention, Brown Palace Hotel, Denver, Colo.

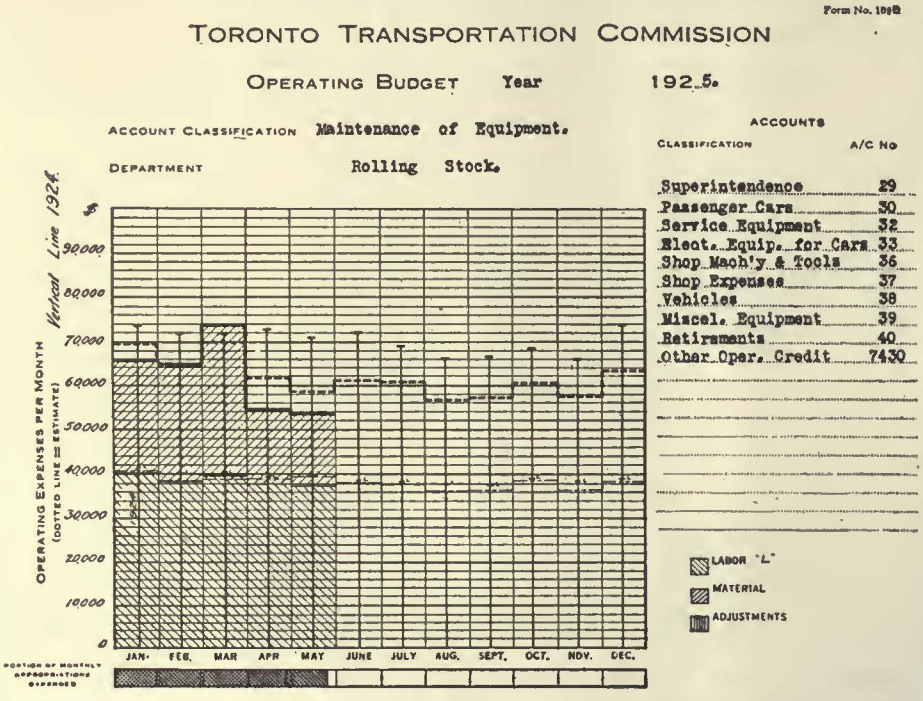
July 23-24—Central Electric Railway Accountants' Association, meeting, Drake Hotel, Chicago, Ill.

August 12-13—Wisconsin Public Utility Association, Railway Section, La Crosse, Wis.

Oct. 4-8—American Electric Railway Association, annual convention and exhibits, Public Auditorium, Cleveland, Ohio.

will not be anxious to put down on paper his exact costs for maintenance of the cars. Things in his shops have been going along about the same for a good many years. When he really thinks about it, has he kept up to date on all the latest money-saving devices? How about the cost of painting cars? He remembers at the last convention he investigated someting about that new system of spraying which would save so much money! And his men are still working with brushes just as they did 30 years before. He must get his estimate down. Hadn't he better do something right away? loose leaf ledgers will not only save a lot of money but enable him to get out the monthly statements for the directors' meetings several days earlier. So he too begins to do some intensive thinking, and before he is through he also becomes an enthusiastic convert to the budget idea.

In this connection it might be pointed out also that the budget system is one of the most effective means of developing a loyal and efficient staff that could be devised. It points out the weak spots in the organization, it is true, but on the other hand it has the advantage of bringing to the personal notice of the executives the abilities of men who possibly would never be discovered in any other way.



MONTH	EXPENDITURES REPORTED			ESTIMATED EXPENDITURES	
	MONTHLY	TOTAL TO DATE	CENTS PER C. M.	MONTHLY	TOTAL TO DATE
JANUARY	65,892.76	65,892.76	2.82	69,800.00	69,800.00
FEBRUARY	64,986.25	130,879.01	3.02	64,200.00	134,000.00
MARCH	73,904.12	204,783.13	3.16	69,980.00	203,980.00
APRIL	54,486.27	259,269.40	2.89	61,530.00	265,510.00
MAY	53,591.43	312,860.83	2.94	58,540.00	324,050.00
JUNE				60,703.00	384,753.00
JULY				60,490.00	445,243.00
AUGUST				56,306.00	501,549.00
SEPTEMBER				57,209.00	558,758.00
OCTOBER				60,380.00	619,138.00
NOVEMBER				57,494.00	676,632.00
DECEMBER				63,208.00	739,840.00
				TOTAL CENTS PER CAR MILE	2.99

REMARKS

This One Form Is Used for all Budget Estimates of the T. T. C.

Then when he thinks of it, there have been a number of new machines invented in the last few years, all of which means a saving of labor. Possibly he should install some new equipment. Perhaps the lighting or ventilation of his shops is very poor. With modern, efficient facilities it is surprising what large savings in maintenance of cars can be effected.

Even the accounting department chief will be a little averse to making an estimate of the salaries and supplies for his department. Those old ledgers cost a good deal of money and keep quite a staff occupied, and there have been several representatives of office system concerns in to call on him lately to explain how machine posting and

4. *Continuous Supervision of Budget.*—The budget must be kept up to date. The actual compilation of the departmental estimates should be done by the comptroller, or some one in close touch both with the executive and financial work of the company. Having been balanced and approved, it must be continually watched and comparisons made. It is of course difficult to get close comparisons of actual expenses with the estimates, except from monthly figures. Revenue, however, can be watched from day to day.

In order to keep the budget up to date in the Toronto Transportation Commission, the actual work requires about one-half the time of a graduate engineer with some accounting experience and about the full time of one clerk. To install a budget system does not have the effect of adding more clerks to the staff. There is just the opposite result. It eliminates a good many who spend their time preparing statistics and tables, cost analyses and routine reports.

5. *Use of Budget as a Standard of Efficiency.*—The advantage of the budget is that it sets up a standard for the department to work to. For example, the rolling stock department, which has been maintaining the cars at an average of 4 cents per car-mile, will decide that this year will do it for 3 cents. If the department head is enthusiastic himself, he will inspire the master mechanic and the foremen all through the shops with this ideal.

To get the full benefits from the budget system requires co-operation. It is not just a one-man job. The comptroller does not accomplish everything by merely installing the system, although the mere existence of a budget has an important moral effect. The important point is that it forces every department to operate according to a predetermined standard, within predetermined limits, or else exposes that department to the necessity of explanations which are sometimes difficult to make once the budget is in effect.

Practical Working of Budget

With the foregoing principles in mind, the budget system of controlling expenditures was started about three years ago in the Toronto Transportation Commission. Its results have been extremely satisfactory. While many of the difficulties which have been referred to in first undertaking the plan were encountered, it is now working very smoothly and almost automatically.

The budget is an estimate of the financial operations of the commission for a year's period in advance. In its complete form it is a combination of a series of estimates. These include estimates of (a) income, (b) operating expenses, (c) fixed charges. From these three groups it is possible, of course, to strike a balance and determine the probable surplus or deficit for the year, provided that every item of income and expenditure has been included in the estimates.

The estimates of income from all sources are made by the comptroller, as in this commission the comptroller's office is the department in which all financial and statistical reports are concentrated. In order to estimate passenger revenue, it is essential first to estimate the revenue passengers for the year. Admittedly this is not an easy task. It involves knowing considerably more than the total revenue passengers of the year before or even of the trend of traffic for a number of years. The comptroller has to take into account not only general statistics and charts, but also he has to make a careful study of local conditions. He has to know the trade statistics for Toronto, the government employment indices, the bank clearings, building construction and suburban development that may affect traffic, the increases in the number of automobile registrations

from year to year; in short, he makes as complete an analysis as any commercial organization would do in estimating on its sales and factory production.

It is needless to say that this one item of passenger revenue is very important and is worth spending some time on, as even a small percentage error means many tens of thousands of dollars when estimating on numbers of passengers which total 180,000,000 per year.

Properly taking the factors into account the estimate is not a guess, but a carefully analyzed judgment of definite facts. The actual results in this commission, in any event, have been far closer than the usual allowance that an engineer would make in preparing his estimates. For example, the estimate of revenue passengers for 1925 was 179,500,000 and the number of passengers actually carried was 180,779,925, a difference of but 0.71 per cent. In individual months there were differences slightly higher than this, but some of these were plus and some minus, so that the net result for the year balanced out.

As another example, the estimate of car-miles for 1925 was 25,078,000 and we actually operated 25,247,058 car-miles. This difference is only 0.67 per cent. It was also estimated that the railway operating expenses (not including motor coach expenses) for the same year would be $7,511,539. The actual costs were $7,350,843, which is 2.14 per cent less than the estimates.

As a matter of fact it is far easier to estimate on the transportation business than any commercial business. It is not at all unusual to have fluctuations due to trade depression of 30 per cent or even 50 per cent in a year's time in some factories. In spite of all our troubles in the electric railway industry, there is a very reassuring steadiness to it.

The other items of revenue from transportation and of non-operating revenue are also estimated by the comptroller. These are usually capable of quite definite computation.

Before the different departments can submit an intelligent estimate as to their expenditures, certain fundamental matters of operation must be definitely settled by the management. The most important of these relates to the car-miles to be operated.

All of the largest spending departments require data on this matter before their estimates can be prepared. Consequently it is essential first of all to prepare as accurate an estimate as possible of the car-miles to be operated in the coming year. This is prepared in its details by the traffic department. A knowledge of proposed extensions is required, studies of the density are made, and every known fact that can have any effect on traffic is considered. The estimates are always divided to show separately the mileage of two-man cars, one-man cars, trailers, etc.

With the figures of expected car-miles to be operated for the year in their hands, the departments are then able to prepare and submit their estimates, not only in dollars, but also to reduce them to a cost in cents per car-mile.

In estimating on the operating expenses, it is extremely important not to overlook any. The responsibility for this falls on the comptroller's department. There are quite a number of general expenses for which no particular department assumes responsibility, and which usually have to be carefully analyzed and estimated by the comptroller. In the aggregate this class of expenses is not large and errors in estimating do not have a serious effect. It is also always safe to allow something for contingencies.

The estimates which have to be made of the fixed charges also are prepared by the comptroller. These include all items of deductions from net income, such as interest and sinking fund charges on the debenture debt, reserves for replacements (which are part of the operating expense accounts according to the I.C.C. classification), reserves for contingencies, taxes, etc. Practically all of these are capable of definite calculation and there is usually no special difficulty in estimating them. Here again it is important to make sure that nothing is overlooked.

Balancing the Budget

The procedure in the Transportation Commission is to submit all of the estimates to the comptroller, who then prepares a final summary of revenue, operating expenses, deductions from net income and surplus.

The first year the budget system was put into effect it appeared at first as though there would be a deficit of three or four hundred thousand dollars. It took a number of conferences before the budget would actually balance and the necessities for economies in operation were brought home to every one. In every case we have been able to balance the budget at the beginning of the year to a satisfactory point, with the co-operation of the operating departments, and not by any arbitrary cuts by the management.

The completed statement for the year is then prepared, setting out the income, the various groups of operating expenses, the deductions from income and the surplus. This statement is then officially approved and becomes the standard which must be measured up to, the compass by which the management can judge accurately the financial course which the system is following.

As has already been pointed out, it is fundamental that the budget be kept up to date if any real value is to be obtained from its operation. For the purpose of budget records we use in the Transportation Commission only one standard form. A copy of the form is shown herewith. It is standard letter size. It was designed to show the results both graphically and in actual figures. Experience seems to indicate that both ways are desirable. The chart, moreover, makes it possible to show the comparative figures of previous years when such are desirable, without making the records too complicated.

At the beginning of the year the approved estimates by months and cumulative for each department are typed in the two lower right-hand columns on the form. At the same time these monthly records are plotted on the chart. For comparison, the vertical lines with the flat cross lines at the top represent the monthly expenditures of the previous year. At the right-hand side of the form are the names of the various accounts for which the department is responsible.

The process of keeping the records up to date is obvious. As soon as the actual expenditures are available from the accounting department, which is usually about ten to fifteen days after the end of the month, they are entered in the columns marked "Expenditures Reported," and at the same time plotted on the chart.

By a different system of cross-hatching, the chart indicates the relative amounts of labor cost and material cost. The small spaces just below the main chart, which are marked "Portion of monthly appropriation expended," are used as a sort of thermometer scale to indicate, at a glance, whether the department is below or exceeding its estimates for the year to date. After the entries of actual cost have been made each month, a blueprint of the master sheet is immediately taken off and copies sent to the departments interested.

By merely crossing out the word "expenditures," we use the same form to compare estimates of revenue with the actual income, or we use it to compare traffic records of passengers or car-miles.

Under ordinary circumstances, each department is responsible for certain definite operating accounts in our standard classification. No other department can use them without proper authority. It has had the good result that items of expense which previously had been nobody's business apparently are now allocated to a definite department.

As a final step in the budget records, the comptroller prepares, every quarter, a summary of the exact position of the Transportation Commission with respect to the gross income, expenditures, fixed charges and surplus, as compared with the original budget figures. This quarterly statement serves additionally to keep the commissioners and general manager closely informed of the course of the business.

Results Obtained from Budgetary Control

It may be desirable to sum up briefly the benefits which can be obtained from budgetary control:

1. There is no more effective way of saving money, and saving it, moreover, in those expenditures which are so important to control, namely, operating expenses.

2. It is the simplest method possible by which an executive can obtain direct control and supervision and exact knowledge of the financial position.

3. It sets up standards of efficiency and develops co-operation and loyalty within a department.

4. It develops co-operation between departments.

5. It develops the right type of executive to the advantage of the company and himself, and at the same time indicates the points in the organization which need strengthening.

6. It develops, and provides in a very accessible form, extremely valu-

able cost data which can be used as a guide to future operations and is not merely of historical interest.

7. It forces a company to make an annual review of every item of expenditure, with the inevitable result that unnecessary expenditures will be eliminated.

Dipping and Baking Are of Great Value in Severe Service*

By D. Chenard
Master Mechanic Levis County Railway, Levis, Canada

DIPPING of armatures is an excellent and worth while practice. The dipping seals up all the cracks and other weak spots which may have developed in the installation of the coils due to vibration, expansion, and contraction. To obtain satisfactory results the process must be done properly. Under our operating conditions where we have seven months of snow, frost and water and extreme variations in temperatures, we have conditions to meet which few companies have. The chance of a breakdown in the insulation of the motor is considerably greater under our conditions, and anything which will help the insulation to stand up under these conditions means a lot to us.

We started dipping armatures in 1923 and excluding bearing troubles our records show an average mileage per failure of 31,915.7 car-miles or 63,831.4 motor-miles for that year. We obtained little benefit from the dipping of the armatures in 1923 as it took more than a year before we had them all dipped and the results did not begin to show up until 1924. The total car mileage per failure per armature including bearings, etc., for the year 1923 was 25,391 car-miles or 51,862 motor-miles. In the year 1924, when the results of dipping armatures began to show, the car-miles per failure increased to 50,857.75 or 101,715.5 motor-miles per armature failure due to electrical trouble. There were no bearing troubles that year, so that these figures cover the total armature failures from all causes.

In 1923 we had sixteen pull-ins for armature failures of all kinds. In 1924 we had eight pull-ins for all kinds, or 50 per cent decrease in pull-ins. There were no pull-ins for bearing troubles. For the year 1925 our records show even a better improvement. We obtained 66,535 car-miles or 133,070 motor-miles per electrical failure, which is a 30 per cent increase in the mileage over the year 1924 and 154 per cent over 1923. Under our winter conditions we sometimes have snow drifting into the motors, which causes dampness, and I have personally examined cars which have been standing at the terminal for a short space of time with the commutators of the motors quite wet. Sometimes we have found the carbon brushes actually frozen in the brush-holders. This will give some idea of the severe conditions we have to face.

With our method of treating, the armatures are first placed in our electrically heated oven at a temperature of 185 deg. F. for about three hours. The armatures are then taken and compressed air is used to blow out all dirt and dust. It is then tested at 550 volts. If this test is successful 1,100 volts is then applied. If this pressure is withstood we double the dose and apply 2,200 volts. The armature is then placed back in the oven over night at the same temperature as before and it is then taken out and dipped in a special round vertical tank using black plastic varnish, and it is left in the tank for an hour till the varnish has thoroughly penetrated into all the cracks and weak places. The varnish is heated up considerably by the heat from the armature and thins off accordingly so that it penetrates better. The armature is then lifted out of the tank and is allowed to drain off for five hours, after which it is placed back in the oven to dry out. It is very important that this last phase of the operation be done properly for if the varnish is not hardened properly it is thrown off by the armature when in operation under heated conditions. We, therefore, leave the armature in the oven at full temperature for approximately 72 hours.

It may be argued by some that dipping of armatures tends to make the coils brittle so that in case of repairs the whole armature has to be stripped and rewound. The use of plastic varnish reduces this danger considerably and it is our experience that with the modern motors where the windings are tight it is not possible to make a satisfactory repair which will stand up to operating conditions whether the armature is dipped or not. On the old type of motor where the coils are loose in the slots it is, of course, possible to repair them and make a fairly good job without rewinding even when they are dipped, which process we carry out with the old type. The main question is to keep the cars on the road and avoid all breakdowns or pull-ins. A weak armature due to repairs will cost more than if it was rewound properly. We figure that every car pulled in off the road costs us about $8.75 each without counting the loss of the car itself from off the road. This amount would be more if we had to send an extra car out to haul the other one in.

*Abstract of discussion before the Canadian Electric Railway Association, Quebec, June 2-4, 1926.

ARMATURE FAILURE RECORD SINCE DIPPING AND BAKING WAS STARTED

	Car-Miles	Motor-Miles	Number of Bearings Changed	Number of Armatures Changed
1923	414,905	829,810	3	16
1924	406,862	813,724	1	8
1925	399,214	798,428	10	6
Total	1,220,981	2,441,962	14	30

Three year average motor-miles per armature changed.....	81,330
Three year average motor-miles per bearing changed.....	174,600
Three year average car-miles per armature changed.....	40,666
Three year average car-miles per bearing changed.....	87,300

Canadian Association Appoints Auditor

IN THE list of officers of the Canadian Electric Railway Association published in the June 12 issue of this paper the name of the auditor was omitted, as it was not included in the official list. The appointment for auditor for the ensuing year is L. Tait, manager and secretary-treasurer London Street Railway, London, Ont.

Midwest Association Announces Program

SPECIAL cars will be run from Kansas City to Denver for the electric railway and supply men attending the third annual convention of the Midwest Electric Railway Association to be held in Denver July 8-10. Arrangement has been made with the Burlington line to run the special cars on the train leaving Kansas City at 10:30 a.m. on July 7, and due to arrive in Denver the following day at 7:30 a.m. Entertainment for the ladies will be provided en route.

Those desiring accommodations on the special cars should notify Secretary J. A. Weimer or D. L. Fennell of the executive committee at the association's headquarters, 530 Railway Exchange, Kansas City, Mo.

Entertainment features include visits to Lakeside Park on Thursday evening, to Elitch's Garden on Friday evening and to Lookout Mountain on Saturday afternoon. The annual banquet will be held at the last-named place Saturday evening. Frank R. Coates, president American Electric Railway Association, will be the principal speaker.

Thursday, July 8, Beginning 9:30 A.M.
Registration and address of welcome.

1:30 P.M.
"Electric Car of the Future," by J. M. Bosenbury, superintendent of motive power and equipment, Illinois Traction, Inc.
"Modern Methods of Equipment," by R. W. Bailey, superintendent of power and equipment, Kansas City Railways.

Friday, July 9, Beginning 9:30 A.M.
"The Interurban Bus," by B. W. Arnold, manager motor coach department, Chicago, North Shore & Milwaukee Railroad.
"The Human Element in the Industry," by F. G. Buffe, general manager for the receivers Kansas City Railways.

1:30 P.M.
"Mass Transportation and the Automobile," by Ernest Stenger, president Denver Tramway.
"Fares, Passes and Transfers," by B. W. Frauenthal, general traffic agent United Railways of St. Louis.

Saturday, July 10, Beginning 9:30 A.M.
"Modern City Track," by Nelson R. Love, chief engineer Denver Tramway.
Election of officers and business session.

American Association News

Entertainment

AT THE meeting of the entertainment committee held in Atlantic City on May 21, several sub-committees were appointed to prepare data on many features for the entertainment of delegates and ladies who will attend the Cleveland convention in October. No definite plans have been announced.

Those attending the meeting were Chairman S. J. Cotsworth, Harry Brown, Fred Bullock representing Col. J. H. Alexander, Fred C. J. Dell, Harry Doyle, T. O. Kennedy, C. S. McCalla, E. P. Waller, J. W. Welsh, Roy Hauer, C. S. McCreery and J. B. Stewart.

Rapid Transit

FUNDAMENTAL data collected and compiled by the rapid transit committee's engineer, E. J. McIlraith, in accordance with an outline prepared earlier in the year, were discussed in a meeting of the committee held at association headquarters on June 10.

It is the plan of the committee to set up in its report such information and data as will serve as a guide in the determination of the rapid transit policy of any community. There was some question of the advisability of submitting this year any definite recommendations regarding the proper or equitable basis for financing construction as between the car rider, the community at large, and benefited property. It was the opinion of some members of the committee that a definite recommendation on this subject would be premature at this time and that the purpose of the report this year should be merely the submission of the information compiled.

Those present at the meeting included G. A. Richardson, chairman, Daniel L. Turner, W. S. Menden, James Walker, Edward Dana, S. E. Emmons, F. H. Shepard and E. J. McIlraith.

Power Generation and Conversion

MATERIAL to go into the final report of the power generation and conversion committee was given the finishing touches at the committee's meeting held at association headquarters, New York, June 1 and 2. Members of the committee present included L. D. Bale, chairman; C. A. Butcher, H. W. Codding, F. W. Peters, L. J. Turley, Mr. Pennington representing C. E. Bennett, and Mr. Vandeventer representing G. W. Saathoff.

The sub-committee on review of existing Manual sections reported that the prime movers committee of the N.E.L.A. had done little in connection with fuel specifications this year, and as action by the power generation and conversion committee depends upon N.E.L.A. recommendations there is little to report. In connection with high-tensile strength bolts for use on superheated steam pipe lines, a ballot is being taken by the American Society for Testing Materials on the adoption of tentative specifications submitted last year and final reports will depend upon this adoption.

A very comprehensive report on existing practices in design and operation of automatic substations, including the subject of remote and supervisory control, was submitted and approved with a few minor changes. There was considerable discussion in regard to a report on the application, characteristics and present status of the mercury arc power rectifier for electric railway service. The committee considers this a very important subject, and a special session of the sub-committee working on this will be called for the purpose of revising the report.

The sub-committee on the ventilation and reduction of noise in automatic substations reported the completion of ventilating tests on a naturally ventilated plant in Baltimore and mechanically ventilated plants in St. Louis, Los Angeles and one of the stations of the Public Service Production Company of New Jersey. Mr. Keller of the Carnegie Institute of Technology, Pittsburgh, Pa., was requested to prepare a discussion for inclusion in the final report on the subject of characteristics of ventilators under various wind pressures, taking into consideration the effect upon discharge of the ventilator due to the accumulative effect of wind velocity and temperature.

Heavy Electric Traction

REPORTS of sub-committees were received at the meeting of the committee on heavy electric traction of the Engineering Association, held in the sun parlor of the Hotel Strand, Atlantic City, on June 11. Members present were H. F. Brown, chairman; Morris Buck, secretary; A. H. Armstrong, H. W. Cope, W. A. Burnham representing A. H. Daus, J. H. Davis, E. P. Chase representing J. V. B. Duer, J. T. Hamilton, J. O. Madison, M. W. Manz and L. S. Wells.

A very complete report has been prepared by the sub-committee on track and third-rail bonds. Information has been collected on the practice of a number of roads. A standard basis for comparison of bond resistance has also been developed and presented in a series of charts and tables.

It was decided to proceed with the publication of the bibliography of heavy electric traction subject to the approval of the association. Further information has been collected and compiled on the subject of articulated trains. This information supplements the complete report of the 1924 committee. Other subjects considered include material in the Engineering Manual, branch-line electrification and self-propelled cars, and data on locomotives and multiple-unit cars.

Power Transmission and Distribution

A BUSY two-day session, June 7 and 8, constituted the final meeting of the power transmission and distribution committee. This was held at the association's headquarters, New York. The following members were present: Charles H. Jones, chairman; J. Walter Allen, W. H. Bassett, M. W. Cooke, J. C. Damon, James H. Drew, C. L. Hancock, C. J. Hixson, A. J. Klatte, F. McVittie, H. S. Murphy, J. F. Neild, W. J. Quinn, W. Schaake and A. Schlesinger.

The sessions of June 7 were devoted exclusively to meetings of the various sub-committees, when reports were put into shape for final presentation. The general meeting occurred June 8. In connection with the review of existing Manual sections it was decided that the name Western white cedar be replaced by the name Western red cedar, to bring the terminology in line with the practice of the American Engineering Standards Committee. Other paragraphs will also be written to conform. Several changes were decided upon which will be made in the specifications for rubber insulated wire and cable for power distribution purposes, the specification and form of contract for electrical conduit construction and specifications relating to poles.

The sub-committee on catenary material specifications found much of the present material now common with specifications for direct suspension material. Recommendation was made that a separate heading be added to take care of this for catenary construction and that the material be left under direct suspension specifications.

In going over specifications for trolley wire wear, the committee found some changes desirable in order to make the association specifications conform with those for the American Society for Testing Materials.

Considerable interest was manifested in the discussion of the report on radio interference. Various sources of interference from electric railways were discussed and analyzed. Details of tests and experiments will be included in the final report, together with experiments which have been made in some other countries.

In considering revision of specifications for 600-volt direct suspension trolley overhead construction, the committee found that the American Engineering Standards Committee is working on similar specifications, and it was felt that the matter should be left as it is for the present and developments watched carefully.

A draft of the main points to be considered in an agreement for the joint use of poles was submitted, and it was decided that the sections headed "Practices of Joint Use" should be revised and rewritten.

New subjects suggested for consideration by next year's committee included clearances between trolley collecting devices and trolley wire fittings, comparison of economics of operation of trolley systems, and specifications for caps and cones.

The News of the Industry

Senator Urges Terminable Permits

Illinois Legislator Recommends Relief from Tax Burdens Be Extended to Electric Railway

State Senator Richard J. Barr, Joliet, declared in a newspaper interview on June 11 that the terminable permit idea appeals to most reasoning persons who have given adequate study to the question. Senator Barr, who is chairman of the Illinois Legislature's joint commission on terminable permits, stated that he was not speaking for the commission but merely giving his own personal impressions.

He could think of no valid reason why a utility should not be permitted to give the service for which it is organized. As he sees it, most students of the matter are of the opinion that short-term franchises hinder, and sometimes prevent, a utility from financing itself upon any proper basis. It follows that without proper financing a utility cannot give adequate and fair service. He said:

> There were excellent reasons for a short-term franchise. When it was fully justified, there was no attempt at regulation. The city, in granting a franchise, said that there must be a day of reckoning, a squaring of accounts. Accordingly, it fixed a short term so that there could be a readjustment with expiration of the franchise. But that was before the days of regulation. Now it is different.
>
> No utility should have a franchise for a month beyond its good behavior. A terminable permit seeks to grant a right to operate only during good behavior, so long as the utility gives good service at a reasonable charge. When a utility is unfair, when it charges too much and gives too little, its right to operate should be terminated.

In questioning the soundness of provisions in the traction ordinance now pending in Chicago, which would compel the surface lines to pay more than 5 per cent of gross receipts as city compensation, pave between the tracks and clean and sprinkle its part of the streets, Senator Barr declared:

> The car rider should pay only the cost of his transportation. Why put a special tax on him for the benefit of the government? There was a time when compensation was rightfully exacted. That was in the days of horse cars when the horses wore out part of the pavement. But electric cars today do not wear out pavements.
>
> A large city needs rapid transit, surface lines and buses. They should supplement each other, not compete with each other. Only by operation in harmony can they supply the best service, and that really is the objective of all of the discussion of transportation, or should be. The fare payer should get it at a reasonable fare.

In referring to the proposal to build subways by special assessment, he added:

> It is unfair that the Chicago car riders should be compelled to pay $45,000,000, the amount at which the fund now stands, with which to build a subway. It is my notion that subways should come from general and special taxation. That is the tendency, in part, in Paris, Rome, New York, Philadelphia and Boston. The car riders should not be penalized. They have some rights. They should not be imposed upon for the benefit of other residents.

New Cars Demonstrated to Richmond Residents

Residents of Richmond, Va., were permitted by the Virginia Electric & Power Company to ride free on May 31, when the company placed in service two of its new cars, part of the shipment of fifteen recently received for service on the Ginter Park-Fulton line. Specifications of them were published in the JOURNAL for May 29, page 953. Two of the cars were operated for demonstration purposes up and down Broad Street on May 31 between 9 a.m. and 4 p.m. A demonstrator was placed aboard each car to explain its new features to the passengers. The cars are scarlet in color, with a white roof and blue trimmings.

One-Man Cars in Downtown Milwaukee

Milwaukee's recently instituted six months experiment of one-man car service through the downtown district on the Walnut Street line seems to be meeting with success from the very outset, both from the standpoint of the public and the company. According to reports of the first four days of operation under the new service made by the traffic department of the Milwaukee Electric Railway & Light Company a total of 121,961 passengers were carried, as compared to 115,186 passengers counted during a four-day check made of two-man car service the week prior to the adoption of one-man service. No complaint on the part of the public has been made against the service. Only five accidents of a minor character were reported. These, however, were declared not to be attributable to the cars.

The Deadhead

As San Francisco Sees Itself

Buses Not Favored by Cleveland Suburbs

Protests against substitution of bus service for trolley lines have been registered in Lakewood, Cleveland Heights and Euclid, Ohio. The Lakewood Council, three to one, tabled the Cleveland Railway proposal of a 60-day trial of buses instead of the Clifton Boulevard trolley line. The added cost of bus service, especially for school children and persons riding within Lakewood limits, was the principal argument advanced. Joseph H. Alexander, vice-president, guaranteed five-minute service, a seat for every passenger and free transfers to proposed intersecting bus lines. Ten cents was the maximum bus fare, but there was a possibility of a reduction, he said.

The Cleveland Heights Council and Mayor Frank C. Cain do not favor any proposal to substitute buses for the Fairmount Boulevard line and asked that the railway extend the Fairmount line half a mile to Canterbury Road and the Euclid Heights line in Mayfield Road 1¾ miles to Warrensville Center Road.

Indictments of Strikers at Buffalo Dismissed

United States District Judge John R. Hazel has *nolle prossed* 28 federal grand jury indictments charging conspiracy and various other offenses in connection with the dynamiting of the Buffalo-Niagara Falls high-speed line of the International Railway, Buffalo, during the strike in 1922. Application for the dismissal of the indictments was made by Richard H. Templeton, United States attorney for the western district of New York. The court was told there was not sufficient evidence to warrant the government to continue the prosecution of the defendants. The charges in almost every case were conspiracy to interfere with interstate commerce.

Among the defendants dismissed by the court were Robert C. Lacey, former New York State Senator; John M. Parker, former president of the Buffalo branch of the Amalgamated; William B. Fitzgerald of Yonkers, national organizer and vice-president of the Amalgamated. Three men were convicted when the original indictments were returned. Each was sentenced to a year in prison and fines ranging from $2,000 to $5,000 were imposed. At the trial a year ago of other defendants all were acquitted.

New Cars in Service in Grand Rapids

Twenty-seven Coaches, Bedecked with Flowers and Flags, Form Part of a Public Utility Parade and Service Demonstration That Was Impressive, Educational and Memorable

Part of Grand Rapids Parade of New Coaches Passing Through the Square

IN A TRIUMPHANT parade viewed by one of the largest crowds assembled there in recent years, the Grand Rapids Railway, Grand Rapids, Mich., demonstrated its 27 new electric rail coaches on Saturday, June 12. The event was made a holiday by Grand Rapids residents, who had patiently waited for the company to complete its tests of three types of modern improved coaches expected to set a new standard of equipment for the industry, and especially meet the needs of Grand Rapids patrons. Weather conditions were ideal—in sharp contrast to the cool, rainy days previous to the parade. Keyed up to a desire to see the new coaches, people jammed Monroe Avenue, the side streets and the residential district through which the coaches passed and applauded the attractive new vehicles. The day after the parade the new coaches were placed in regular service.

The parade started from the Hall Street carhouse. It was scheduled to move at 1 p.m., but the large number of photographers and newspaper men, making movies and "stills," delayed the start until nearly 2 o'clock. Traffic was virtually suspended on Division Avenue as the parade headed by motorcycle police rolled through that street and entered Monroe Avenue, swung around the Ottawa Avenue loop and really passed in review through the heart of the city.

All of the 27 new coaches were bedecked with flowers and flags. They were preceded by the first horse car operated in the city, an old 16-ft. type of 1880 car, a 1900 type of car and another of more recent design, all arranged in the order named. After these came the Minnesota, the St. Louis and the Ohio, all modern cars, offering a picture of street railway progress that was impressive, educational and memorable. Fifty city organizations—noonday luncheon clubs, women's clubs, improvement associations, schools, civic bodies, past and present city officials—were guests of the railway and rode in the new coaches. Six bands made the parade heard as well as seen.

Descendants of the pioneers for whom the coaches were named were the honor guests. Many of them, pleased with the honor paid their relatives, were accompanied by invited guests. Also included among the guests were staff correspondents of the ELECTRIC RAILWAY JOURNAL, *Railway Age*, the *Saturday Evening Post*, and Chicago and other Middle West newspapers.

After leaving the downtown district the parade proceeded out Cherry Street to Ramona Park, but returned to Monroe Avenue where it split. The coaches then made their maiden trips over the routes they will henceforth serve.

RAILWAY MANAGEMENT CONGRATULATED

City officials, citizens and visiting railway representatives congratulated L. J. DeLamarter, vice-president and general manager, for his company's and his own accomplishment in creating a new and ultra-modern type of electric rail vehicle to meet the competition of the private automobile by offering to the public more comfortable, luxurious city transportation. Thanks were also extended to him from all sides for dedicating the new coaches to the people of Grand Rapids. City officials predicted that Mr. DeLamarter's effort to give the citizens railway service unexcelled by any other city comparable to Grand Rapids in size would prove invaluable, if the demonstration of the performance of the cars and their unprecedented reception were any criterion. Many citizens who have not been in a street car for years rode in the new coaches during the parade and pledged themselves in future to reserve their autos for pleasure purposes.

An analysis of the reaction of the people to the new coaches during the first few days after their installation seems to indicate that the people are especially pleased with the low steps. The luxurious seats and comfortable cushions are coming in for favorable comment, and the lighting arrangement, which permit of reading in any corner of the car, is greatly appreciated. So far as men are concerned the smoking compartment is a decided hit with them. This is a clubby arrangement of seats in the rear for patrons who find pleasure in My Lady Nicotine.

The step-well received its first tryout on Sunday, the day the new coaches went into service. It rained that day, but patrons found the step-well permitted them to enter the coaches quickly and under shelter.

The semi-noiseless operation of the coaches is also appreciated by the merchants in Monroe Avenue. One of them said to the correspondent of the ELECTRIC RAILWAY JOURNAL on Monday that "it is now possible for me to converse with my customers without yelling at the top of my voice when the street cars go by that I may make myself heard, or without cupping my ears to hear what the customer says."

Old Friends of Daniel H. Waters Riding in Car Named After Him

Residents along the routes on which the new coaches are operating also comment on the reduction of noises.

Easy exits from the coaches is another feature that is winning popular favor with Grand Rapids patrons through the new automatic rear-door treadle. Children have discovered the "slick way" they can alight from the car and are rapidly showing their parents the "new trick." Operators report that the treadles are helping them to handle the crowds on the downtown loading platforms during the rush hours.

In an interview in the Grand Rapids *Herald*, Mayor Elvin Swarthout in commenting on the new coaches said:

> Grand Rapids may well be proud of the enviable position which it holds in pioneering the development of transportation beyond the stage which had been accepted as standard. The new coaches are a revelation of convenience and comfort, and great credit is due the officials of the company for the enterprise and zeal expended with such splendid results.

City Commissioners George F. Gruenbauer, John D. Karel and others declared the new coaches were a tribute to the vision of the management.

Gerald J. Wagner, the city's consulting engineer, who has followed closely the progress of the company since the granting of the 1918 franchise, expressed satisfaction at the happy climax of co-operation between the City Commission and the railway officials. In an interview in the *Herald* he said:

> There are innumerable instances of cities where progress has been impossible because of the friction and distrust between the company and the municipal government. Grand Rapids is fortunate in having worked out a plan for utility regulation which offers the most friendly co-operation with the company and does not hamper company initiative. Mr. DeLamarter and the company are to be congratulated for giving to Grand Rapids this acme of coach progress, a memorable milestone in the march of street railway progress and city transportation.

The *Herald* said editorially:

> The men responsible for the Grand Rapids Railway are of right supremely proud of the 27 new coaches which today will make their first public appearance. With them the people of Grand Rapids have a right to feel proud; and with the managers the people also deserve a share of credit for the thoroughness of this improvement. Month after month—ever since fire destroyed a large part of the local company's rolling stock—the public has ridden without protest in weather-beaten, ramshackle antiques. Confident of the accomplishment which today is revealed the public co-operatively made no protests. Because Grand Rapids always has had good railway service and the best of cars, this complacent acceptance of less than the best deserves mention. Today the confidence which that patient waiting evidences is justified in handsome measure. Our compliments to the Grand Rapids Railway, General Manager DeLamarter and the people of Grand Rapids!

PRESS COMMENT VERY FLATTERING

The Grand Rapids *Press* on Wednesday, June 9, said:

> They represent a faith upon the part of the local railway in this city's future. This faith has meant the exceedingly painful experience of passed dividends and heavy capital investment. It has grown out of a conviction that we have here an ideal town for such an experiment; a city disposed to deal fairly with its utilities, and a city destined to steady growth and a lasting industrial demand for traction service. It is a faith based on the knowledge that Grand Rapids is a progressive town capable of appreciating the best and worthy of advanced utility efforts to please.
>
> To quote the ELECTRIC RAILWAY JOURNAL, "if the net result is merely to stimulate a more general effort to improve the street car as a transportation merchandising agency, Mr. DeLamarter's strenuous efforts in the face of many obstacles and some skepticism will prove of invaluable service to the industry." That is the comment of Mr. DeLamarter's own business associates. His fellow citizens would like to add that they appreciate and approve his boundless confidence in this community and its destiny.
>
> Grand Rapids' new street cars are to go into service next Saturday. They provide this city with the most luxurious electrical transportation in the United States. They represent the ultimate, to date, in street car design. But they represent something else, of more importance though of a less tangible nature.

On Monday, June 14, the Grand Rapids *Press* printed this editorial under the heading "Public Be Pleased":

> Grand Rapids turned out Saturday in circus mood for Louis DeLamarter's parade of new street car equipment. Its enthusiasm is due to appreciation of a public utility which has said: "The public be pleased" instead of "The public be damned."
>
> Mr. DeLamarter has won a deserved and increasing popularity for his service. This popularity is evidence of his alertness, his canny sense of the best commercial appeal to make to a community in the name of electric transportation. It is evidence, too, of his rare business foresight with regard to the solid industrial prospects of this city.
>
> The *Press* recently commented upon the street railway and its investment, and upon Mr. DeLamarter. It does so again, because Saturday's public turnout was in the way of a confirmation of the methods adopted and investments made. Business men, officials, employees and ordinary citizens seized the chance to see the new cars and to ride in them. Good will was the day's keynote; and good will today must be the first asset on the books of a utility competing with automobile transportation.

All in all, Grand Rapids residents are proud of their new coaches and in welcoming them seem to have reacted to the psychology that was Mr. De Lamarter's aim—an increased patronage through comfort and attraction and winning the potential rider who wants to ease his pride in a vehicle that offers the same refinements as does his own automobile.

As a beacon welcoming the arrival of modern transportation for Grand Rapids, a colossal bonfire, fed by worn-out and obsolete street cars of the past, will be built at Comstock Park west of the company's property, Thursday, June 24. In accordance with the railway's custom of burning all useless equipment, Mr. DeLamarter will destroy these ancient models and borrowed cars because they are beyond possibility of repair or reconstruction. The bonfire will be a gala occasion and many features are planned for the celebration, to which the public is invited.

Nurses from Three Hospitals Rode in One of the Coaches

Another First for Philadelphia

Daily passenger airplane service from Washington to the Sesqui-Centennial grounds will be opened by the Philadelphia Rapid Transit Company early in July. Fokker monoplanes will be used. The actual operating schedule has not been drawn up and the exact date on which the air line will begin operation will depend on when the ships are available for use.

The Navy Yard flying field will be placed at the disposal of the P.R.T. air line and a government field will be used at the capital. Technical operation of the monoplanes will be under the direction of Anthony H. G. Fokker, designer of the ships. He will also select the pilots. The line will be financed by the P.R.T. No indication has been given of the rate between the two cities.

Mayor Kendrick made the announcement about the new service. He said:

> This interesting and constructive plan of the P.R.T. means another "first" for Philadelphia. Establishment of commercial aviation between the cities of Philadelphia and Washington under the capable management of Mr. Fokker indicates that Philadelphia will assume leadership in this important method of transportation.
>
> It is indeed a contribution to the Sesqui-Centennial to have commercial air service started during the celebration.

The strides taken in commercial aviation in Europe greatly impressed Mr. Mitten, the P.R.T. head. Mr. Mitten said:

> The safety of commercial aviation is today an accepted fact in Europe. The air lines there have an enviable safety record. The London-Paris service in 1925 carried almost 20,000 passengers without serious accident. My personal observation upon the flying field was that airplanes are used very generally by business men, and that elderly ladies, who a few years ago would have been found knitting by the fireside, now gleefully and confidently use the air service.
>
> Ascertaining by cable that Mr. Fokker could and would build the necessary number of planes in the time allowed and would undertake the responsibility of supplying a safe and satisfactory service, I agreed to support a daily airplane passenger service between Philadelphia and Washington during the Sesqui, subject only to our receiving the co-operation of the government.
>
> Fokker three-engine monoplanes, equipped to carry ten passengers each, will be used in this service. Selection and supervision of the flying force will be under Mr. Fokker's personal direction. Wright air-cooled engines will be used in these planes, which embody the latest features of Fokker construction and flying qualities, non-stalling, non-spinning, and with perfect control at all speeds. They are actually safer than the Fokker planes which are now flying almost 10,000 miles a day on regular commercial air lines abroad.

New Power Contract Contemplated in Kansas City

B. J. Denman, vice-president of the United Light & Power Company, the holding organization of the Kansas City Power & Light Company, will continue conferences in connection with the projected purchasing of power from his company by the Kansas City Railways when it is reorganized.

The power plant of the railway is not as efficient as that of the Kansas City Power & Light Company and the railway reorganizers estimate that $1,500,000 would be necessary to put the plant upon an efficient basis. The light company, it is said, is able to furnish electric power to the railway at three-quarters of a cent per kilowatt-hour.

If these arrangements for power for the railway are completed, it is said that negotiations will include provision for the sale of the railway's power plant to the light company, by which it will be retained to handle peak loads and emergencies.

Apparently, the hydro-electric power project now under way on the Osage River is not to be considered at this time by the local organizations.

New Transportation Program at Columbia

A program adopted by the City Council of Columbia, S. C., provides that cars of the Columbia Railway, Gas & Electric Company are to be operated only on such lines as are profitable; zones, with 5-cent fares and no transfers are abolished, a straight 10-cent fare being charged, and additional buses are to be operated by the Carolina Transit Company to serve communities from which trolley service is withdrawn. Under the arrangement, transfers are to be provided, without additional charge, from the street cars to the bus lines and vice versa. The buses and street cars are operated by separate and independent companies.

The omnipresent jitney, regarded by many as the real disturbing factor in the transportation problem, is also handled in the program adopted by City Council.

A joint committee, composed of members of the South Carolina Railroad Commission and the City Commission of Columbia, in its report to the City Council said:

> We particularly desire to impress upon you our belief that neither the street car company nor the bus company can long survive jitney competition unless they (jitneys) are regulated in the city of Columbia.

And so the jitneys, carrying passengers anywhere in the city limits at 10 cents a head, operating on no regular schedule, are to be required to provide a $250 surety bond. This ruling, it is believed, will rapidly drive the jitney out of business, as most of the drivers will not care to supply that bond. With the free lance jitneys out of the running, the bus company and the railway, both of which are reported to be suffering from lack of nourishment now due to jitney competition, will have everything their own way and the citizens hope they will be able to make tongue and buckle meet.

The transportation problem has been much in the public eye in Columbia for several months. The general public has been singularly apathetic and indifferent with regard to it. The buses came, and while there was some hullaballoo, no very great row was made. The jitneys with 10-cent fares, the buses with 10-cent fares and the trolley cars with 5-cent fares (and a zone system) all struggled along and the wonder grew that all could continue to operate. The jitney drivers changed frequently, but the machines were kept in service somehow and hundreds of people favored them in that they carried the passengers direct to their homes. Now, however, it is believed that the jitney will be driven from the field and that buses will replace street cars on all except a few of the streets.

Essentials of New York Bus Situation Grasped by Wall Street Journal

ALREADY Mayor Walker has rather frankly indicated his acceptance of the view that surface lines on Manhattan island obstruct traffic and should be removed. That is, of course, not the only question involved in Mr. Craig's proposals. Even an affirmative answer on that point does not necessarily confirm the wisdom of buying the Fourth and Madison, the Eighth and the Ninth Avenue lines for $7,000,000. Equally important questions are: Whether the owners of these lines have anything to sell the city that is worth the price asked; whether surface transit lengthwise of the island should be motorized; whether any engineering study of the advantages of buses compared, not with antiquated surface cars now feebly operated but with modern electric cars adequately maintained and competently run, has been made on the public behalf.

If, as the Mayor appears to believe and as is sufficiently obvious in other ways, the city could have no purpose in buying these lines except to wipe them off the streets, the real nature of the transaction would be to pay $7,000,000 or some other sum to terminate the franchises involved. If their owners cannot make them pay, what are the franchises under which they were built worth? A franchise which has become only a permission to lose money in the city streets cannot have any value.

Mr. Craig's explanation that most of the persons interested in these lines are well along in life and do not care to "deplete their estates" by investing in new equipment has no application to at least one of the properties. He and his associates acquired the Fourth and Madison Avenue line within recent weeks from the New York & Harlem Railroad, a corporation amply able to finance rehabilitation of its surface line if its management saw any promise of adequate profits ahead. As to the others, aged persons who are not looking for a hazard of new fortunes can always find a market for a property which needs only young blood and capital to revive its prosperity.—*Wall Street Journal.*

Terms of New Agreement Discussed at Tacoma

With an agreement from the start that both sides shall "lay all their cards face up on the table" negotiations have been undertaken between the new City Council and the Tacoma Railway & Power Company, Tacoma, Wash., for a settlement of the car problem. The new Mayor, Melvin G. Tennent, who replaced Mayor Fawcett, the sworn enemy of the transportation company, presided at the first conference. He announced as the aim of the City Council "the lowest possible fare consistent with good service for all the city and fair treatment of the company." He suggested that the company should allow the city's representatives to assist in working out any economies of operation. One such means of economy suggested is the stopping of cars at every third block in the residence sections.

Among the preliminary matters disposed of at the first conference was the commitment of the Council to inclusion of an interchange of transfers between the Tacoma Railway & Power Company's cars and those of the municipal belt line on the tideflats, service to outlying sections and convenient sale of any tokens or passes agreed upon as necessary parts of any settlement.

Statement by the company of the lowest valuation upon its properties which it will feel justified in accepting as a basis of computation of a fair return was agreed upon as the foundation upon which actual arbitration of terms must rest. It was agreed that 6 per cent would be taken as a tentative rate of return to use in computations.

An important understanding proposed by Mayor Tennent and agreed upon was that no conversations or conferences upon the transportation problem should be held by individuals of opposite sides of the conference body, but that whatever was done would be done by the body as a whole.

New Tentative Ordinance for Louisville

A tentative ordinance has been placed in the hands of Mayor A. A. Will by the Louisville Railway, Louisville, Ky., providing for a straight 7-cent fare and a 10-cent combination bus and railway fare, with transfers.

According to the proposed plan, bus lines would be used for extension of suburban service, and one or more of the more important street car lines would be extended. The ordinance would make a 7-cent fare the basic fare and arrange for increasing this fare, if conditions and earnings warranted it. It would remove regulation of the company from the hands of the Board of Public Works. Rate changes would be acted upon by the General Council, and would not be automatically controlled by a barometer fund as at present. Properties of the company would be appraised by the city and company and a valuation established, with earnings regulated through fares to guarantee a reasonable return on investment. The new regulations, it was stated, were based on the transportation act of 1920, with such changes as needed to fit local conditions. Under the new plan the standard bus fare would prevail on combination bus and street car trips. School teachers and pupils would be carried at half fare and policemen, firemen and park guards would ride free when in uniform.

Under the present regulations there is a 7-cent fare, but under a sliding scale, in which a barometer fund establishes the rate, at either 6 or 7 cents. There are no transfers from cars to bus. The buses are operated by the Kentucky Carriers, Inc., a subsidiary of the Louisville Railway, and the cash bus fare is 15 cents, with four tickets for 50 cents.

Des Moines Residents Enjoy Riding All Day for Quarter

The Des Moines City Railway, Des Moines, Iowa., sold 5,484 passes on its intial "all-day-for-a-quarter" Sunday plan and passengers traveled 37,131 times on these tickets, which were good from 5 a.m. Sunday to 5 a.m. Monday. The regular fare is 10 cents. Car riders on the try-out day averaged nearly seven rides for each ticket.

Des Moines is the third city in the country to give a try-out to the plan intended to boost traffic on what is ordinarily the lightest day of the week. The proposed installation of the plan was mentioned in the ELECTRIC RAILWAY JOURNAL issue of June 5, page 989. Pittsburgh initiated the plan and it has been tried in Wheeling, W. Va.

Oil-Electrics for Freight Movement in Rochester

Freight lines on the new industrial railway built by the city of Rochester, N. Y., in the bed of the abandoned Erie Canal through the heart of the city will be operated by oil-electric locomotives.

This was revealed when bids were opened by the City Board of Contract and Supply on electrification of the road from Brighton, on the eastern limits of the line, to the Barge Canal on the west. The specifications, as revised, call for electrification of two passenger tracks and operation of freight lines by oil-electric engines. By this move 4 miles of electrification were saved, city officials asserted.

It is expected that the subway will be in operation in the fall. The tracks are laid, stations and bridges completed and only the electrification work is to be finished. The operator of the railroad has not been decided upon. That matter is still in the hands of a committee of citizens appointed by Mayor Clarence D. Van Zandt, "the father of the subway." It is deemed improbable that the city will attempt to operate the system. Rather it is thought that some operator, most probably the New York State Railways, which has the needed equipment, will lease the subway railroad. The line will carry passengers from the outskirts, take care of all interurban lines entering the city and serve industry by freight hauling and switching.

"The Shartel Monuments"

Some idea of the high regard in which John W. Shartel, the late president and receiver of the Oklahoma Railway, Oklahoma City, Okla., was held by his subordinates and associates is shown in the tribute to him in the *Oklahoma Railwayan*, the official paper of the company.

Through this vehicle George G. Barnes, who worked with Mr. Shartel in legal undertakings for many years, expresses what he thought of the man who 30 years ago went to Oklahoma and not only dreamed his dreams but made them come true. Another tribute, signed "M.W." is entitled "The Shartel Monuments," wherein it is hoped that Mr. Shartel with phantom fingers will direct the street cars, still "showering the wealth of his great genius upon them even in death."

It was said that, to his intimate friends, Mr. Shartel expressed the desire to retire from the active management of the Oklahoma properties and devote the major part of his time to the writing of histories of the American Revolution and the war of the states. The tremendous difficulties which faced the company, however, delayed his retirement, and at the time of his death he was but awaiting the moment to withdraw.

Rights Under Indeterminate Permit Fixed in Indiana

When a public utility surrenders its franchise with a municipality and takes an indeterminate permit from the Indiana Public Service Commission, all the rights, powers and duties which existed under the franchise in favor of either party to the franchise are abrogated. The Indiana Supreme Court has so ruled. The case arose in South Bend, where the Chicago, Lake Shore & South Bend Railway, an interurban line now known as the Chicago, South Shore & South Bend Railway, had a provision in its franchise with the city of South Bend which permitted it to run a track in La Salle Avenue, one of the principal streets of the city. One clause of the franchise, however, restricted the company from handling freight in this street except as might be provided by city ordinance.

A few years ago construction work was started on some large buildings in this street and the company was asked by the contractor to haul material to and from the scene of construction. City officials did not object and the company agreed. Property owners, however, brought injunction proceedings. They won the case in the Superior Court. Between the time of the filing of the suit and the trial of the case the company surrendered its franchise and took out a permit from the Public Service Commission. Attorneys of the company took the position that the surrender of the franchise abrogated all restrictions and the company was at liberty to operate freight trains under the 1920 law, which gives interurbans that right.

The property owners contended that the surrender of the franchise affected only such matters as fares, charges and character of service.

Aldermen Pass Richmond Franchise Over Veto

The Board of Aldermen of Richmond, Va., has overridden Mayor Bright's veto. On June 15 it passed the blanket franchise sought by the Virginia Electric & Power Company by a vote of nine to three. Eight votes were necessary for passage. The Common Council had previously overridden his veto. Sale of the franchise will be advertised for four consecutive weeks, after which the Council will examine bids.

Members of the board were supplied with a statement showing the per cent of tax charged on gross receipts on traction business in other cities. According to this statement, Baltimore was the only city showing a greater rate than 3 per cent. The present rate in Richmond is 6¼ per cent. The Virginia Electric & Power Company sought a 3 per cent tax. Five per cent for the first year, to be graduated downward over a period of ten years until it was 3 per cent, to remain for the next twenty years (the life of the franchise being 30 years), was agreed upon as a compromise. The Mayor wanted the tax to remain at 6¼ per cent. It was for this reason he vetoed the measure.

The terms of the proposed new grant have long been the subject of discussion and negotiation.

Safety Talks for School Children

Conductor S. J. Steele and Operator J. E. Watson of the railway department of the Georgia Railway & Power Company, Atlanta, Ga., were asked by Principal J. H. Smith of the William A. Bass Junior High School to speak to the students on "Safety" as part of the school's program for "Safety Week." Mr. Steele warned the students always to go to the right-hand curb after alighting from a street car and never to hold to the side of a street car while riding a bicycle or roller skating. Mr. Watson, who operates a one-man safety car, illustrated his talk with a number of examples of how stopping the street car has many times saved people from injury after their own carelessness has placed them in danger.

Talks by operators and conductors before school children, according to officials of the company, open an entirely new line of attack upon the problem of safety on the streets, and men in the employ of the company will be encouraged to make such talks when the demand for them arises.

Court Dismisses Suit Against Philadelphia Rapid Transit

Judge Dickinson in the United States District Court on June 8 dismissed the suit of Daniel J. Furey against the Philadelphia Rapid Transit Company, in which he asked the court to order a refund of approximately $57,000,000, alleged to have been collected in excess of a 5-cent fare. The court declared that Furey had no cause for action in the matter because the State Supreme Court had passed on the constitutionality of the Public Service Commission act and other points brought out by Furey in his case.

News Notes

Sesqui Edition of "Traveler."—The Philadelphia Rapid Transit Company, Philadelphia, Pa., has issued a Sesqui-Centennial edition of its "Traveler," a guide book with a description of all the city's transit facilities. The new edition carries the cover designed by John J. Gough, to whom a $500 prize was awarded on May 1. A feature of the book is a map 17 in. x 28 in. showing trolley and bus routes throughout the city.

Plea for Continued Freight Rates Heard.—Hearing on the petition of the Salt Lake & Utah Railroad, Salt Lake City, Utah, for the maintenance of transcontinental rates on westbound shipments and the establishment of such rates on eastbound shipments of freight was commenced recently in Salt Lake City before Examiner W. A. Hill of the Interstate Commerce Commission. The Salt Lake & Utah, which is also known as the Orem line, has enjoyed the privilege of giving transcontinental rates on westbound shipments which it hauls in connection with the transcontinental railroads, and recently applied to the commission for the right to establish the same rates on eastbound shipments. This causes the Union Pacific to apply to the commission for a cancellation of all rights on the part of the local railroad to charge transcontinental rates. The petition of the Orem line now being heard, therefore, asks the commission that the plea of the Union Pacific be not granted, and in addition that the eastbound through rates, not heretofore enjoyed, be established.

Fare Collecting Changes.—The Philadelphia Rapid Transit Company, Philadelphia, Pa., will install a new system of fare collection on routes 11 and 34, eastbound cars, beginning June 20. The innovation will allow the company to operate one-man cars on these routes. Passengers on these routes will pay fares to conductors if they leave the car before it enters the subway. If they ride into the subway, they pay their fares to cashiers at stations after they leave the car. Automatic turnstiles are being installed for this purpose.

Higher Fare May Be Sought in Sandusky.—It is said that the Lake Shore Electric Railway of Cleveland gave notice to the City Commission of Sandusky, Ohio, that it intends to present a franchise providing for a 7-cent fare instead of the present 5-cent fare on the company's city lines. The officials explained that revenue of the city lines had been failing to meet operating expenses. The 25-year franchise, under which the company has been operating city cars in Sandusky, expires in July.

Order Affects Grade Crossings.—The Public Service Commission of Pennsylvania has decided that the Scranton Railway must maintain watchmen at all grade crossings in the city and vicinity where one-man cars are operated. In addition the company must also have one-man cars come to a stop within 15 ft. of each crossing in order that the motorman-conductor can satisfy himself as to the safety of proceeding. When the Scranton Railway, some months ago, applied to the commission for the modification of the law compelling the placing of watchmen at grade crossings, former City Solicitor P. V. Mattes filed a petition on behalf of the city protesting against the request. A hearing was held before the commission, at which time City Solicitor C. B. Little presented arguments on behalf of the city. The commission ordered an investigation by its own engineers, with the result that the stand of the city was upheld.

Would Spend $15,000 on Repairs.—The Cincinnati Street Railway, Cincinnati, Ohio, has requested authority from Edgar Dow Gilman, Director of Street Railroads and Motor Buses, to spend $15,000 in making repairs on the Fairview incline, which has been closed down by the railway. Pending action of the director, the railway has rerouted its College Hill cars in order to give the residents of Clifton Heights and Fairview, ordinarily served by the incline, adequate car service. In the event the new rearrangement proves satisfactory, it is likely that Mr. Gilman will authorize the abandonment of the incline instead of making the necessary repairs.

Hearing on Electrification Deferred.—At the request of William A. Jones counsel for the Richmond Hill Board of Trade, the Transit Commission has adjourned until Oct. 15 the hearing on the application of the board and other petitioners for the electrification of the Glendale cut-off of the Montauk Division of the Long Island Railroad. Mr. Jones said that it would be difficult to produce witnesses during the summer, as so many persons interested in the matter would be away.

Hearing on Fare Application Delayed.—Ignoring the protest of the United Traction Company, Chairman Pendergast of the Public Service Commission recently granted the request of the city of Albany, N. Y., for a delay of two months in hearing the application of the company for an increase in fare. The commission at the same time promised a speedy decision on the contention of the city of Troy that a franchise binds the company to a 5-cent fare on its lines in that city.

Freight Car Contract Approved.—No opposition appeared when the Massachusetts Department of Public Utilities gave a hearing on the application of the Boston Elevated Railway, Boston, Mass., for the approval of a contract with the Boston & Worcester Street Railway for operating freight cars of the latter company over lines of the "L" in Boston. The new contract is a revision of the contract in force between the two companies since 1912. The chief changes in the new contract are in the rate increase for power used and a provision for operating cars by employees of the Boston & Worcester instead of "L" carmen as at present. The use of Boston & Worcester employees in operating its cars means a substantial saving to the latter company, as wages of the Boston & Worcester employees are lower than those of the elevated employees.

Recent Bus Developments

Dates Fixed for I.C.C. Bus Hearings

A schedule of thirteen hearings in cities from coast to coast was announced by the Interstate Commerce Commission on June 16 in connection with an exhaustive investigation of motor truck and motor bus operation by and for and in competition with the railroads.

The hearings will begin at Chicago July 27 before Commissioner Esch and Examiner Flynn and will be closed in Washington on Sept. 29. All parties in New York with an interest in the matter will be heard at a session to be held in the Merchants' Association Rooms, 233 Broadway, on Sept. 10. The schedule of hearings follows:

Chicago, July 27; St. Paul, July 30; Portland, Ore., Aug. 7; San Francisco, Aug. 12; Los Angeles, Aug. 17; Denver, Aug. 25; Detroit, Sept. 1; Boston, Sept. 8; New York, Sept. 10; Dallas, Sept. 20; Kansas City, Sept. 24; Washington, D. C., Sept. 29.

In a session ordering the hearings the committee prepared a detailed questionnaire which must be answered by every common carrier subject to the Interstate Commerce laws requiring information as to all motor operations by them, by subsidiaries or by competitors.

The questionnaire will not go to the so-called independent motor bus and motor truck operators. It was learned, however, that the independent operators will come in as parties at interest through various state and national organizations and arrangements have been made by the commission to give them a full hearing.

Under the present arrangement the railroads will be heard first, then the operators of buses or motor trucks and then other interested parties, including representatives of shippers and state or municipal utility commissions.

Independent Bus Rights Lost in Tacoma

In connection with negotiations opened with the Tacoma Railway & Power Company, Tacoma, Wash., for a settlement of the transportation problem of the city, Mayor Tennent has stated that the Council considered that when the Puget Transportation Company, to which bus permits had been granted, discontinued service several months ago, it canceled its permits and the Council would not risk further complications with renewed service just at this time. The Mayor said, however, that if the negotiations with the railway did not work out favorably, the city might again resort to the bus for service. City attorney Murray expressed the opinion that there was no question of the right of the Council to declare the permits void by reason of discontinuance of service, but that a resolution would have to be adopted setting forth the grounds for cancellation and fixing a date for a hearing at which the company should have an opportunity to defend itself. Permits issued last year to the Puget Transportation Company for twelve buses on the Point Defiance line have already been revoked, and the bus company has been admonished not to start regular service under the old permits, a course it had threatened to pursue.

Blanket Bus Permit Denied by Ohio Court

The Supreme Court of Ohio on May 27 reversed a decision of the Public Utilities Commission granting franchises over irregular routes to the Buckeye Special Transit Company. Some sixteen existing transportation companies, both steam and electric, had appealed from the decision of the commission and that brought the case before the Supreme Court.

The refusal to grant the franchises requested by the Buckeye company was based on three grounds. For one thing the company had not followed the rule which required the application to be advertised for three weeks in a newspaper of general circulation published at the county seat of each county in the state in or through which the applicant proposed to operate. Practically, of course, this would have meant an advertisement of the application in each of the 88 counties of the state.

The second ground for the reversal of the regulation was that the company had not shown that the regular lines of transportation service were not furnishing reasonable facilities.

The third ground was that casual and unusual service such as heretofore has been rendered under private contract is not the proper subject matter of a certificate of public convenience and necessity. The court says:

> The whole subject of public motor transportation is new, and it is not surprising that the legislation on this subject has failed to meet all of the problems presented.

It is also quite certain that further legislation will be required definitely to authorize the commission to grant such wholesale service without compliance with all the requirements of notice and statement and of proof of necessity and convenience applicable to smaller and regular operators.

Excursions by Bus by Interstate

The Interstate Public Service Company has arranged to run a series of excursions by bus to all of the state parks and to other points of interest in Indiana. The first excursion was set for June 6 from Indianapolis to Brown County by the way of Franklin and Columbus and returning by the way of Bloomington and Martinsville. The trip was planned so as to give those taking it four hours in Brown County. The excursions will be conducted personally by representatives of the Interstate.

Party Business Profitable in Kansas City

According to a statement credited to Francis M. Wilson, one of the receivers of the Kansas City Railways, Kansas City, Mo., the use of the bus in that city has increased to a marked degree since the advent of hot weather. This increase has been noticeable both in the patronage of the regular schedule routes and in the business of chartering buses for special hire, started by the receivers some time ago.

The receivers have found the special charter and party business a very profitable phase of bus transportation and have made every effort in recent months to increase this class of patronage by large parties at night after rush hours on the regular lines is over.

Mr. Wilson also said the receivers have found it difficult to determine the source of bus patronage, but he estimates that about 60 per cent of the bus revenue represents a loss in street car patronage.

According to the statement, the loss of about $20,000 a month on the buses is attributed to the use of pneumatic tires and to the fact that buses in Kansas City are not allowed to carry standing passengers. Tires are said to cost the company 3.8 cents per mile, and Mr. Wilson estimated that the use of solid tires would cut this expense to less than 1 cent per mile. He also said the buses would carry nearly twice the number of passengers now carried, if passengers were permitted to stand.

According to F. G. Buffe, general manager for the receivers, the Kansas City Railways' bus system is being operated as cheaply as are similar services in other cities, despite the fact that in Kansas City no line has a grade of less than 5 per cent to travel while on some of the routes the grade is as much as 13 per cent.

The buses are leased to special parties at the rate of $7.50 an hour, with special rates effective where intervals of waiting are required. The demand for this class of service is growing rapidly among clubs, conventions, societies, etc., for special trips of all kinds. The receivers have frequent calls to meet special parties at the Union Station to take visitors for a tour of the city or on other trips.

No Action on Chicago Bus Offer

Pending the outcome of an investigation by the Cook County Board of Commissioners no action has been taken on the standing offer of the Chicago Motor Coach Company to operate buses from points where street car lines and steam railroads touch the public forest preserves of Cook County to various picnic, swimming and scenic spots now inaccessible to all but the private automobilist. The motor coach company desires to establish this service in advance of the International Eucharistic Congress, which will bring hundreds of thousands of visitors to this section from all parts of the world on June 20. Inasmuch as the service proposed will be furnished on Saturday afternoons, Sundays and holidays only, there is a possibility that the city of Chicago will agree to subsidize the lines.

Receiver Sought for Ohio Bus Line

The Red Star Company, a bus line which some months ago disposed of its rights between Springfield and Dayton to the bus subsidiary of the Indiana, Columbus & Eastern Traction Company, now proposes, it is said, to do likewise with its Springfield-Columbus franchise. Suit asking for the appointment of a receiver was filed in the Clark County Common Pleas Court recently.

The plaintiff avers that the Red Star Company is indebted to him in the sum of $1,028, representing unpaid premiums on insurance policies. He declares that a deal is pending whereby the "sole assets of the company," namely, certificates of conveyance issued to the company by the Ohio Public Utilities Commission, are to be transferred to the Columbus & Springfield Transportation Company. All other property used by the lines is held in the names of individuals, the plaintiff said. He asks for an injunction to restrain the company from disposing of the conveyance certificates until his suit has been heard.

No Action on New York Bus Proposals

At a conference of the members of the Board of Estimate of New York on June 15, it was decided to have an analysis made of each application for the right to run buses in the city. These analyses will be made by the Board of Transportation and the Bureau of Franchises of the Board of Estimate and it is expected that they will be ready by July 1. As soon as these reports are completed the board will be reconvened in a closed session on the call of Mayor Walker to resume consideration of the bus situation. It was said on excellent authority that the award of a franchise or franchises would probably not be delayed long after that.

Mayor Walker is understood to favor a city-wide system to be operated by one company, if terms can be obtained in that way which will be as advantageous to the city as would be the award of a franchise for each borough.

Another phase of the bus situation will be considered on July 22 when the Board of Estimate will hold its hearing upon the proposal of former Comptroller Charles L. Craig for the city to buy the Fourth and Madison Avenue, Eighth Avenue and Ninth Avenue surface lines to clear those streets for bus routes.

Mayor Wants Independent Buses in Buffalo

Mayor Frank X. Schwab of Buffalo, who has been in Europe two months studying bus transportation, has returned to Buffalo with a proposal to license the operation of independent bus lines over various streets of the city in competition with the International Bus Corporation, a subsidiary of the International Railway. Mayor Schwab says a transportation emergency exists in Buffalo and he is willing to have the city purchase at least 50 buses immediately.

The City Council was informed by the Mayor that he was opposed to granting additional bus franchises to the International Bus Corporation in view of the public statement of Bernard J. Yungbluth, president of the railway and bus companies, that the corporation lacked funds with which to finance improvements to its system as ordered by the Public Service Commission.

The Mayor's opposition to the bus plan of the International Railway is not unexpected. Last summer he sponsored the Ernest M. Howe 5-cent bus plan. This proposal collapsed when the company headed by Mr. Howe was unable to get financial assistance.

Application of the company for permits to operate additional bus lines in Buffalo, was held up by the City Council pending the return to Buffalo of Mayor Schwab from Europe. Voters demanded a referendum on the proposed franchises when it was apparent the Council would approve the permits in Mayor Schwab's absence. In view of widespread opposition to the new permits, it was apparent the voters would defeat the franchises.

Bus Terminal Extended.—The Public Service Commission on June 11 authorized the Mid-State Coach Lines, Inc., to extend its authorized terminal for its Oswego city bus route from East Tenth and Church Streets to the city line on the Hall Road, a distance of about 1 mile.

Company Must Keep to Agreement.—The City Council of Marlboro, Mass., has threatened to revoke the bus license of the Boston & Worcester Street Railway to operate buses in the city if the prediction of a group of Marlboro employees that they may be dropped from the company payroll is correct. The city has an agreement with the road whereby it will retain all Marlboro residents employed at the time the company put buses on instead of trolley cars for passenger service.

Will Abandon Part of Bus Line.—A petition seeking authority to abandon the operation of that part of its bus line between Fort Wayne, Ind., and the Indiana-Ohio line has been filed with the Indiana Public Service Commission by the Fort Wayne, Van Wert & Lima Traction Company, through its receiver, Henry C. Paul. The bus line in question is part of the line operating between Fort Wayne and Lima. The petition alleges that revenues of the first four months of this year were far less than operating expenses.

Bus Route in Auburn Extended.—The Public Service Commission on June 11 granted the petition of the Mid-State Coach Lines, Inc., for permission to extend its route in the city of Auburn by operating over the route formerly served by the North Street line of the Auburn & Syracuse Electric Railway. The commission denied the petition for a certificate authorizing bus operation over practically the same route now used by the local trolley line. It was stated at the hearing that the company did not propose to start operation over this line immediately, and permission to abandon the trolley line has never been asked.

Competitor for Schenectady Railway.—Application for the operation of a bus line which would come into direct competition with the Schenectady Railway, giving interurban service between Albany and Schenectady, was made recently by William G. Schultz, Lathams, who asks for a certificate to operate one 25-passenger bus between Albany and Schenectady under the name of the Albany, Colonie & Schenectady Bus Line. It is proposed to make four round trips a day and add other buses as the demand warrants. The Albany Common Council recently passed an ordinance giving the necessary local consent.

Bus Permits Allowed.—The Illinois Power & Light Corporation has been granted formal permit by the Illinois Commerce Commission to operate buses on several Bloomington and Normal, Ill., streets and to establish a line between the two cities.

Bus Report Satisfactory.—It is announced that earnings of two buses placed in operation on June 2 over a new route by the Evanston Bus Company, a subsidiary of the Evanston Railway, are already more than equaling operating expenses.

Must Conform to Paving Rules.—The proposed plan of the Madison Railways to abandon its Harrison Street car line and substitute bus service along Regent Street met with a setback when the Common Council adopted the recommendation of its special street railway committee which requires the company to bring its tracks up to grade and make other repairs to its right-of-way in conjunction with the city's new paving work on Harrison Street between Monroe Street and Keyes Avenue.

Buses Between Omaha and Papillion. The Omaha & Lincoln Railway & Light Company, Ralston, Neb., has been authorized by the Nebraska State Railway Commission to abandon car service between Omaha and Papillion and substitute buses. The company was out of pocket $3,548 last year in operating the lines. Morning and evening a car will be run as far as Ralston, halfway to Papillion in order to keep the franchise alive. The rest of the tracks will be taken up.

Bus Franchise Granted.—The town of Easthampton, Mass., has granted a franchise to the Boston & Maine Transportation Company to run buses between Easthampton and Mount Tom Junction, to take the place of the passenger service hitherto maintained by the Boston & Maine on the branch line between these points.

Bus Extensions in Rochester.—The Rochester Co-ordinated Bus Lines, Inc., subsidiary of the New York State Railways added two lines on June 14 to its rapidly growing bus system. Service was begun on the Emerson Street extension and the Glide Street routes, both feeder lines, to serve the extreme western border of the city. The Emerson line will be extended to connect with two trolley lines. Both of these lines serve growing factory and residential districts. A half-hour running schedule will be maintained, and as traffic warrants, the schedule will be increased and equipment added.

Financial and Corporate

Foreclosure Sale Confirmed

Way to Reorganization Cleared by Federal Judge in Approving Kansas City Purchase Action

Final objections to the reorganization plan of the Kansas City Railways, Kansas City, Mo., were ruled out by Judge Kimbrough Stone on June 15 in closing the hearing on the decree confirming the sale of the property to the Kansas City Public Service Company. The court indicated that formal confirmation of the order would be made during the week ended June 19.

Actual possession of the property will not pass to the new owners until the fall. It is estimated that all the cumbersome preliminaries to the transfer cannot be accomplished in less than 60 or 90 days. The property is to be paid for by turning in first mortgage bonds. While these bonds largely have been assembled in depositories in larger cities, there are some 40,000 separate bonds. Their careful handling, checking and recording will be a matter of weeks.

After John T. Harding, special master commissioner, takes over the funds in the receivers' treasury and makes the necessary disbursements, including various allowances, the new purchasers of the property are allowed 30 days to assemble and transport the bonds to Kansas City. Mr. Harding has been granted two months in which to check these before issuing a deed to the Kansas City Public Service Company.

Compensation to the receivers and other parties who have served directly or indirectly as officers of the court in connection with the receivership will be made the subject of a special order, expected to be signed within a few days.

Five Kansas City business men, including R. A. Long, chairman of the board of the Long Bell Lumber Company, testified before the court on June 14, estimating the value of the receivers' services at from $50,000 to $75,000 a year apiece. Receivers Fred W. Fleming and Francis M. Wilson, F. G. Buffe, general manager, and several department heads testified regarding the accomplishments of the receivership. Each receiver has been paid to date $115,000. Their services now are in the ninth month of the sixth year.

On June 14 the Continental & Commercial Trust & Savings Bank, Chicago, trustee under the first mortgage, asked $35,000 as a fee for services it had rendered. The fee applied for in behalf of R. J. Higgins, counsel for the first mortgage trustees, was also $35,000. The firm of Mayer, Meyer, Austrian & Platt, attorneys for the first mortgage bondholders, asked a fee for a similar sum. The fee for services of both receivers, of James E. Goodrich, counsel for receivers, Charles L. Carr, assistant to Judge Goodrich, and others to whom final allowances will be made have been left to the discretion of the court.

The decree confirming the sale of the railway to Kansas City Public Service Company was signed by Judge Stone late Wednesday. Allowances were made as follows: To receivers, $71,000 each in addition to amount already paid; to Judge Goodrich, $59,000 in addition to amount already paid; to C. L. Carr, $3,000; to Continental Bank, $5,000; to Mayer & Platt, $35,000; to R. J. Higgins, $35,000; to John Harding, $6,500 in addition to amount already paid; to E. F. Swinney, $10,000; to William G. Holt, attorney for the Armour interests, $10,000; three other minor allowances.

City Moves in Rochester Valuation Case

The city of Rochester, N. Y., has made its first court move in its long-standing suit for a reappraisal of the valuation of the Rochester lines of the New York State Railways under which the present service-at-cost contract between the city and the railways was fixed.

The question submitted to Supreme Court Justice Adolph J. Rodenbeck was to determine whether by deferred action the city had not forfeited its right to ask revaluation. George Draper, assistant corporation counsel, argued for the city that action for the suit was in reality instituted within the first two years of the contract. Should Justice Rodenbeck rule that the city had acted in time, the city's fight would start in earnest, Mr. Draper said. The reappraisal would entail employment of experts at heavy cost to both sides. James F. Hamilton, president of the railway, recently made a compromise offer to obviate the necessity of a suit, but his proposal was rejected by the city.

The city contends that in the original base valuation of $19,216,000, made five years ago, the appraisers failed to make proper allowance for depreciation. The railways was willing to compromise at $1,000,500 less than this figure although Mr. Hamilton said he believed the original appraisal to be fair. His motive in making the offer, he said, was to eliminate a long and costly litigation.

Local Banks Gets Jacksonville Bonds

Consideration of bids for the $55,000 bond issue authorized to apply on the purchase price of the four new cars which have been added to the rolling stock of the Municipal Railway of South Jacksonville, Fla., was recently undertaken by the City Council. As a result the Florida South Side Bank, whose bid of $54,367.50 was the highest submitted, was awarded the issue. The bonds are of $1,000 denomination and will mature July 1, 1955. The road is run under a lease from the city which guarantees the operator against loss.

$41,175 Balance Reported by Indianapolis Street Railway

Total net earnings of the Indianapolis Street Railway, Indianapolis, Ind., for the year ended Dec. 31, 1925, less taxes were $1,116,924. This compares with $1,120,072 for the year 1924. The balance for 1925, after all deductions, was $41,175. These facts are contained in the report of the company presented at the annual meeting of the stockholders on June 9, 1926.

On account of the large decrease in revenue from city passenger fares and the transfer charge of 1 cent, shown in the report under "Earnings and Operating Expenses," it was found necessary, as a partial relief, to petition the Public Service Commission on Nov. 17, 1925, to allow a charge of 2 cents instead of 1 cent for each transfer.

After a full hearing this was granted, beginning Jan. 1, 1926. It is estimated that this increase should produce $150,000 additional revenue per annum, but thus far in 1926 the falling off in revenue passengers and the added expense of running the Broad Ripple line and operating buses have more than absorbed all of this increase.

In order to serve outlying territory and to protect itself from further en-

INCOME ACCOUNT OF THE INDIANAPOLIS STREET RAILWAY FOR YEAR ENDED DEC. 31, 1925

Gross Earnings:	Year 1925
Passenger receipts—city lines	$4,754,227
Transfer receipts—city lines	176,492
Track rentals interurban passenger cars	110,301
Track rentals interurban freight cars	54,675
Chartered cars	1,317
Advertising	31,020
Dog permits, etc	1,299
Rent of land and buildings, miscellaneous	27,753
Rent of terminal building and stations	236,469
Sale of power	6,910
Rent of equipment	2,045
Miscellaneous income	104
Receipts, Broad Ripple line	86,142
Bus receipts	40,966
Interest, discount, etc	6,649
Total	$5,536,369
Operating Expenses:	
Maintenance of way and structures	$631,678
Maintenance of equipment	517,988
Special maintenance, per order of Public Service Commission of Indiana	20,708
Operation of power plant	734,466
Operation of cars	1,682,517
General expense	445,464
Total	$4,032,821
Net earnings	$1,503,548
Less taxes	386,624
Total net earnings, less taxes	$1,116,924
Deductions—Bond Interest:	
Interest on $4,000,000 Citizens Street Railroad 5s	$200,000
Interest on $4,664,000 Indianapolis St. Ry. Co'a. 4s	188,030
Interest on $3,635,000 Indianapolis Trac. & Term. Co'a. 5s	181,919
Interest on $200,000 Broad Ripple Traction Co'a. 5s	10,000
Interest on trust equipment notes	3,798
Interest on Indianapolis Car Equipment Company Preferred stock	5,450
Intercst on notes, etc	39,986
Total deductions	$629,193
Surplus (exclusive of accrued depreciation)	$487,741
Deduction from Surplus:	
Indianapolis Street Railwny sinking fund	$76,666
Indianapolis Traction & Terminal Co. sinking fund	69,900
Dividends paid on $5,000,000 preferred stock 1925	150,000
Dividends unpaid on $5,000,000 preferred stock 1925	150,000
Total deduction	$446,566
Balance	$41,175

croachments of independent bus lines the company has established seven feeder bus lines, connecting with the company's street cars at certain points, and has also put in operation three through bus lines reaching the center of the city. This service has required the purchase of 30 buses at a cost of $270,000.

There have been no quarterly dividends paid on the preferred stock of the company since June 1, 1925, on account of decreased earnings, due to the constantly increasing use of privately owned automobiles, more or less unemployment and the very serious inroads made by independent bus competition.

STATEMENT OF GROSS EARNINGS, MAINTENANCE, OPERATION AND TAXES OF THE INDIANAPOLIS STREET RAILWAY

Earnings	1925	1924
Passenger receipts—city lines	$4,754,227	$4,804,890
Transfer receipts—city lines	176,492	246,110
Miscellaneous earnings—track rentals, etc	605,649	537,175
Gross earnings	$5,536,369	$5,588,176
Maintenance of way and structures	$631,678	$631,201
Maintenance of equipment	517,988	516,272
Special maintenance expended from revenue from increased fares by order of Public Service Commission	20,708	122,910
Total maintenance	$1,170,375	$1,270,384
Operation of power plant	$734,466	$771,997
Operation of cars	1,682,517	1,616,028
General expenses	445,462	425,338
Total operating expenses	$4,032,821	$4,083,749
Net earnings	$1,503,548	$1,504,427
Less taxes	386,624	384,354
Net earnings, less taxes	$1,116,924	$1,120,072

The building owned by the company adjoining the passenger terminal station on Market Street, which was formerly used as an interurban freight house, was remodeled during the year 1925 for the accommodation of buses operated by the various interurban companies and certain other bus lines. The facilities afforded by this change have attracted nearly all of the bus lines running out of Indianapolis so that at present it is the principal bus terminal operating in the city, the only other bus terminal in the city being the small one on Kentucky Avenue, which was used by the independent bus lines when they started. It is explained that the volume of business should result in increased revenue from terminal charges and added value to the rental privileges in the Terminal Building, as well as to the rent of offices.

The company has at present 26 one-man safety cars in service. These are used on lines where travel is not heavy. Some 80 more cars will be converted for one-man operation. This will, it is expected, result in a substantial saving in operating expenses.

Original Valuation in Buffalo Holds.—The International Railway, Buffalo, N. Y., has lost its fight to have the Public Service Commission increase the valuation of its system as fixed by the commission several years ago. The company sought a higher valuation to lay the basis for a fare increase on its local lines in Buffalo. The state utilities board ruled that the original valuation must be sustained.

Lower Balance on Kansas City Interurban

While the operating results of the Kansas City, Clay County & St. Joseph Railway, Kansas City, Mo., for the year ended Dec. 31, 1925, show a decrease in business for the year as a whole, conditions changed for the better beginning about Oct. 1, and a comparison of the last three months shows an increase over a similar period for 1924 in gross revenue and net income, revealing an earned surplus in excess of dividend requirement for the three months. This was the opening statement in the annual report to the stockholders for the year ended Dec. 31, 1925.

The total number of passengers carried in 1925 was 1,660,991, against 1,936,875 in 1924. The earnings, however, will show a greater per cent of decrease due to decrease of through passengers and an increase of commuters. The passenger business shows an increase in number in October, November and December over the corresponding months in 1924. The report states that as an item of interest there were 781,945 passengers carried on the Excelsior Springs division of the electric railway during the year, or about twice the number carried on all bus lines operating over the same territory.

The Kansas City, Clay County & St. Joseph Auto Transit Company, while working in conjunction with the railway, is a separate corporation. The Auto Transit Company is operating three coach or bus lines—one between Kansas City and Excelsior Springs, a distance of about 30 miles; another between Kansas City and Parkville, a distance of about 10 miles, and a third from Kansas City via Smithville and Gower to St. Joseph, Mo., a distance of about 60 miles.

SUMMARY OF RESULTS FROM OPERATION OF THE KANSAS CITY, CLAY COUNTY & ST. JOSPEH RAILWAY, 1924 AND 1925

	1925	1924
Railway operating revenue:		
Transportation revenue St. Joseph division	$676,076	$692,929
Transportation revenue Excelsior Springs division	190,121	277,130
	$866,197	$970,060
Other operating revenue St. Joseph division	5,936	5,665
Other operating revenue Excelsior Springs division	2,282	2,154
	$8,218	$7,820
Total operating revenue	$874,415	$977,880
Railway operating expense:		
Way and structures	$91,380	$85,569
Equipment	64,249	61,866
Power	108,313	114,906
Conducting transportation	196,259	211,144
Traffic	9,496	10,157
General and miscellaneous	128,849	128,887
*Depreciation	17,324	44,645
Taxes (except income taxes)	26,182	29,837
Total	$642,055	$687,014
Operating income	$232,360	$290,866
Non-operating income:		
Interest funded securities	2,579	5,105
Interest unfunded securities	7,765	6,328
Total	$10,344	$11,433
Gross income	$242,705	$302,299
Deductions from gross income:		
Interest	160,318	161,402
Miscellaneous	3,215	3,257
Total	$163,534	$164,659
Net income	$79,170	$137,639
Less estimated income taxes	.....	5,000
Balance available for surplus and dividends	$79,170	$132,639

The auditors have taken accrued depreciation less expenditures for renewals and replacements, $42,085 for 1924 and $17,324 for 1925, as appropriations of surplus—add these amounts and minor adjustments of $137 and $41 respectively, to check their surplus net income.

40-Mile Connecticut Interurban to Quit

The Hartford & Springfield Street Railway, Warehouse Point, Conn., has been granted permission by Judge Isaac Wolfe in the Superior Court to discontinue all railway service on its lines after June 25. At the present time the company is operating an electric service between Warehouse Point and Rockville and from Warehouse Point to Hartford. Saturdays the trolleys operate on a through schedule between Hartford and Springfield. This applies to lines on the east side of the Connecticut River. On the west side there is no railway service.

Recently the railway was acquired for $10,000 by Francis B. Cooley for the bondholders at a mortgage foreclosure sale. An effort has since been made to interest new capital and effect a suitable reorganization. These negotiations are still in progress, but difficulty arose when money was sought to repair the track and overhead lines and buy new rolling stock.

Buses have been operated with success, and during the past year $100,000 was invested in this type of carrier. Inasmuch as it would cost $1,000 a mile to repair the overhead work and $30,000 to put the track in first-class condition, it was deemed advisable to adopt the bus exclusively. Moreover, it was much easier to induce new capital to promote bus transportation than to reclaime the railway.

The railway is said to have lost $10,000 during the last seven months of its operation. On the other hand the buses are said to have operated at a profit. The latter service has suffered somewhat recently through competition from the Interstate Buses Corporation and the New England Transportation Company.

H. B. Freeman, the receiver for the railway, has applied to the Connecticut Public Utilities Commission for permission to buy six additional buses to replace the trolley service.

I.T.S Men Make Record in Placing Stock

Bearing witness to the high standing of the Illinois Traction System in the communities which it serves, the 6,139 shares of 7 per cent preferred stock of the Illinois Power & Light Corporation, which controls the Illinois Traction, sold by employees of that company in a two weeks drive during May broke all records for stock selling campaigns thus far established by the company. Of the $600,000 of stock sold more than 50 per cent was placed for cash.

One of the features of the campaign, in which only about one-third of the company's employees participated, was that there was no accompanying advertising or publicity of any kind and that the sale was made by personal contact almost entirely.

Surplus for Quarter Reported in Rochester

For the first time since the New York State Railways signed a service-at-cost contract with the city of Rochester, five years ago, a quarterly report of operations shows a surplus. The report of Charles R. Barnes, Railways Commissioner, for the quarter ended Jan. 31, 1926, reveals a surplus of $56,110. One month of operation under an increased fare is covered in the report as the rate was advanced in Rochester from 7 to 8 cents on Jan. 1.

The report shows a surplus of $61,689 from railway operations and a deficit of $5,578 in bus and trackless trolley operations. The balancing account as of Jan. 31 indicates an accumulated deficit of $311,665. As the amount of fare is determined by this balancing account, city and railway officials see no immediate possibility of any return to a lower fare in the city. According to the contract, the balancing account must show a surplus of $200,000 before a fare reduction is possible.

The total number of passengers carried, including transfer and others, for each of the three months of the quarter, was as follows:

	Railway System	Trackless Trolleys	Gasoline Buses
1925 November...	7,763,174	122,700	27,780
1925 December....	8,546,717	128,999	33,741
1926 January.....	8,365,374	126,936	35,725
Total.....	24,675,265	378,635	97,246

The total number of passengers carried during the quarter on all lines operated under the service-at-cost contract, was 25,151,146.

A summary of the surplus or deficit account for the quarter follows:

	Railway Lines	Bus Lines	Total
1925 November.....	$10,959.77 deficit	$1,776.45 deficit	$12,736.22 deficit
1925 December.....	19,553.95 surplus	2,334.56 deficit	17,219.39 surplus
1926 January.....	53,095.04 surplus	1,467.75 deficit	51,627.29 surplus
Totals.....	$61,689.22 surplus	$5,578.76 deficit	$56,110.46 surplus

A comparison of passenger revenues and revenue passengers, Railway City Lines, for the month of January, 1926, under the 8-cent fare, with January, 1925, under a 7-cent fare follows:

Passenger revenues, city lines, 1926.....	$477,681
Passenger revenues, city lines, 1925.....	452,858
Increase.....	$24,823
Per cent increase.....	5.48
The change from 7 cents to 8 cents is an increase of 14.29 per cent in fare.	
Revenue passengers, city lines, 1925.....	6,693,127
Revenue passengers, city line, 1926.....	6,199,224
Decrease in revenue passengers carried.	493,903
Per cent decrease.....	7.38
The surplus for railway lines, month of January, 1925, under 7 cent fare was..	$28,851
Month of January, 1926, under 8-cent fare was.....	53,095
An increase of.....	$24,243

This approximates the increase in passenger revenues. It is pointed out that the increase on the trolley lines for January, 1926 (8-cent fare) compared with same month in 1925 (7-cent fare) was only 5.48 per cent, while the increase in fare was 14.29 per cent. This indicated decrease in the number of passengers carried might be attributed to the increased fare. There were, however, other factors which were important in bringing about this condition.

Hopeful for Reorganized Road on Long Island

The story is no longer new of how a group of Queens business men, interested in seeing local trolley service maintained between the Rockaways and Jamaica, banded together to purchase the property of the defunct Long Island Traction Company and reorganize it and revive it as the Jamaica Central Railways, but Parke A. Rowley, vice-president of the Bank of Manhattan, in charge of its Jamaica branch, did give some facts at a hearing before Chairman John F. Gilchrist and Commissioner Leon G. Godley of the Transit Commission on June 8 that shed new light on the transaction.

The hearing was upon the application of the reorganized company for permission to issue 2,000 shares of nonpar value stock and to bond itself in the sum of $140,000 to meet the cost of the purchase of the road at receiver's sale, amounting to $115,000, and for working capital. The hearing was continued by Chairman Gilchrist to permit counsel for the railroad to furnish additional figures as to the valuation of the property.

Mr. Rowley is treasurer of the company. He testified that as a banker in Jamaica he had watched with interest previous attempts to reorganize the road that did not come to fruition. He said:

> As a banker in Jamaica I was very much interested when persons came to me and told me that the continuation of the road, which operates between Jamaica and the Rockaways, was vital for the well being of a large number of persons living to the south of Jamaica. Many had bought homes along the line of the railroad. There were mortgages on some of these homes and it appeared that the owners of all of them were likely to be without any transit if the railroad stopped operation. That meant great suffering for those people; it meant a loss for those who held the mortgages on those homes.
>
> So some of us got together, I think it was just the night before the sale of the property, and arranged to buy it in with the thought we might operate it and possibly make it pay if the greatest economy were used. So we arranged for the purchase of the property and were able to get it for $115,000, although we stood ready to bid up to $150,000. We plan to operate the road with the least overhead possible with good service. The officers have agreed not to take a cent from the treasury of the company in salaries until such time as the road is firmly on its feet. We have also stipulated among ourselves that every available cent that comes in shall be put back into the road.
>
> We took over the operation of the road on April 5, and in that month we carried approximately 40 per cent more passengers than the road carried at this time last year.

New Director Chosen.—Philip Pond was recently elected a director of the New Haven & Shore Line Railway, New Haven, Conn., to succeed A. William Sperry.

Single Track Line Will Replace Double Track.—The New Jersey & Pennsylvania Traction Company, Trenton, N. J., has been granted permission to remove one of the double tracks on North Willow Street and to maintain a single track hereafter on that street.

Service Discontinued.—The Missouri Public Service Commission has entered an order authorizing the Southwest Missouri Railroad, Joplin, Mo., to discontinue its street car service from Duquesne to Duenwig in Jasper County. Three months ago the commission ordered the company to make two round-trips in the morning and in the evening for a trial period and the fare was increased from 15 to 20 cents. The record, however, showed operating losses.

Ohio Property Sold. — All property holdings of the Cleveland, Painesville & Ashtabula Electric Railway, Cleveland, Ohio, were sold for $75,000 at a receiver's sale conducted by Harry R. Collacott, chief master at the court house of Painesville, Ohio, on April 30. Frank M. Cobb Cleveland attorney, was the purchaser. The line, 24 miles long, connects at Painesville for Cleveland with the Cleveland, Painesville & Eastern Railroad, which controls it.

Vermont Roads Taken by Forshay Interests.—Interests owning the Burlington Traction Company, the Military Post Street Railway and the Vergennes Electric Company, Burlington, Vt., have announced the sale of these properties to the W. B. Forshay Company, New York. It is understood that these properties will be consolidated into one company, known as the People's Vermont Hydro-Electric Company, which in turn will be owned by the People's Light & Power Corporation, recently organized by the W. B. Forshay Company to take over, manage and operate its utilities.

Another Participation Distribution.—The voting trustees and board of directors of New York Railways Participation Corporation, New York City, have declared a second distribution on account of its assets. This distribution will be made as of July 7, 1926, and will be made in cash at the rate of $200 for each share of the stock of the Participation Corporation held.

Valuation Argument Before Court of Appeals.—The Court of Appeals of Maryland at Annapolis on June 9 heard arguments in the case involving the valuation of the property of the United Railways & Electric Company, Baltimore, by the Public Service Commission. The commission fixed $77,000,000 as the valuation of the property and in this amount was a $7,000,000 item for easements. Clarence W. Miles, who at the time of the hearing was people's counsel, opposed including any valuation for easements and took the case to the Circuit Court of Baltimore, where the Public Service Commission was upheld. The appeal to the Court of Appeals followed.

Manhattan Railway Squaring Back Dividends.—A divident of $1.48 a share on account of accumulated dividends and the regular quarterly dividend of $1.25 a share on the modified guaranteed stock of the Manhattan Railway,

New York, will be paid on July 1 to holders of record June 15. The back dividend represents 50 cents a share on account of dividends deferred because of insufficient earnings for the quarter ended Oct. 1, 1925, and of 98 cents a share for the quarter ended Jan. 1, 1926. The 50-cent payment makes up the $5 rental for the year 1925 and the 98 cents makes up the full dividend for the Jan. 1 quarter of this year when a disbursement of only 27 cents a share was made. The dividend is a charge against the earnings of the Interborough Rapid Transit Company, by which the elevated lines are operated under lease.

Fall in Net Income.—For the ten months period ended April 30, 1926, the passenger revenue of the Brooklyn City Railroad, Brooklyn, N. Y., was $9,434,013 and $9,415,703 for the ten months period ended April 30, 1925. After the consideration of income deductions the net corporate income for the ten months period ended April 30, 1926, was $1,168,801 and $1,216,667 for the ten months period ended April 30, 1925.

Change of Name Allowed.—The Danbury & Bethel Traction Company, formerly the Danbury & Bethel Street Railway, Danbury, Conn., has been authorized by the Public Utilities Commission to change its name to the Danbury Power & Transportation Company. The company plans to issue 2,000 shares of common stock of no par value, instead of the $300,000 issue of 6 per cent preferred stock. With this change in effect the capital stock of the company will be $500,000 of 6 per cent first mortgage bonds and 5,000 shares of stock without stated par value.

Gross Corporate Income $338,996.—The San Diego & Arizona Railway, San Diego, reports to the California Railroad Commission its 1925 operating revenue at $1,361,149, compared with $1,338,061 for 1924. The operating expenses, excluding taxes, for 1925 are reported at $1,041,206 and at $999,871 for 1924, leaving net operating revenue of $319,942 for 1925 and $338,189 for 1924. During 1925 taxes charged to operation amounted to $84,633 and for 1924 to $80,176. Deducting the taxes leaves operating income of $235,309 for 1925 and $258,013 for 1924. Adding to the operating income the non-operating income of the company results in a gross corporate income of $338,996 for 1925 and $342,102 for 1924.

Earnings and Traffic Increase in May.—Fewer persons used the street cars in May than the average four-year period figure of 584,922 passengers, but the operation of auxiliary bus service enabled the Madison Railways, Madison, Wis., to show another increase in earnings and passengers carried by the railway and bus systems that month. Passengers carried during May by both systems numbered 514,395, compared with 481,460 during the corresponding month of last year. In May, 1926, 469,324 passengers were carried by the street cars. Gross earnings of the cars and buses during May were $34,949, compared with $33,840 in May of last year. Of the total May earnings $31,553 was earned by the railway line, against $31,494 for the corresponding month of last year.

Personal Items

Thomas Pumfrey New Chief Engineer at Portland

Thomas Pumfrey, appointed chief engineer of the Portland Electric Power Company, Portland, Ore., will be in entire charge of maintenance of way and equipment for the city lines, buses and interurban lines. For sixteen years now the new chief engineer has had charge of the maintenance of way department, with supervision over construction and maintenance of tracks, roadways, bridges, buildings and all engineering and drafting work. In addition to those previous duties he will now have entire charge of all rolling stock.

Before he became connected with the

Thomas Pumfrey

Portland Electric Power Company Mr. Pumfrey served as chief engineer of the International Railway, Buffalo, N. Y., from 1899 to 1910. So in a period of more than 25 years Mr. Pumfrey has been connected with only two companies. But that has been a period rich with experience. He started with the International Railway just before the Pan-American Exposition and he did his bit under Thomas E. Mitten in helping to put the Buffalo property in good physical condition to handle the exposition crowds. There he served first as acting engineer of way for the company's Buffalo lines, but it was only a short time before the responsibility was made his for caring for this work on the entire system. This was no mean job considering the extent of the system at Buffalo and the diversity of service furnished, but it supplied him with a wealth of experience which he was able to apply to his work at Portland, where the railway system was somewhat similar in extent and character to that at Buffalo.

It was in August, 1910, that Mr. Pumfrey went to Oregon. His first title there was engineer of maintenance of way. At the outset the extent of his activities was circumscribed to the duties that are generally accepted as coming under that title, but as time went on the field of his operations was widened and his appointment as chief engineer was a formal recognition not only of the loyal service of the man but of his capacity for work and his engineering talent.

J. W. Carpenter Heads Dallas Railway

John W. Carpenter was elected president of the Dallas Railway, Dallas, Tex., at a meeting of the board of directors on June 12. The position of president has been vacant for some time.

C. W. Hobson resigned as chairman of the board of the railway and his resignation was accepted. He explained that since the General Electric Company has disposed of its stock in the local concern, he, as the Southwestern manager of the larger company, did not need to continue as a railway executive.

Richard Meriwether, who has been general manager of the Dallas Railway since its organization in 1917, will continue to serve in that capacity and as vice-president.

No change in the operating organization under Mr. Meriwether's management is contemplated. Mr. Carpenter's endeavor will be directed to the company's affairs to the end that the city of Dallas may have the best possible transportation service. His responsibilities as vice-president and general manager of the Texas Power & Light Company will not be affected by being identified with the Dallas Railway.

J. E. Allbritton was recently appointed assistant instructor of the transportation department of the Birmingham Electric Company, Birmingham, Ala., to co-operate with C. L. Luker, chief instructor, in training new men for train service and in improving the quality of the work of men already in the service. Mr. Allbritton has been associated with the Birmingham company since 1908.

R. L. Leach, formerly assistant superintendent of distribution of the Georgia Railway & Power Company, Atlanta, Ga., has been promoted to general stores keeper to succeed E. L. Fariss, resigned. Mr. Leach joined the forces of the Georgia company fifteen years ago. In 1916 he was transferred to the distribution department, where he became chief clerk and later assistant to the superintendent. Early this year he was transferred to the stores department.

E. L. Austin, formerly an official of the Philadelphia Rapid Transit Company, Philadelphia, Pa., was appointed director in chief of the Sesqui Exposition, Philadelphia, on June 15 to succeed the late Capt. Asher C. Baker. The appointment was made by Mayor Kendrick and will be sent to the board of directors of the Sesqui on June 21 for confirmation. Mr. Austin was formerly business manager. He was appointed comptroller of the Sesqui last June.

Manufactures and the Markets

News of and for Manufacturers—Market and Trade Conditions
A Department Open to Railways and Manufacturers
for Discussion of Manufacturing and Sales Matters

Mack Is Optimistic for Summer Months

Sale of Mack buses to traction companies during the past few weeks has been quite active, according to officials of the International Motor Company. It is the opinion of these officials that the summer season will see a considerable increase over the number of buses sold to electric railways as compared with similar business last year. The following sales were made to traction companies recently:

Public Service Transportation Company, New Jersey 5
Pittsburgh Motor Coach Company (Pittsburgh Railways) 4
Conestoga Transportation Company, (Conestoga Traction Company)..... 2
North Branch Bus Company (Lehigh Traction Company) 8

Bids Wanted for 100 Buses for Buffalo

Bids for the purchase of 100 buses will be asked by the city of Buffalo, N. Y., as soon as the specifications are prepared. The City Council voted unanimously to authorize Mayor Frank X. Schwab to advertise for bids after the Mayor issued an order declaring a transportation emergency exists in Buffalo due to the alleged failure of the International Railway to provide adequate service on its local lines.

The City Council also authorized the corporation counsel to inform the Public Service Commission and the International Rai way that the Mayor and the Council would not be responsible for deaths or injuries resulting from the condition of the rolling stock and trackage of the International Railway.

The action of the municipal authorities was taken in spite of the adverse decision of the city law department that the City Council is without authority to own and operate bus lines in the city, but in unanimously adopting the resolution the Mayor and members of the City Council indicated they hoped to bring the question squarely before the courts.

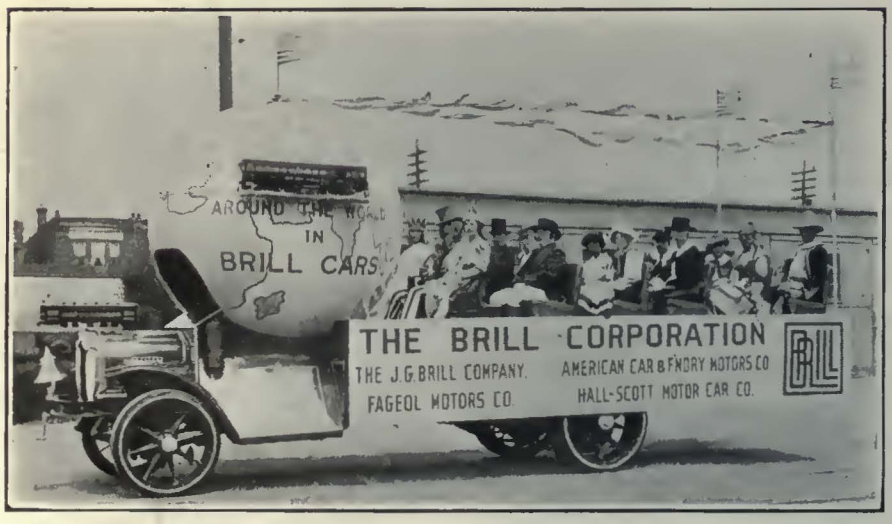
E. M. Herr Comments on Westinghouse Prospects

At the annual meeting of stockholders held recently in the main works of the Westinghouse Electric & Manufacturing Company, Pittsburgh, Pa., E. M. Herr, president of the company, stated that business would probably maintain a satisfactory level during the ensuing year. He went on to say:

Business on the whole is rather b tter than was expected and is on the same basis as last year. Our company has maintained a level volume and now has a satisfactory load for its facilities. Due to seasonal conditions, we may expect a slight decrease in business during the summer months. Crop conditions in the fall will determine, to a certain degree, business conditions at that time. If crops are small bus ness w ll probably be at a lower level, although there will not be a large decrease even under adverse conditions.

At the meeting the following directors, whose terms had expired, were re-elected: F. A. Merrick, vice-president and general manager Westinghouse Electric & Manufacturing Company; R. B. Mellon, president Mellon National Bank, Pittsburgh, Pa.; George M. Gerity, president American Rolling Mill Company, Middletown, Ohio; Jerome J. Hanauer of Kuhn, Loeb & Company, New York, N. Y.

J. G. Brill Enters Picturesque Float in Philadelphia Pageant



AN INTERESTING feature of the industrial pageant held in Philadelphia, Pa., on June 3 in honor of the Sesqui-Centennial celebration was a float of the J. G. Brill Company. Uncle Sam manually controlled the car moving around the world, and he was at the same time in a motorman's position on the "car" behind the world, thus expressing the thought that he led the representatives of the different countries. These representatives, riding on the body of the float, were seated on Brill seats.

Yellow Coach to Increase Capital Stock—G.M. Absorb Fisher Body

The organization of a new $30,000,000 transportation enterprise by the Yellow Truck & Coach Manufacturing Company and backed by the General Motors Corporation, of which it is a subsidiary, was made public on June 8 by John D. Hertz, chairman of the board. In this connection it is proposed to increase the capital stock of the Yellow Truck & Coach Manufacturing Company to provide $14,000,000, of which $10,000,000 is to be made immediately available for the new enterprise. It is interesting to note that this is the first time that General Motors interests have engaged in the business of operating transportation. The new company is known as the Hertz Drivurself Corporation and will act as a holding company, controlling state and local Drivurself companies throughout the United States.

In addition to this new enterprise it was voted at a special meeting of stockholders of the Fisher Body Corporation to dissolve the corporation and to sell to the General Motors Corporation all of the assets of the Fisher Body Corporation, taking in payment 1,600,000 shares of common stock of the General Motors Corporation. Upon dissolution of the Fisher Body Corporation, this General Motors common stock will be distributed to stockholders of the Fisher Body Corporation on the basis of one share of General Motors for each 1½ shares of Fisher Body.

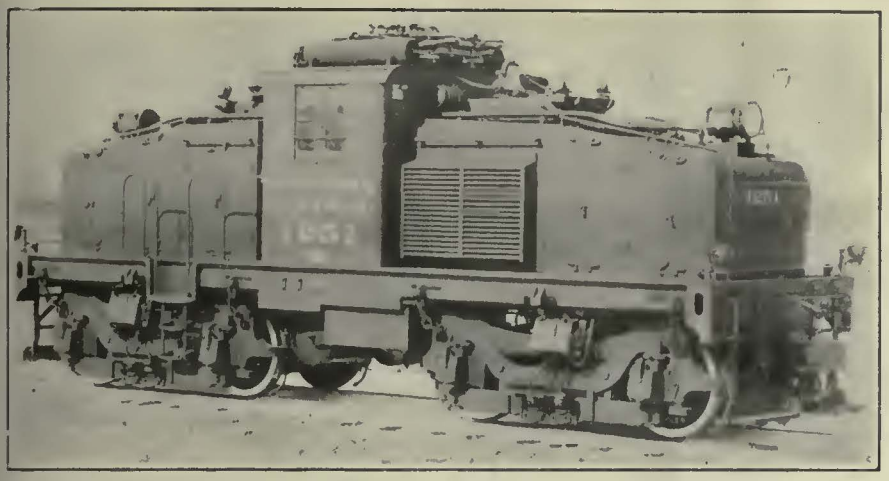
Haskelite Is Standard on Chicago Surface Lines

Haskelite was specified for the roofs, bulkheads and corner linings of the 100 new cars recently ordered by the Chicago Surface Lines, Chicago, Ill. Other principal specifications on these cars were published in the issue of the ELECTRIC RAILWAY JOURNAL for May 22. Haskelite has been specified as standard on the Chicago Surface Lines for the past four years.

Switching Electric Locomotives for the New York Central

Delivery was recently made to the New York Central Railroad of seven 600-volt 100-ton switch engines for use in switching service on the electrified portions of the line between Harmon and New York. These locomotives were built by the American Locomotive Company and the electrical apparatus supplied by the General Electric Company.

The electric equipment consists of four GE-286-A motors, with 72-17 gearing. P.C.L. three-speed control is provided, with eleven, seven and eight steps, and two reduced field running steps on each full field connection. The platforms on the locomotives are made



Exterior View of 100-Ton Switching Electric Locomotive for New York Central

ACCEPTANCE TESTS OF CLASS Q ELECTRIC LOCOMOTIVES

Equipped with 4 G. E. 286-A Motors

	Run No. 1	Run No. 2	Run No. 3	Run No. 4
Date	April 18, 1926	April 18, 1926	April 18, 1926	April 18, 1926
Extent of run	Harmon to Marble Hill	Marble Hill to Harmon	Harmon to Marble Hill	Marble Hill to Harmon
Locomotive No.	1250	1250	1250	1250
Number of cars	54 { 37 empty 14 loaded 3 cabooses	54 { 37 empty 14 loaded 3 cabooses	53 { 37 empty 13 loaded 3 cabooses	53 { 37 empty 13 loaded 3 cabooses
Weight of cars, tons	1,474	1,474	1,438	1,438
Weight of locomotive	100	100	100	100
Weight of train	1,574	1,574	1,538	1,538
Number of stops	5	5	5	5
Total length of stops	12'-9"	11'-28"	12'-1"	14'-41"
Elapsed time	1-22'-25"	1-14'-37"	1-14'-25"	1-17'-18"
Maximum speeds, m.p.h.	28-32.4	28.3-30.7	29.5-33.5	26.2-30.9
Voltage for above speeds	605-640	580-645	550-690	500-680
Watt-hours per trailing ton-mile	29.5	26.7	25	25.4
Exploring Coil Temperatures				
Motor armature	1 C.	2 C.	3 C.	4 C.
Temperature at end of run				
Motor No. 1	94 C.	97 C.	96 C.	95 C.
Motor No. 2	92.5 C.	88 C.	94 C.	90 C.
Air temperature	9 C.	8 C.	10 C.	10 C.

by the Commonwealth Steel Company. The motors have a continuous rating of 430 amp. and the hourly rating is 460 amp. Fifteen-hundred-volt insulation is provided on the contactors and motors.

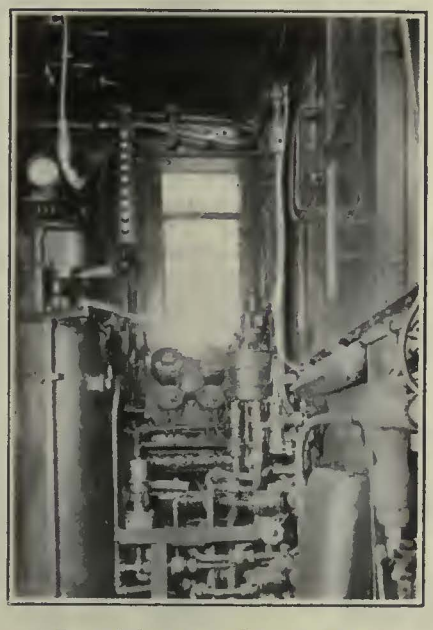
The locomotives are capable of hauling a 1,500-ton train at 25 m.p.h., at an average voltage of 575. It is expected that the locomotives can do better than 25 m.p.h. over the profile of the New York Central electrified division. The new locomotives are provided with both overhead and third-rail collectors.

For the purpose of checking the heating of the motors, four acceptance test runs were made on April 18, 1926, between Harmon and Marble Hill. The weight of the test train was approximately 1,500 tons and was made up of 37 empty and seventeen loaded cars. Five two-minute intermediate stops were made with a layover at each end of each run of seventeen minutes. The length of each run was 23.5 miles. Indicating and recording instruments were installed on a caboose attached to the locomotive to obtain speed, voltage, current temperature of motors and kilowatt-hours, etc. The results of these runs showed the locomotive well within the specified requirements.

The more important characteristics of these switching electric locomotives will be found in an accompanying table.

In addition to the switching locomotives, which have just been delivered, ten passenger electric locomotives are in process of construction as well as two 170-ton road freight electric locomotives. The passenger locomotives will be of a type similar to those in operation on the New York Central Lines.

Type.....Double truck, four 44-in. wheels
Length over coupler faces.....38 ft.
Truck center .....20 ft.
Total wheelbase .....28 ft. 3 in.
Total weight .....100 tons
Weight on drivers .....100 tons
Horsepower per locomotive 1,330
Motors..Four GE-286-A 660-volt multipolar geared
Gear ratio .....4.235; gear, 72; pinion, 17
Capacity.....1,500 tons on 575 volts
Speed:
Design 25 m.p.h. with 1,500 tons trailing load.
Test 35 m.p.h. with 1,500 tons trailing load..
Safe operating speed (light).....40 m.p.h.
Acceleration.....0.18 m.p.h.p.s.
Tractive effort with 20 per cent adhesion 40,000 lb. per locomotive.
Watt-hours per ton-mile—25 to 29.5 on four test runs.



Control Apparatus in Locomotive

Yellow Sales Total 30 Buses to Electric Railways During May

The following sales of bus equipment to electric railway properties are reported for the month of May by the Yellow Truck & Coach Manufacturing Company, Chicago, Ill.:

Connecticut Company, New Haven, Conn., five Z-29-passenger city service coaches.

Dominion Power & Transmission Company, Hamilton, Ont., Canada, nine X 21 city service chassis.

Michigan Electric Railways, Jackson, Mich., two X-21-passenger city service coaches.

Wisconsin Public Service Company., Milwaukee, Wis., one X-21-passenger city service coach.

Chicago, Aurora & Elgin Railroad, Aurora, Ill., one "Y" parlor coach.

Springfield Street Railway, Springfield, Mass., two Z-29-passenger city service coaches.

San Antonio Public Service Company, San Antonio, Tex., seven X-21-passenger city service coaches.

Colorado Springs & Interurban Railway, Colorado Springs, Col., three "X" parlor coaches.

Ohio Brass Issues Rail Poster

An instruction poster describing the difference between the steel metallic and copper metallic arc welding processes and illustrating the proper method of applying the Titon and AW-12 arc weld bonds has just been published by the Ohio Brass Company, Mansfield, Ohio. The poster is intended as a guide for welders responsible for the installation of rail bonds. Copies are available without cost and will be mailed upon request to the company.

General Tire Gets Cincinnati Contract

The largest contract for automobile tires ever placed in Cincinnati, Ohio, has been awarded by the Cincinnati Street Railway for its motor buses. The contract is for two years and the total amount in money exceeds $250,000. The contract was awarded to the General Tire Company, Akron, Ohio, through the firm of Sohngen & Bischoff, its Cincinnati representative. It was estimated that approximately 3,000 tires would be used. The size of the tires is 34 in. x 7 in. on the six-wheel buses and 36 in. x 6 in. on the four-wheel buses.

Westinghouse Officials Move to New York

Further steps in the reallocation of the Westinghouse Electric & Manufacturing Company's sales department, under the recently announced reorgan-

ization plan, have been taken with the transfer of three officials of this department from Pittsburgh to New York City. The officials are Myles B. Lambert, transportation sales manager; E. H. Froebel, central station sales manager, and Bernard Lester, industrial sales manager.

Rolling Stock

Arkansas Central Power Company, Little Rock, Ark., has received six of its order of 30 cars from the American Car Company, St. Louis, Mo. These are single-entrance safety cars with an over-all length of 28 ft. 6½ in. The other cars are in the paint shop and delivery will be made shortly.

Morris County Traction Company, Morristown, N. J., has received five street car type buses during the period from May 15 to May 31. These buses were purchased from the Fageol Company of Kent, Ohio.

San Francisco, Cal.—Bids for fifteen new Municipal railway cars will be called for by the Board of Works within a short time. This action follows the appropriation of $255,000 for this purpose by the finance committee of the Board of Supervisors.

Butte Electric Railway, Butte, Mont., has received one six-cylinder street car type bus from the Fageol Motors Company of California.

Los Angeles Motor Bus Company, Los Angeles, Cal., a subsidiary of the Los Angeles Railway and the Pacific Electric Railway Companies, received delivery in May of two double-deck Fageol buses from the Fageol Motors Company, Oakland, Cal. They were equipped with Westinghouse air brakes.

Track and Line

Connecticut Company, New Haven, Conn., is planning to start work soon on laying double track for its line on Forbes Avenue, New Haven.

San Francisco, Cal.—Contract for the 4,232-ft. Duboce rapid transit tunnel, to open the Sunset District for more rapid residential development, has been signed. The estimated cost is $1,650,000. It is proposed to have cars of the Market Street Railway operating through the tunnel within fifteen months, reducing the time of travel from the Pacific Ocean beach terminal to the San Francisco ferry building from five to 39 minutes over this route. Traffic intensity will determine the degree of reduction.

Evanston Railway, Evanston, Ill., will soon undertake the extension of its Central Street line from Lincolnwood Drive to Ridge Road, a distance of approximately ¾ mile. The thoroughfare is unimproved, but the company will pave the width of its single track with asphalt. All materials for construction are on hand.

United Railways & Electric Company, Baltimore, Md., and the city of Baltimore will share the expense of relocating car tracks on streets that are to be widened in acordance with an agreement ratified by the City Council. It is planned to shift the car tracks to the center of a number of the streets that are to be widened. The agreement was drawn some time ago and was approved by the Board of Estimate. Then it was submitted to the City Council for ratification.

Piedmont & Northern Railway, Charlotte, N. C., will spend $75,000 on a track expansion project on South Mint Street. The laying of 4 miles of additional track and the construction of an automobile unloading platform will make up the improvement program.

Cincinnati, Ohio.—An ordinance to amend the electric railway franchise and to accelerate the track construction program of the Cincinnati Street Railway has been introduced in the City Council. The measure allows the railway $400,000 additional in 1926 and reduces the sum it may spend in later years on track repair work. The franchise requires the railway to spend $1,750,000 in track rebuilding over a four-year period.

Milwaukee Electric Railway & Light Company, Milwaukee, Wis., has announced a city-wide track reconstruction program which will cost more than $1,000,000. Reconstruction of the track zone on East Water Street, costing approximately $55,000, is practically completed. New rails and paving of the track zone costing $15,000 will take place on Layton Boulevard. This work is being done in connection with the city's plan to eliminate the raised parkway in the center of the boulevard. When this is completed work will be switched to the extension of the Center Street double-track line, costing $45,000. Other major track improvements outlined in the program for completion this summer approximate $300,000. Suburban lines also will come in for their share of improvements. To provide transportation for the rapidly growing district of Whitefish Bay, served by the Oakland-Delaware line, new tracks will be laid on Washington Avenue. This work will cost $13,000.

Trade Notes

Gibb Welding Machines Company, Bay City, Mich., manufacturer of electric arc, spot and seam welders, broke ground June 10 for an addition to its factory that will more than double its present floor space.

Maurice N. Trainer, has resigned as representative of the eastern district of the sales department of the American Brake Shoe & Foundry Company, headquarters New York office, and has been elected vice-president of the American Malleables Company with headquarters at Lancaster, N. Y. The American Malleables Company is a subsidiary of the American Brake Shoe & Foundry Company.

New Advertising Literature

The Spicer Manufacturing Corporation, South Plainfield, N. J., has issued a price list on Spicer parts for the type M cushioned coupling.

Okonite Company, Passaic, N. J., has issued a series of leaflets stressing the advantages to be obtained from the use of Okocord, Manson tape, Dundee A friction tape, Dundee B friction tape, Okonite tape and Okonite cement. Copies of these leaflets, which are prepared in a very interesting fashion, are available to all who may desire them and will be mailed upon request by the Okonite Company.

ELECTRIC RAILWAY MATERIAL PRICES—June 15, 1926

Metals—New York

Copper, electrolytic, cents per lb.	14.025
Lead, cents per lb.	8.20
Nickel, cents per lb.	35 00
Zinc, cents per lb.	7 57
Tin, Straits, cents per lb.	61 125
Aluminum, 98 to 99 per cent, cents per lb.	27.00
Babbitt metal, warehouse, cents per lb.:	
Commercial grade	54 00
General service	30.50

Bituminous Coal

Smokeless mine run, f.o.b. vessel, Hampton Roads	$4.325
Somerset mine run, Boston	1 875
Pittsburgh mine run, Pittsburgh	1 75
Franklin, Ill., screenings, Chicago	1.80
Central, Ill., screenings, Chicago	1 75
Kansas screenings, Kansas City	2.425

Track Materials—Pittsburgh

Standard steel rails, gross ton	$43.00
Railroad spikes, drive, Pittsburgh base, cents per lb.	2 90
Tie plates (flat type), cents per lb.	2.35
Angle bars, cents per lb.	2.75
Rail bolts and nuts, Pittsburgh base, cents, lb.	4.25
Steel bars, cents per lb.	2.00
Ties, white oak, Chicago, 6 in.x8 in.x8 ft.	$1.35

Hardware—Pittsburgh

Wire nails, base per keg	2.65
Sheet iron (28 gage), cents per lb.	3.10
Sheet iron, galvanized (28 gage), cents per lb.	4.30
Galvanized barbed wire, cents per lb.	3.35
Galvanized wire, ordinary, cents per lb.	2.50

Waste—New York

Waste, wool, cents per lb.	12–18
Waste, cotton (100 lb. bale), cents per lb.:	
White	13–17.50
Colored	10–14

Paints, Putty and Glass—New York

Linseed oil (5 bbl. lots), cents per lb.	11.85
White lead in oil (100 lb. keg), cents per lb.	15.00
Turpentine (bbl. lots), per gal.	$0.89
Car window glass, (single strength), first three brackets, A quality, discount*	84.0%
Car window glass, (single strength), first three brackets, B quality, discount*	86.0%
Car window glass, (double strength) all sizes, A quality, discount*	85.0%
Putty, 100 lb. tins, cents per lb.	4–6

* Prices f.o.b. works, boxing charges extra.

Wire—New York

Copper wire, cents per lb.	16.00
Rubber-covered wire, No. 14, per 1,000 ft.	$6.25
Weatherproof wire base, cents per lb.	18.00

Paving Materials

Paving stone, granite, 5 in. New York—Grade 1, per thousand	$147
Wood block paving 3½, 16 lb. treatment, N. Y., per sq.yd.	$2.70
Paving brick 3½x8½x4, N. Y., per 1,000 in carload lots	51.00
Paving brick 3x8½x4 N.Y., per 1,000 in carload lots	45 00
Crushed stone, ¾-in., carload lots, N. Y., per cu.yd.	1.85
Cement, Chicago consumers' net prices, without bags	2.10
Gravel, ¾-in., cu.yd., f.o.b. N. Y.	1.75
Sand, cu.yd., f.o.b. N. Y.	1.00

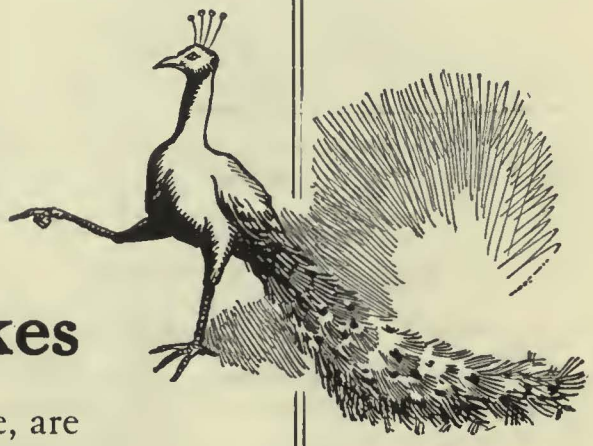
Old Metals—New York and Chicago

Heavy copper, cents per lb.	11 50
Light copper, cents per lb.	9 75
Heavy brass, cents per lb.	7 125
Zinc, old scrap, cents per lb.	4 25
Lead, cents per lb. (heavy)	7 25
Steel car axles, Chicago, net ton	$17 25
Cast iron car wheels, Chicago, gross ton	15 25
Rails (short), Chicago, gross ton	16 25
Rails, (relaying), Chicago, gross ton	25.50
Machine turnings, Chicago, gross ton	6.75

PEACOCK

Equip those modern light-weight cars with

Peacock Staffless Brakes



Because they require minimum platform space, are light in weight yet have tremendous braking power, Peacock Staffless Brakes are well adapted to the modern light-weight safety car.

Because they are dependable under all conditions—even with the heaviest passenger load on the steepest grade—these brakes are a guarantee of safety in any emergency.

Peacock Staffless Brakes provide three times the power of ordinary ones and have a chain winding capacity of 144 inches which sets the brakes no matter what the brake rigging conditions may be.

Installation costs are small and maintenance costs are practically negligible.

The Peacock Staffless

Write for further particulars and for estimates on your installation.

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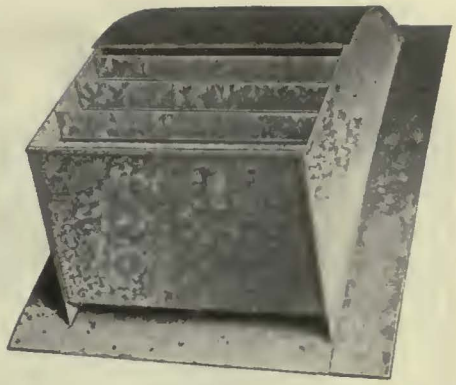

N-L Ventilators for the Modern Car

Appearance is a most important factor in choosing a ventilator for the modern car. Attempts to modernize the lines of a car are of no avail if the roof line is to be marred by clumsy, ill-appearing ventilators. N-L car ventilators, while designed to give a maximum exhaust, do not sacrifice good appearance.

The interior finish of the modern car demands that the ventilators be weather proof. N-L guarantees that their ventilators are thoroughly weatherproof, yet the ingenious water baffle does not choke up the air passage. Their ability to ventilate thoroughly is never questioned.

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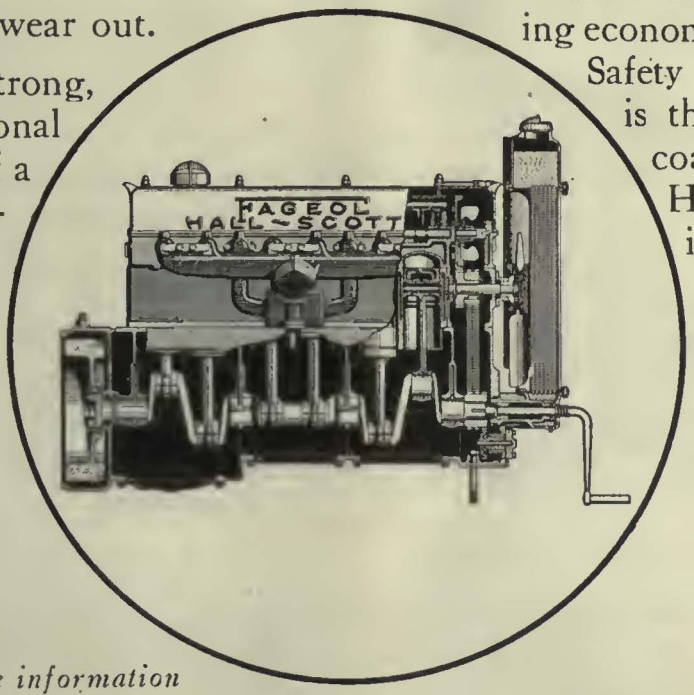
It is brutally strong, and the occasional replacement of a few simple inexpensive parts brings this engine back to new condition. This is one of the chief reasons for the recognized operating economy of the Fageol Safety Coach, which is the only motor coach in which the Hall-Scott engine is available.



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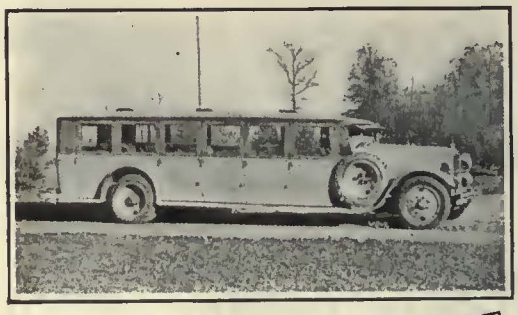
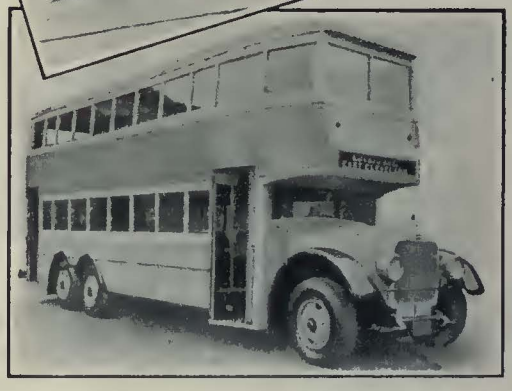
30 CHURCH STREET, NEW YORK, N. Y.

Leece-Neville Voltage Regulation Is Used On These Busses





Wherever fine busses are found—wherever operators pay close attention to the care of batteries and comfort of passengers, there you will find Leece-Neville voltage regulation.

Makers of good busses either install it as regular equipment, or provide a mounting to receive it, because they know the favor it holds with operators.

It prolongs life of battery by preventing overcharge, goes as far as possible in insuring that batteries are always fully charged, keeps lights steady and unwinking. Lessened battery costs alone will pay for it in a short time.

There is a Leece-Neville Service Station near you. Write for its name. There you can see a demonstration of Leece-Neville voltage regulation and starting and lighting equipment.

The Leece-Neville Co.

CLEVELAND, OHIO

Double-deckers for Akron

The Six-Wheel Company of Philadelphia announces another important contribution to the motor bus industry.

A one-man operated fully-enclosed double-deck motor coach on pneumatic tires. Full headroom both decks.

The first of this new type has been delivered to The Northern Ohio Power & Light Co., Akron, Ohio

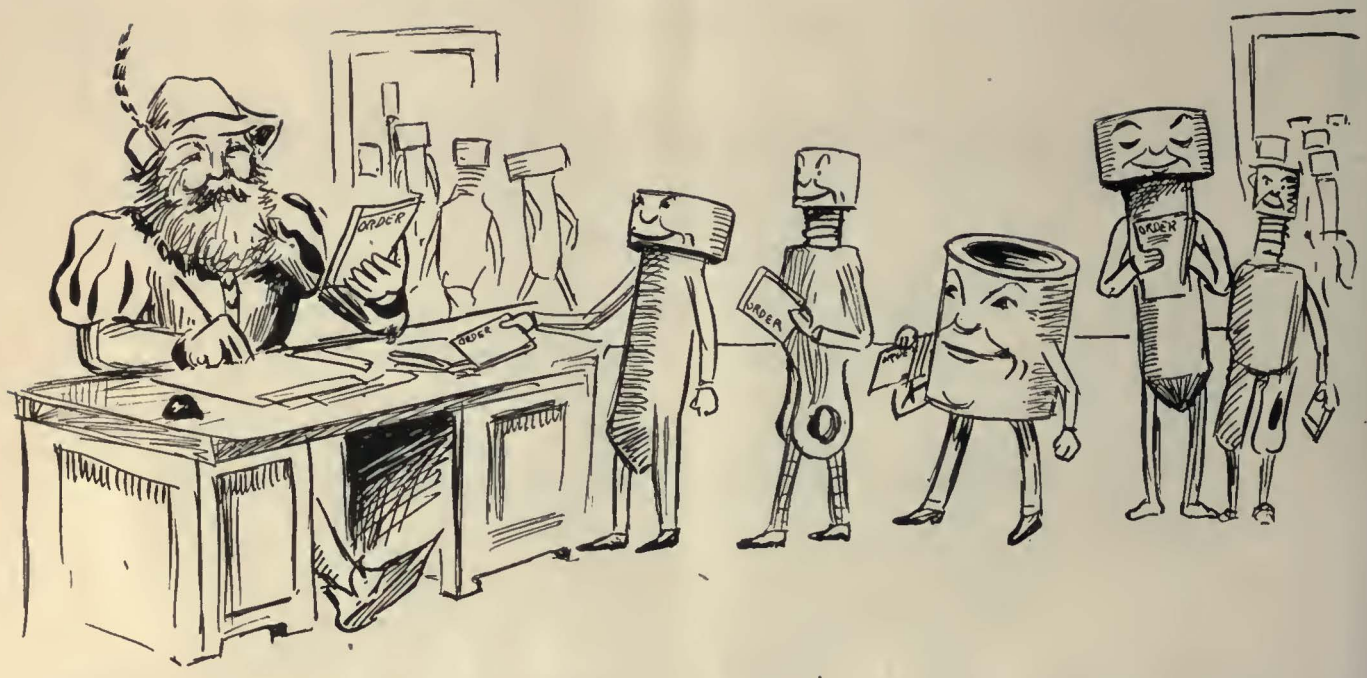
One-man operation possible at all times.
Two-man operation at peak hours if desired.
Rear door operated by pneumatic treadle.
Lower operating cost with safety.

Full particulars of this and other models on request.

THE SAFEWAY SIX-WHEELER

THE SIX WHEEL COMPANY, 1800 W. LEHIGH AVENUE, PHILADELPHIA, PA.

Manufacturers of De Luxe, City, and Double Deck Type Six-Wheel Coaches



Bringing in the repeats—

Some silver-tongued salesman may sell an initial order but only hard cold facts determine the placing of a repeat order.

Constant repeats, such as those received for Boyerized Parts are proof positive that these products are making good right on the job. The reason can be found in the fact that the special Boyerizing Process gives Boyerized Parts three or four times the life of ordinary steel car parts.

For a thorough test, try Boyerized Parts on your cars. Write for quotations on your requirements.

The McArthur Turnbuckle

Brake Pins	Spring Posts
Brake Hangers	Bolster and Transom Chafing Plates
Brake Levers	McArthur Turnbuckles
Pedestal Gibs	Manganese Brake Heads
Brake Fulcrums	Manganese Truck Parts
Center Bearings	Bushings
Side Bearings	Bronze Bearings
Spring Post Bushings	

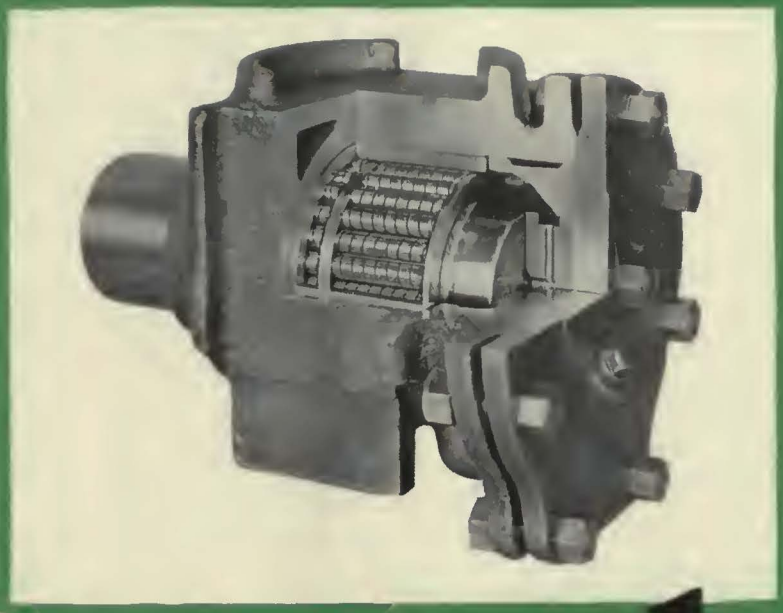
Bemis Car Truck Company

Electric Railway Supplies

Springfield, Mass.

Representatives:

Economy Electric Devices Co., Old Colony Bldg., Chicago, Ill.
F. F. Bodler, 903 Monadnock Bldg., San Francisco, Cal.
W. F. McKenney, 54 First Street, Portland, Ore.
J. H. Denton, 1328 Broadway, New York City, N. Y.
A. W. Arlin, 772 Pacific Electric Bldg., Los Angeles, Cal.



Proved!

1,250,000

by more than ~~a million~~ car miles

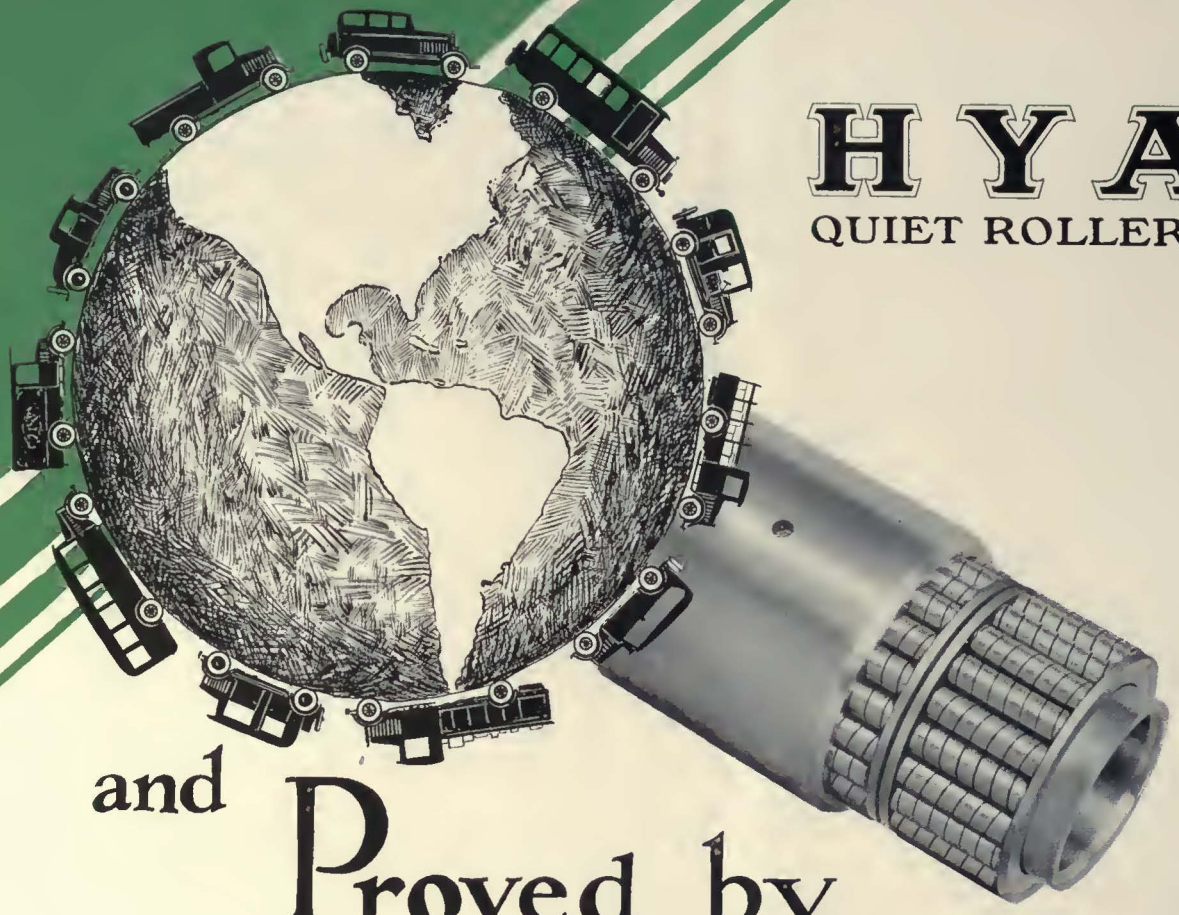
The mileage accumulated by Hyatt-equipped cars is growing fast. New cars with Hyatt Roller Bearings are being put into service, while those already equipped carry on. That is why the figure above has changed so materially in four months.

The use of Hyatt Roller Bearings on electric railway cars, is not an isolated test or two, but an established, practical proposition which is building up an operating and low maintenance record in every day service.

...tt Roller Bearings meet ...ry A. E. R. A. require-...nt. They carry full stand-... loads in bores which fit ... standard trucks without ...nge.

HYATT

QUIET ROLLER BEARINGS



HYATT

QUIET ROLLER BEARINGS

and Proved by millions and millions of motor car miles

Since anti-friction bearings were first adopted in automobile design, many years ago, Hyatt equipment has been a recognized standard. The mileage of Hyatt equipment in trucks, busses and automobiles, if it could be estimated, would run into the hundreds of millions.

You know that a moderately strong push will serve to move your automobile on level ground. It has even been found possible for one man to move and "spot" a trolley car equipped with Hyatt Roller Bearings, on a certain Indiana road. Such easy motion means material savings in power. Let a Hyatt railway bearing engineer show you how your equipment can be modernized.

HYATT ROLLER BEARING CO., NEWARK, N. J.
(Division of General Motors Corporation)

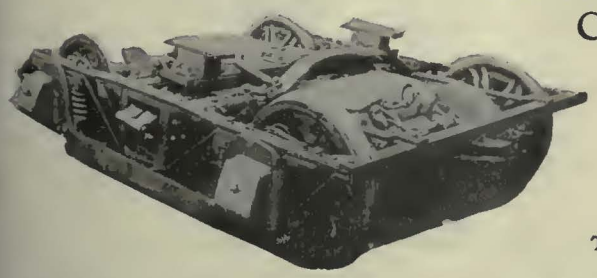
Modern Rolling Stock
Increases Earnings

ON many properties, both city and interurban lines, new cars of the modern type are attracting more patronage and operating at less expense than the older cars they replaced. New cars will do the same on your property. Let our engineers help you plan equipment to meet today's needs.

For instance, The Gary Railways of Gary, Indiana, and the Chicago and Joliet Electric Ry. Co., have recently placed orders with us for light weight one man interurban cars to replace heavy, two man operated cars.

Cummings Car and Coach Company

Successors to McGuire Cummings Mfg. Co.
111 W. Monroe Street
CHICAGO



TYPE MC62 LOW CAR BODY TRUCK

LIGHT WEIGHT CITY AND INTERURBAN CARS. SINGLE AND DOUBLE TRUCKS. GAS-ELECTRIC MOTOR-COACH

Providence

THE United Electric Railways Company car, illustrated, serves New England's second largest city, and is equipped with "STANDARD" Rolled Steel Wheels

Rolled Steel Wheels
Quenched and Tempered Carbon Steel Axles
Coil and Elliptic Springs

STANDARD STEEL

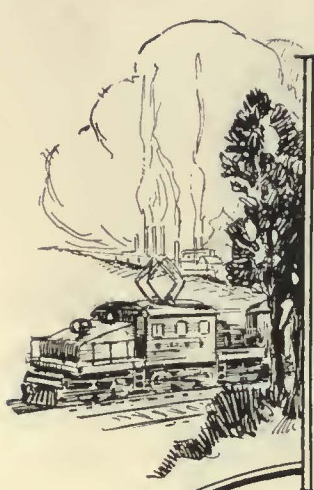
WORKS COMPANY

PHILADELPHIA, PA.

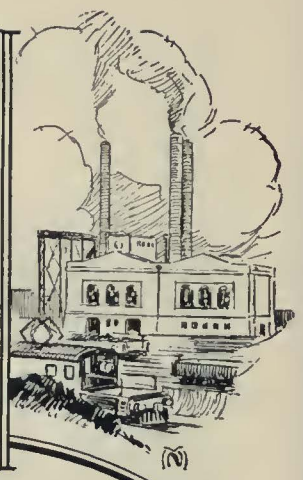
BRANCH OFFICES:

CHICAGO	PORTLAND, ORE.	ST. PAUL, MINN.
ST. LOUIS	RICHMOND, VA.	PITTSBURGH, PA.
NEW YORK	SAN FRANCISCO	LOS ANGELES, CAL.
HOUSTON, TEXAS	BOSTON	MEXICO CITY, MEX.

WORKS: BURNHAM, PA.



Lubrication and Power



THE cost of faulty lubrication shows itself not only in the repair and depreciation accounts, but also in the coal bill. Lubrication has two purposes. The first is to prevent the bearing surfaces from rubbing against each other and thereby causing undue wear. The second is to permit the machinery to run easily, so the least possible amount of power will be required to drive it.

When the bearings of any machine are lubricated with an oil that is too light to withstand the bearing pressure or the heat which that particular bearing develops, it permits the bearing surfaces to come together, and friction results. This not only causes rapid depreciation of the bearing, but it also necessitates more power to keep the machine running.

If too heavy an oil is used, it may not reach all parts of the bearing. But even if it does, the internal friction of the lubricant itself will impose a "drag" on the machinery, so that a certain excess of power will be required to operate it.

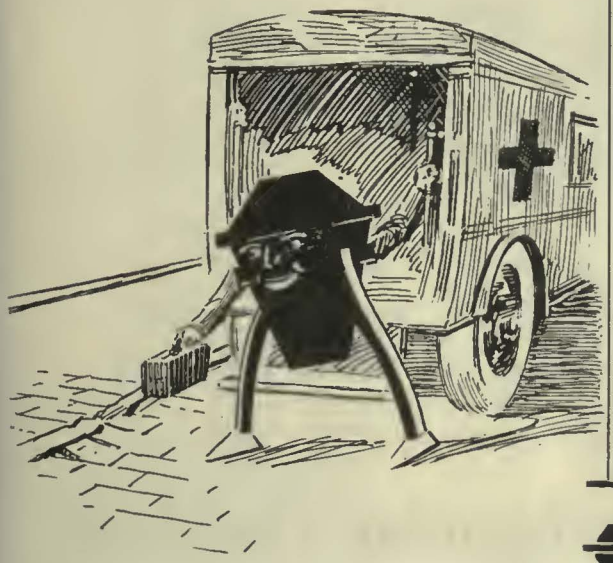
Of course, the additional power required to operate a single machine under these conditions is not very great, but when it is multiplied by the number of machines operating in the entire plant, the amount of extra power required is likely to mount up to surprising figures.

Correct lubrication will bring lower repair and maintenance bills, and will also show in the fuel bills.

Standard Oils and Greases

are made in many grades to meet the lubrication requirements of all machinery in use in the industrial world. Use the correct grades on all your machinery, and you will find a notable decrease in your fuel expense.

STANDARD OIL COMPANY
(INDIANA)
General Offices: **910 S. Michigan Ave., Chicago, Illinois**



"First-aid" and last! For old and defective rail Joints

LOOSE joints, cupped joints, broken joints—sore spots in the track system which cause abnormal noise, rough riding and actual damage to cars—these deserve prompt and effectual attention. Radio interference, due to defective bonds, is another new and disturbing feature of the rail joint problem. Why not cure these troubles now,—once and for all? Thermit Welding will do it, and thereby improve public relations.

Whereas the ordinary patch-work repair job on a joint is merely a temporary relief, Thermit Welding achieves a solid lasting job! It eliminates the joint completely and in its place affords a smooth-riding, continuous piece of rail as good as new.

THERMIT

THERMIT

METAL & THERMIT CORPORATION

120 BROADWAY, NEW YORK, N.Y.

PITTSBURGH CHICAGO BOSTON SOUTH SAN FRANCISCO TORONTO

Southern Equipment Men Favor "Tool Steel" Gears and Pinions

At the Electric Railway Association of Equipment Men—Southern Properties—meeting at Mobile, February 26th, 1926, the question was asked—"What difference have member companies found in the life of gears and pinions? Tool Steel, ———"

(The names eliminated are competitive gears).

Note in the framing of the question, "Tool Steel" was put first. It always is.

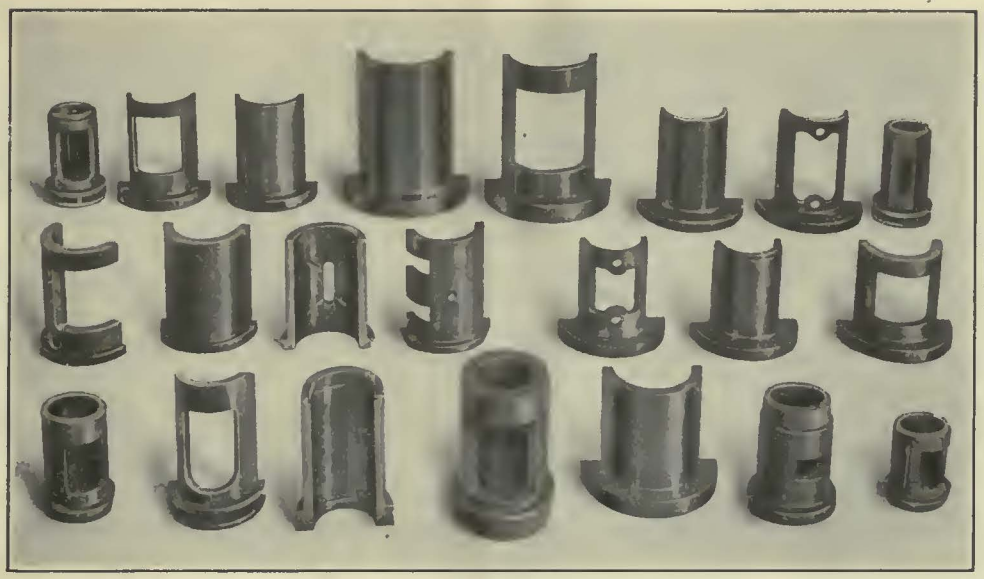
Nine Equipment Men gave their experience, most of them very flattering to "Tool Steel," none of them finding any other gear superior.

What the man who does not use them says—

"The good reports that we got in Mobile will bear fruit, and it certainly gives us something to think of when it comes to the replacement of gears and pinions."

This is the effect the discussion had upon one of the Members who had not been using "Tool Steel" gears.

The Tool Steel Gear & Pinion Company
Cincinnati, Ohio



Do Your Bearings "Stand the Gaff"?

Columbia No. 1— a bearing bronze developed by long experimentation — has been adopted by many roads as "standard" because of its long wearing qualities. They know it will "stand the gaff."

For years we have been specialists in the manufacture of bearings— armature and axle bearings, motor bearings, compressor bearings and journal bearings.

We know that in such bearings you will look for perfect halves, for interchangeability, for smooth and perfectly machined surfaces.

You will find the qualities you look for in all Columbia products.

We have patterns on hand for all the standard electric railway motors and many bearings with special dimensions for rebored motors or re-turned shafts on axles.

May we send you information and an estimate on bearings or any other of our standard products?

The

COLUMBIA MACHINE WORKS

and Malleable Iron Company

Chestnut St. and Atlantic Ave. Brooklyn, N. Y.

SEARCHLIGHT SECTION

USED EQUIPMENT & NEW—BUSINESS OPPORTUNITIES

UNDISPLAYED—RATE PER WORD:

Positions Wanted, 4 cents a word, minimum 75 cents an insertion, payable in advance.

Positions Vacant and all other classifications, 8 cents a word, minimum charge $2.00.

Proposals, 40 cents a line an insertion.

INFORMATION:

Box Numbers in care of any of our offices count 10 words additional in undisplayed ads.

Discount of 10% if one payment is made in advance for four consecutive insertions of undisplayed ads (not including proposals).

DISPLAYED—RATE PER INCH:

1 to 3 inches.....$4.50 an inch
4 to 7 inches..... 4.30 an inch
8 to 14 inches..... 4.10 an inch

Rates for larger spaces, or yearly rates, on request.

An advertising inch is measured vertically on one column, 3 columns—30 inches—to a page.

ERJ

POSITIONS WANTED

POSITION wanted as inspection or shop foreman, 10 years as armature winder, motor repairman, and acting inspection foreman, will guarantee good results. PW-914, Electric Railway Journal, 1600 Arch St., Phila., Pa.

SUPERINTENDENT transportation. With a wide experience and successful record on city and interurban properties also co-ordination of rail and bus service, successful in handling labor, public relations, etc. Recognized as a transportation official of exceptional ability fully capable of getting results on any property. At present engaged. Personal reasons for desiring change. Best of references. Correspondence invited. Address PW-915, Electric Railway Journal, Guardian Building, Cleveland, Ohio.

Rotary Converters

1—500 kw., 600-v., 833 amp., 900 r.p.m., 6-ph., compound wound Westinghouse Rotary Converter, with 3—165 kva., 60-cy., single ph., 13200 v. primary transformers with A.C. and D.C. panels.

1—300 kw., 600-v., 500 amp., 1200 r.p.m., 6-ph., compound wound interpole Westinghouse Rotary Converter, with 3—110 kva., 60-cy., single ph., 13200-v. primary transformers with A.C. and D.C. panels.

GEO. SACHSENMAIER CO.
926 N. Third St., Philadelphia, Pa.

SAVE 30% TO 50% ON
RAILS-LOCOMOTIVES-CARS
Economy—Service
Quality—Reliability
HYMAN-MICHAELS COMPANY
Peoples Gas Bldg., Chicago
ST. LOUIS — DALLAS — LOS ANGELES
SAN FRANCISCO — PORTLAND — SEATTLE

"Opportunity" Advertising:

Think *"SEARCHLIGHT"* First!

G-02

FOR SALE
30 Birney Safety Cars
Brill Built
West. 508 or G. E. 264 Motors. Cars Complete—Low Price—Fine Condition.

ELECTRIC EQUIPMENT CO.
Commonwealth Bldg., Philadelphia, Pa.

Today's Prices Are Highest

Let "Searchlight" Help You

The quicker idle equipment is sold, the higher the selling price it can demand—today's prices are always highest because—

Equipment permitted to remain unused depreciates rapidly and occupies valuable space. Every day of idleness brings down the possible selling price.

"Searchlight" Locates Quick Buyers

The wise owner of idle equipment promptly informs the field of his desire to sell through an advertisement in the Searchlight Section, where he knows that those who might need what he has will be most likely to look first.

WHAT AND WHERE TO BUY

Advertising Agencies
Doyle Kitchen & McCormick

Advertising, Street Car
Collier, Inc., Barron G.

Air Brakes
Christensen Air Brake Co.
Westinghouse Air Brake Co.

Air Receivers & Aftercoolers
Ingersoll-Rand Co.

Anchors, Guy
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Appraisals
American Appraisal Co.

Armature Shop Tools
Elec. Service Supplies Co.
Columbia Machine Works

Automatic Return Switch Stands
Ramapo Ajax Corp.

Automatic Safety Switch Stands
Ramapo Ajax Corp.

Axles
Bemis Car Truck Co.
Bethlehem Steel Co.
Brill Co., The J. G.
Carnegie Steel Co.
Johnson & Co., J. R.
National Railway Appliance Co.
Standard Steel Works
Westinghouse E. & M. Co.

Axles, Carbon Vanadium
Johnson & Co., J. R.

Axles (Front & Rear) Motor Truck & Passenger Car
Timken-Detroit Axle Co., The

Axles, Steel
Bethlehem Steel Co.
Carnegie Steel Co.
Johnson & Co., J. R.

Axles, Trailer & Motor Bus
Timken-Detroit Axle Co., The

Babbitt Metal
Ajax Metal Company
Johnson & Co., J. R.
More-Jones Brass & Metal Co.

Babbitting Devices
Columbia Machine Wks.

Badges and Buttons
Elec. Service Supplies Co.
International Register Co.

Bearings, Anti-Friction
Hyatt Roller Bearing Co.

Bearings and Bearing Metals
Ajax Metal Company
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia Machine Wks.
General Electric Co.
More-Jones Brass & Metal Co.
Westinghouse E. & M. Co.

Bearings, Center and Roller Side
Columbia Machine Works
Stucki Co., A.

Bearings, Roller and Ball
Hyatt Roller Bearing Co.
Norma Hoffman Bearing Corp.

Bells & Buzzers
Consolidated Car Heating Co.

Bells and Gongs
Brill Co., The J. G.
Columbia Machine Wks.
Elec. Service Supplies Co.

Benders, Rail
Railway Trackwork Co.

Bodies, Bus
Cummings Car & Coach Co.

Body Material—Haskelite & Plymetl
Haskelite Mfg. Corp.

Boilers
Babcock & Wilcox Co.

Bolts, Nuts, Rivets
Russell Burdsall & Ward Bolt & Nut Co.

Bond Testers
Amer. Steel & Wire Co.
Elec. Service Supplies Co.

Bonding Apparatus
Amer. Steel & Wire Co.
Electric Railway Improvement Co.
Elec. Service Supplies Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

Bonds, Rail
American Steel & Wire Co.
Electric Railway Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Brackets and Cross Arms (See also Poles, Ties, Posts, etc.)
Bates Expanded Steel Truss Co.
Columbia Machine Works
Electric Ry. Equipment Co.
Elec. Service Supplies Co.
Hubbard & Co.
Ohio Brass Co.

Brake Adjusters
Brill Co., The J. G.
National Ry. Appliance Co.
Westinghouse Tr. Br. Co.

Brake Shoes
Bemis Car Truck Co.
Brill Co., The J. G.

Brakes, Brake Systems and Brake Parts
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia Machine Wks.
General Electric Co.
National Brake Co.
Safety Car Devices Co.
Westinghouse Traction Brake Co.

Brushes, Carbon
General Electric Co.
Jeandron, W. J.
Le Carbone Co.
Morganite Brush Co.
U. S. Graphite Co.
Westinghouse E. & M. Co.

Brushes, Graphite
Morganite Brush Co.
U. S. Graphite Co.

Brushes, Wire Pneumatic
Ingersoll-Rand Co.

Brush Holders
Columbia Machine Works

Bulkheads
Haskelite Mfg. Corp.

Bus Seats
Hale-Kilburn Co.
Heywood-Wakefield Co.

Buses, Motor
American Car & Foundry Motors Co.
Brill Co., The J. G.
Cummings Car & Coach Co.
Fageol Motor Co.
Graham Brothers
International Motor Co.
Mack Trucks, Inc.
Six Wheel Co.

Bushings, Case Hardened and Manganese
Bemis Car Truck Co.
Brill Co., The J. G.
Columbia Machine Works

Cables (See Wires and Cables)

Cambric Tapes, Yellow and Black Varnished
Irvington Varnish & Ins. Co.
Mica Insulator Co.

Carbon Brushes (See Brushes, Carbon)

Car Lighting Fixtures
Elec. Service Supplies Co.

Car Panel Safety Switches
Consolidated Car Heating Co.
Westinghouse E. & M. Co.

Car Wheels, Rolled Steel
Bethlehem Steel Co.

Cars, Dump
Brill Co., The J. G.
Differential Steel Car Co.

Cars, Gas, Rail
Brill Co., The J. G.

Cars, Passenger, Freight, Express, etc.
Amer. Car Co.
Brill Co., The J. G.
Cummings Car & Coach Co.
Kuhlman Car Co., G. C.
National Ry. Appliance Co.
Wason Mfg. Co.

Cars, Second Hand
Electric Equipment Co.

Cars, Self-Propelled
Brill Co., The J. G.
General Electric Co.

Castings, Brass, Composition or Copper
Ajax Metal Company
Anderson Mfg. Co., A. & J. M.
Columbia Machine Wks.
More-Jones Brass & Metal Co.

Castings, Gray Iron and Steel
American Steel Foundries.
Bemis Car Truck Co.
Columbia Machine Wks.
Standard Steel Works
Wm. Wharton, Jr. & Co., Inc.

Castings, Malleable & Brass
Bemis Car Truck Co.
Columbia Machine Wks.

Catchers and Retrievers, Trolley
Earll, C. I.
Elec. Service Supplies Co.
Ohio Brass Co.
Wood Co., Chas. N.

Catenary Construction
Archbold-Brady Co.

Ceiling Car
Haskelite Mfg. Corp.
Pantasote Co., Inc.

Ceilings, Plywood Panels
Haskelite Mfg. Corp.

Chairs, Parlor Car
Heywood-Wakefield Co.

Change Carriers
Cleveland Fare Box Co.
Electric Service Supplies Co.

Circuit-Breakers
Anderson Mfg. Co., A. & J. M.
General Electric Co.
Westinghouse E. & M. Co.

Clamps and Connectors for Wires and Cables
Columbia Machine Works
Dossert & Co.
Elec. Ry. Equipment Co.
Elec. Ry. Improvement Co.
Elec. Service Supplies Co.
General Electric Co.
Hubbard & Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Cleaners and Scrapers, Track (See also Snow-Plows, Sweepers and Brooms)
Brill Co., The J. G.
Ohio Brass Co.

Clusters and Sockets
General Electric Co.

Coal and Ash Handling (See Conveying and Hoisting Machinery)

Coil Banding and Winding Machines
Columbia Machine Wks.
Elec. Service Supplies Co.
Westinghouse E. & M. Co.

Coils, Armature and Field
Columbia Machine Wks.
General Electric Co.
Westinghouse E. & M. Co.

Coils, Choke and Kicking
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.

Coin Counting Machines
Cleveland Fare Box Co.
International Register Co.

Coin Sorting Machines
Cleveland Fare Box Co.

Coin Wrappers
Cleveland Fare Box Co.

Commutator Slotters
Columbia Machine Works
Elec. Service Supplies Co.
General Electric Co.
Westinghouse E. & M. Co.
Wood Co., Chas. N.

Commutator Truing Devices
General Electric Co.

Commutators or Parts
Cameron Elec'l Mfg. Co.
Columbia Machine Wks.
General Electric Co.
Westinghouse E. & M. Co.

Compressors, Air
General Electric Co.
Ingersoll-Rand Co.
Sullivan Machinery Co.
Westinghouse Tr. Br. Co.

Compressors, Air, Portable
Ingersoll-Rand Co.
Sullivan Machinery Co.

Compressors, Gas
Sullivan Machinery Co.

Condensers
General Electric Co.
Ingersoll-Rand Co.
Westinghouse E. & M. Co.

Condenser Papers
Irvington Varnish & Ins. Co.

Connectors, Solderless
Dossert & Co.
Westinghouse E. & M. Co.

Connectors, Trailer Car
Columbia Machine Works
Consolidated Car Heating Co.
Elec. Service Supplies Co.
Ohio Brass Co.

Controllers or Parts
Columbia Machine Wks.
General Electric Co.
Westinghouse E. & M. Co.

Controller Regulators
Elec. Service Supplies Co.

Controlling Systems
General Electric Co.
Westinghouse E. & M. Co.

Converters, Rotary
General Electric Co.
Westinghouse E. & M. Co.

Copper Wire
American Brass Co.
Anaconda Copper Mining Co.
Rome Wire Co.

Copper Wire Instruments Measuring Testing and Recording
American Brass Co.
American Steel & Wire Co.
Anaconda Copper Mining Co.

Cord, Bell, Trolley, Register
Brill Co., The J. G.
Elec. Service Supplies Co.
International Register Co.
Roebling's Sons Co., J. A.
Samson Cordage Works
Silver Lake Co.

Cord Connectors and Couplers
Elec. Service Supplies Co.
Samson Cordage Works
Wood Co., Chas. N.

Couplers, Car
American Steel Foundries
Brill Co., The J. G.
Ohio Brass Co.
Westinghouse Tr. Br. Co.

Cranes, Hoist & Lift
Electric Service Supplies Co.

Cross Arms (See Brackets)

Crossing Foundations
International Steel Tie Co.

Crossings
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co., Inc.

Crossing, Frog and Switch
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

Crossing Manganese
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton Jr. & Co., Inc.

Crossings, Track (See Track Special Work)

Crossings, Trolley
Ohio Brass Co.
Westinghouse E. & M. Co.

Curtains & Curtain Fixtures
Brill Co., The J. G.
Morton Mfg. Co.
Pantasote Co., Inc.

Dealer's Machinery & Second Hand Equipment
Elec. Equipment Co.
Hyman Michaels Co.
Sachsenmaier Co., Geo.
Salzberg Co., Inc., H. E.

Derailing Devices (See also Track Work)

Derailing Switches
Ramapo Ajax Corp.

Destination Signs
Columbia Machine Wks.
Electric Service Supplies Co.

Detective Service
Wish-Service, P. Edward

Door Operating Devices
Brill Co., The J. G.
Consolidated Car Heating Co.
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Doors and Door Fixtures
Brill Co., The J. G.
General Electric Co.
Hale-Kilburn Co.

Doors, Folding Vestibule
Nat'l Pneumatic Co., Inc.
Safety Car Devices Co.

Drills, Rock
Sullivan Machinery Co.

Drills, Track
Amer. Steel & Wire Co.
Elec. Service Sup. Co.
Ingersoll-Rand Co.
Ohio Brass Co.

Dryers, Sand
Elec. Service Supplies Co.
Ohio Brass Co.
Westinghouse E. & M. Co.

Ears
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Roebling's Sons Co., John A.
Rome Wire Co.

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Railway Trackwork Co.
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Kelly Cooke & Co.
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Consolidated Car Fender Co.
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Valentine & Co.

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Nat'l Ry. Appliance Co.

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Carnegie Steel Co.
Standard Steel Works

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Bethlehem Steel Co.
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Electric Service Supplies Co.

(Continued on page 66)

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Ohio Brass Co.

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Smith Heater Co., Peter

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Smith Heater Co., Peter

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Ramapo Ajax Corp.
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Morton Mfg. Co.

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Tapes and Cloths (See Insulating Cloth, Paper and Tape)

Tee Rail Special Track Work
Bethlehem Steel Co.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

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Electric Service Sup. Co.

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Thermostats
Consolidated Car Heating Co.
Gold Car Heating & Lighting Co.
Railway Utility Co.
Smith Heater Co., Peter

Ticket Choppers & Destroyers
Electric Service Sup. Co.

Tickets and Transfers
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Carnegie Steel Co.
International Steel Tie Co.

Ties, Wood Cross (See Poles, Ties, Posts, etc.)

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Hubbard & Co.
Railway Trackwork Co.

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Bethlehem Steel Co.
Buda Co.
Columbia Machine Wks.
Ramapo Ajax Corp.
Wm. Wharton, Jr. & Co., Inc.

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Ohio Brass Co.

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Trolley Wheel Bushings
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Star Brass Works

Trolley Wheels (See Wheels, Trolley)

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Electric Service Supplies Co
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Thornton Trolley Wheel Co.

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Morton Mfg. Co.

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Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.

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Electric Railway Improvement Co.
Metal & Thermit Corp.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co.
Westinghouse E. & M. Co.

Welders, Rail Joint
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Railway Trackwork Co.

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General Electric Co.
Metal & Thermit Corp.
National Railway Appliance Co.
Ohio Brass Co.
Railway Trackwork Co.
Una Welding & Bonding Co
Westinghouse E. & M. Co.

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Electric Railway Improvement Co.
Railway Trackwork Co.
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American Steel & Wire Co.
General Electric Co.
Railway Trackwork Co.
Roebling's Sons Co., J. A.

Welding Wire and Rods
Railway Trackwork Co.

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Wheel Presses (See Machine Tools)

Wheels, Car, Cast Iron
Bemis Car Truck Co.
Griffin Wheel Co.

Wheels, Car Steel & Steel Tire
American Steel Foundries
Carnegie Steel Co.
Standard Steel Works

Wheels, Trolley
Bayonet Trolley Harp. Co.
Columbia Machine Wks.
Elec. Ry. Equipment Co.
Electric Service Supplies Co.
General Electric Co
More-Jones Brass & Metal Co.
Nuttall Co., R. D.
Star Brass Works

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Carnegie Steel Co.

Whistles, Air
General Electric Co.
Ohio Brass Co.
Westinghouse E. & M. Co.
Westinghouse Traction Brake Co.

Window Sash Locks & Racks
Morton Mfg. Co.

Wire Rope
Amer. Steel & Wire Co.
Roebling's Sons Co., J. A.

Wires and Cables
American Brass Co.
Amer. Electrical Works
Amer. Steel & Wire Co.
Anaconda Copper Min. Co.
General Electric Co.
Okonite Co.
Okonite-Callender Cable Co., Inc.
Roebling's Sons Co., J. A.
Rome Wire Co.
Westinghouse E. & M. Co.

Wood Preservatives
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Youngstown's "Electric Coaches"

When the Youngstown Municipal Railway recently introduced 13 Modern Cars, handsomely designed and equipped, it recognized the possibilities for increasing the public's riding habit by the use of attractive cars.

In addition to the use of mahogany finish, rubber floor covering, dome lighting, deep spring cushioned seats, and panelling below the vestibule windows to conceal the air piping, these cars are mounted on Brill No. 177-E1 Trucks which guarantees smooth and comfortable riding. Equipped with four 25 Hp. motors, the weight is 33,000 lb.

Arranged for one-man two-man operation the new Youngstown cars seat 44 passengers.

What they found —after 13 years

Commutator—In excellent condition. It has never been turned.
Bearings—Tool marks still visible.
Gearing—Scarcely any perceptible back lash.
Besides, there was no slack in bearings, connecting rods, or wrist pins.

This CP-27 Compressor was selected at random from among the 196 CP-Compressors on the Key System Transit Company's cars. Installed on a car that weighs 38,000 lb., it has been furnishing continuous service since Sept. 1911. In thirteen years the car operated 640,670 car-miles, which corresponds to approximately 24,000 hours of compressor operation. During this time there has been no repair nor replacement of any mechanical or electrical part.

These facts relating to the operation of one CP-27 do not mark an unusual record. They do speak convincingly of the stamina built into this line of G-E car equipment and account for the general preference for the CP-Compressor among railway men. The CP is well termed the Low-Maintenance Compressor.

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GENERAL ELECTRIC