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NOTICE.

Papers and correspondence on all subjects of practical interest to our readers are cordially invited. Our columns are always open for the discussion of problems of operation, construction, engineering, accounting, finance and invention.

Special effort will be made to answer promptly, and without charge, any reasonable request for information which may be received from our readers and advertisers, answers being given through the columns of the JOURNAL when of general interest, otherwise by letter.

Street railway news and all information regarding changes of officers, new equipment, extensions, financial changes, etc., will be greatly appreciated for use in our Directory, our Financial Supplement, or our news columns.

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The two street railway conventions just held in Chicago cannot fail to materially strengthen both organizations, the American Street Railway Association and the Street Railway Accountants' Association of America. The business of both conventions was admirably managed by their officers and executive committees, so that there was not a dull moment from the time of arriving in Chicago till that of leaving. The sessions commenced promptly at the hour specified in the programme, and the meeting rooms were at all times crowded with delegates, instead of being neglected in favor of the exhibits or other attractive features, as has frequently been the case in times past. The greater interest on the part of delegates to the larger convention (the meetings of the Accountants' Association have always

been well attended) was due to two reasons. The first paper on the programme to be read on Tuesday was one in which all were interested, both because of the prominence of its author, Mr. Yerkes, and the importance of his subject. The hall was crowded, therefore, during the reading of this paper and in the following discussion thereof by some of the ablest men in the industry, and this first meeting "set the pace" for the entire convention. The second reason was the wise determination by the executive committee, at the instance of Mr. McCormack, to leave one day, Friday, free for the inspection of exhibits, and at the same time to make certain that all or nearly all the delegates remained in town by placing the annual banquet on the evening of that day, instead of on Thursday, as has usually been done in the past. The results of this change of plan were most happy, and quite surely mean its adoption as a regular feature of future conventions, for it not only secured for the convention meetings themselves a larger attendance, as has just been stated, but opinion is practically unanimous that more actual business has been done at this convention than at any previous one in the history of the association. The delegates and "supply men" were able to get together without difficulty to close contracts, and a number of very large orders were placed for all kinds of material and supplies. This is decidedly as it should be, for such a meeting place as is afforded by these conventions ought to be a great convenience to both purchaser and seller.

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Although the exhibit hall in Chicago was much smaller than that in Boston last year, and many of those who wished to make exhibits had to be denied space at the last, while the applications of all, or nearly all, were cut down almost 50 per cent, yet the exhibit seemed practically as complete as in previous years, and was well arranged for business purposes. All in all, the number of exhibitors was but little smaller than last year, while the amount of space taken was slightly less than 25,000 sq. ft., as against 33,000 sq. ft. last year. The committee on exhibits, of which James R. Chapman was chairman, certainly deserved credit for the remarkable success which it achieved in transforming Tattersall's, which is, in reality, an ugly and unpleasant building, into one which was almost a "bower of beauty," with its flag and streamer decorations, its complete arc and incandescent lighting service and its variety of exhibits. There is nothing but praise also for the care given by this committee to the interests of exhibitors. Everything worked smoothly and well, the transportation facilities were good, and on Tuesday morning all the exhibits were practically in place, ready for inspection, something which is not always, by any means, accomplished at conventions. At a meeting of supply men, held in Convention Hall, Oct. 19, with Elmer P. Morris chairman, and H. C. Evans secretary, resolutions were passed commending the action of Ira A. McCormack, of the executive committee, for recommending and having adopted the resolution, setting aside one day for the express purpose of inspecting the exhibits. At this meeting a vote of thanks was also extended to the association for its courteous treatment of the supply men.

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The meetings of the Accountants' Association were, as has always been the case, businesslike and valuable to a

degree. This association has, in its two years of life, accomplished more than could possibly have been expected of it, and the high tribute to its work in standardizing street railway accounts recently paid by the committee on standardization of the National Association of Railway Commissioners, is most surely well deserved.

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It is perfectly true, however, as Mr. Kittredge remarks in another column, that the Street Railway Accountants' Association is only on the threshold of its work. What has been accomplished so far, while most important and valuable, is still little more than the standardizing of a form of statement, not the development of a complete economical accounting system. We believe firmly that nine-tenths of our street railway companies are employing far too large a force in their accounting departments—that they are multiplying work—and that they are not in touch with modern commercial methods and labor-saving devices. When the largest street railway company in this country (gaged by gross earnings) is able to handle from \$12,000,000 to \$15,000,000 of money per annum in receipts and expenditures, and \$5,000,000 to \$10,000,000 more on construction account with but seven men in its auditor's department and two or three in its treasurer's, there would seem to be little reason for much smaller companies having the force of men which they now employ. We shall have more to say about the organization of accounting departments in the coming year, but meanwhile we urge our street railway friends to most carefully investigate accounting practice in the best models, and particularly to study the mechanical labor-saving appliances of modern accounting as exhibited, for example, in the great department stores or in some few of the street railways which have so far adopted them.

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The new officers of both associations are worthy of their posts and of the traditions of the associations. President-elect John M. Roach has been connected with street railways for more than twenty-seven years in important positions of responsibility, and has always been a warm friend of the association. As he was chiefly responsible for bringing the convention to Chicago this year, and as he has done more than any other one man to make the visit the complete success which it certainly has been, he was the logical candidate, and had no competitor. First Vice-President John A. Rigg, of Reading, is at the head of several important Eastern properties recently brought together for the purpose of effecting operating economies, and is a man of the highest personal character and reputation. Second Vice-President H. H. Vreeland, although but six years in the street railway field, is generally recognized as one of the wisest and most successful managers in the country, possessing as he does in a high degree financial acumen, organizing ability and a knowledge of the influences that move men's minds, together with a broad, kindly and entirely genuine sympathy with the labor which he controls, and which is, to a man, enthusiastically devoted to him. Third Vice-President F. G. Jones, of the Memphis Street Railway Company, is one of the most prominent men in his section of the country, and C. K. Durbin, of Denver, Charles W. Wason, of Cleveland, John R. Graham, of Quincy, and Nicholas S. Hill, Jr., of Charleston, will add strength to the executive committee.

Mr. Hill won a host of friends in this convention by his brilliant, aggressive and persistent campaign in behalf of Charleston as a meeting place for the convention next year, and while, for various reasons, he failed in this, his first effort to extend the hospitalities of Charleston to the association, the general feeling is that another year he will be more successful, if he still desires to entertain the convention. Finally, the association is fortunate in retaining for the new executive committee the services and experience of the retiring president, Mr. Sergeant—one of the best presidents who have ever occupied the chair.

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The election of C. N. Duffy as president and W. F. Ham as first vice-president of the Accountants' Association is a natural and fitting result of the magnificent work which they have done as members of the committee on standardization, and of their devotion to the interests of the association. They have been always generous of both time and money in furthering the interests of the association, and, both being men of indefatigable energy and acute and intelligent thinkers, it is not surprising that the work of this important committee should have called forth the almost enthusiastic expressions of approval from the committee of the Association of Railroad Commissioners, quoted in the last report. W. G. Ross, of Montreal, the second vice-president, has always been prominent in the councils of the association. It would be impossible to name a man who could and would fulfil the duties of secretary and treasurer with greater care, patience and courteous attention to every inquiry than Mr. Brockway, and the amount of work which he has accomplished during the past two years is little short of marvelous. The department of blanks and forms, which he has created, is admirably conceived, and will be of such benefit to those who are desirous of improving their system of accounting that a trip to Toledo from any part of the United States is fully worth while, though by the system of correspondence which Mr. Brockway has instituted, such a trip is not always necessary. The Street Railway Accountants' Association of America has every reason to be proud of the fine lists of officers and executive committees who have been in charge of its affairs since the beginning.

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In deciding upon Kansas City as the meeting place for the convention of 1900, the association has departed somewhat from precedent, in that two Western cities have been chosen in consecutive years, but this action has not been taken without good reason. While it is true that over 80 per cent of the street railway mileage of the country lies east of the Mississippi River, there should be at least an occasional meeting held in the further West, and we believe that Denver, or even San Francisco, would be popular, on many accounts, as convention meeting places, and that so many vacations would be arranged to take in the necessary transcontinental trip at convention time that the attendance would be little smaller than in the Eastern cities. Kansas City is certainly not too far west to attract practically all the Eastern delegates, while it is sufficiently far to perhaps bring into the association and to the convention many of the extreme Western companies, and the city itself, under the leadership of Mr. Holmes and the Metropolitan Street Railway Company, will certainly ex-

tend a hearty welcome to the 1900 convention, and will take good care of it in every way.

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The buttons this year were very handsome. The head of the famous Chicago girl was the *motif*, above which were the initials "A. S. R. A.," and below the word "Chicago," while "1899" was in the central disk. The delegates' buttons were in a rich blue, the accountants', in yellow, the ladies', in white, and those given to "others in attendance" were in red. As usual, the buttons acted as "free passes" upon the local surface and elevated railways.

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Secretary Penington was, as usual, one of the most popular men of the convention, and his uniform courtesy toward all, and his disposition to do everything in his power to promote the comfort and pleasure of every delegate and supply man, were highly appreciated. His management of the finances of the association has been, as always, excellent, and the surplus is constantly increasing.

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Among those usually seen at the conventions, but who did not, for various reasons, attend this year, were John A. Brill, vice-president of the J. G. Brill Company, who is absent in Europe; C. W. Price, proprietor of the "Electrical Review;" Edgar Peckham, president of the Peckham Motor Truck & Wheel Company; John W. McNamara, general manager of the Albany Railway; James H. McGraw, president, STREET RAILWAY JOURNAL; Clinton L. Rossiter, president of the Brooklyn Rapid Transit Company; William F. Ham, auditor Brooklyn Rapid Transit Company; Bert L. Kilgour, electrician, Cincinnati Street Railway Company; W. F. Kelly, recently of Columbus, now of Oakland, Cal.; J. B. Cahoon, formerly of Elmira, but now connected with electric lighting enterprise in Syracuse; W. B. Ferguson and E. P. Shaw, owners of many street railway properties in Massachusetts; C. M. Wickar, formerly of the North Shore Traction Company, now of the Chicago Union Traction Company; P. F. Sullivan, general manager of the Massachusetts Electric Companies; Henry C. Payne, of Milwaukee; Richard McCulloch, formerly of St. Louis, now of Geneva, Switzerland; Harry Scullin, of St. Louis, who is not now connected with street railway enterprises; O. T. Crosby, of the Washington Traction Company, now traveling in Africa; John Graham, of Wilkesbarre, and W. J. Johnston, formerly of the "Electrical World," now traveling in the Orient.

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The "Street Railway Review" deserved much credit for its enterprise in publishing during the convention a daily edition containing lists of attendants, proceedings of the day before, and descriptions of the exhibits, etc., together with illustrated articles on the Chicago drainage canal, the Union Stock Yards, and other Chicago enterprises. Only those who have been through a work of this kind can understand the immense amount of labor which it involves, the editorial force having to spend practically the entire twenty-four hours preparing matter, correcting proofs, etc. Although many errors will inevitably creep into any work of this kind, so hastily done, they are always excusable and nearly always excused, while the convenience of such a daily resume is considerable. In these daily bulletins and in its special issue of October fifteenth, devoted almost entirely

to a description of Chicago as a business, artistic and street railway center, the "Review" has well upheld the traditions of a city noted for its generous hospitality to visitors, and for the care which it takes to make certain that they appreciate its many attractions.

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We cordially commend to street railway managers Mr. McCormack's paper on "Train Service and Its Practical Application." It is an able discussion of a problem which is, next to the management of labor, the most important which a company has to solve, i. e., that of running a sufficient number of cars to accommodate the public without eating up all the receipts in operating expenses. It is not too much to say that the net revenue of a road depends upon the management of its car service. More than once has a property been saved from bankruptcy and set firmly upon its feet by a change of management and a better balancing of car service and traffic. It is impossible to generalize upon this subject, as the conditions are so wholly local in every city. All that can be done is to suggest, as Mr. McCormack has done, convenient ways of finding out what service the public really needs and is prepared to pay for. The "car-service engineer" of a street railway is to put these and other methods into practice, and should be a man of the highest intelligence, acumen and energy.

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The paper by Mr. Vanderveer on the "Care of Car Equipment" was an interesting one, and upon a branch of street railroading which is of great importance. The old proverb of "a stitch in time saves nine" applies nowhere more forcibly than in the care of railway apparatus, and it is the best kind of economy to keep both the rolling stock and its equipment in good condition by frequent inspection. The speaker limited the advisable night inspection to that only which is absolutely necessary, and preferred to make all repairs by daylight. This opinion was indorsed by all the speakers who discussed this subject, and it will receive general acquiescence. The paper was the prelude to a general discussion on the advisability of running single motor equipments. The experience with single motors, elicited by these expressions of opinion, seems to have been that they require more repairs than double or four-motor equipments, but to us this fact seems attributable not to the number of motors per car, but to a lack of power capacity on the car. Considering the proper equipment of a car from the standpoint of repairs only, the motor repairs per car should vary approximately, though not exactly, with the number of motors on the car, provided, of course, that the single motor equipments have double the capacity of each motor in the double-motor equipment, or four times the capacity of each of the motors in the four-motor equipment. There ought not either to be any great difference in motor efficiency under the same conditions, and any difference which would exist would naturally be in favor of the motor of larger capacity. Both of these points can be readily seen by considering the parallel case of stationary motors. From both a repair and efficiency standpoint, one 80-h.p. motor would give better results, say, than two 40-h.p. motors or four 20-h.p. motors. In railroad operation, however, these two are not the only points to consider. Traction is a very important question, and one to which is intimately connected that of quick ac-

celeration, on which in turn depends the third important question of current economy. On roads where these are desiderata, and among such roads should be classed those desiring quick service and high speed and having grades, the disadvantages of the multiple-motor system will be more than outweighed by its merits.

Treatment of Labor After the New York Strike

We recur briefly to the so-called strike in New York city, in order to bring to light certain incidents of the strike and the after treatment of the employees who so loyally stood behind the administration of the Metropolitan Street Railway Company, when urged to desert it by spurious and self-seeking labor leaders. It is a well-known fact that President Parsons, of the Knights of Labor, was extremely anxious to avoid throwing down the gage of battle, knowing the inevitable result, but was forced into it by a few discharged employees on some of the more recently acquired lines, who desired to make mischief for their own ends. Mr. Parsons was wiser than his associates. On the day the strike was declared many of the men on the different divisions refused to go home after completing their regular hours of service, but voluntarily stayed in the barns all night in order that they might take the place of any of the men who might desert the company. Some of the motormen bitterly resented the presence of policemen on their cars, saying that they had been able to take care of their cars hitherto, and needed no help now. Others fought for the privilege of taking the first car out on the morning of the strike. In general, the utmost contempt for the malcontents, and loyalty to the administration was the rule and not the exception. Such loyalty as this deserved its reward, or so the management felt, though reward was apparently the last thing the men on the system thought of. The question of how recognition could best be given came up for discussion, and some of the employees longest on the system were called in consultation by President Vreeland. Three plans were submitted to them for consideration, one, a large donation to the Employees' Mutual Benefit Association; the second, the granting of a cash present to all men, and the third, the granting of a three days' vacation with pay. After considerable discussion, it was unanimously agreed that the last plan offered something which the men would appreciate more than the others, and for the first time in the history of any great street railway system, so far as we know, the men were enabled to take an outing without feeling that the children must lose a pair of shoes or the wife a bonnet in consequence. The surprise and pleasure of the men at this unexpected act of the company are almost touching, as showing how highly this opportunity to take a little pleasure has been appreciated. One further result of the strike should be mentioned. The men who left the company's service at the beginning of the strike, many of whom did so much against their will by reason of threats or appeals by the strikers, were given twenty-four hours in which to return to service. After the expiration of this time, not a man remaining out was, or ever will be, accepted as an employee by the company. The strongest influences have been brought to bear in some cases to secure the reinstatement of certain men, but in every case such reinstatement has been absolutely and

finally refused, it being felt by the management that disloyalty should not be placed on a par with loyalty even in a single instance.

Recent Practice in Track Construction

Among the many changes which the last ten years have made in street railroading none, with the exception of motive power, has been more radical than in the department of track construction for paved streets. Eight years ago the most approved form of street railway track could easily have been defined, but looking back at that period now we can hardly find a single feature of the former construction, with the exception of the form of rail-heads, which is generally accepted as standard practice for paved streets. Changes have been made in the height of rail, weight of rail, length of rail, percentage of carbon, joints and character of sub-construction. To be sure, all of these innovations have not been accepted as desirable by all track engineers, but it is undeniable that many of them, including the increase in weight and length of rail, have been accepted by all, height by most, and joint construction and concrete sub-base by a slightly less number. The latest developments in this "modern" construction, as it may be termed, are described quite fully in the papers in this issue by Mr. Butts, of Kansas City, and Mr. Silliman, of Scranton; and while in details the constructions differ in many particulars, both employ the concrete sub-base as a continuous support for the rail. The discussion on Mr. Butts' paper by the American Street Railway Association was, on the whole, favorable for its use for heavy city construction, although there were some dissenters, and it must by no means be assumed that track engineers are universally in its favor. In some respects, Mr. Silliman's construction seems more substantial than that employed in Kansas City. We think the use of steel ties or cross-girders (Mr. Silliman employs for this purpose 52-lb. girder rails every 10 ft.) would be an essential factor in keeping the track in alignment and superior to the exclusive use of tie-rods for this purpose, as the rail is better maintained in an exactly vertical position. With the imbedding of the steel ties in the concrete, however, difficulty will be encountered in making the track connections when the rail is renewed, unless the old tie is torn up. The joint connections, of course, are also different, in one case being riveted, and in the other cast-welded. There is also a variation in the form of concrete sub-base used; in Scranton the concrete is laid entirely across the track, while in Kansas City it is laid in trenches under the rails. We presume the latter construction would have been employed in the former city if the pavement had already been laid on concrete, and will be employed when it comes to renew the rails. Neither of the speakers referred to the subject of track renewals, which is, of course, an important question where a concrete sub-base is employed, as where the rail is imbedded in concrete the entire old base must be renewed when the rails wear out and new rails are substituted.

While the use of concrete sub-base is increasing, the use of wooden ties for city work has also many advocates. The latest and best track construction in Chicago is on wooden ties, mounted on a broken stone ballast, and it is interesting to note that in the most recent work in New York City, that of the Third Avenue Railway Company, the use of

wood in sub-construction was considered so desirable that it is being employed in the form of stringers under the rails, even in electric conduit construction. Undoubtedly, the use of wood in track construction conduces to easy riding, a very important feature, as shown by the fact that in the work of the Third Avenue Railway Company, already cited, steel springs are being used under the rails in the old construction, where the shape of the existing yokes did not permit the introduction of wooden stringers under the rails. Independent of the question of durability, the result sought for in this construction has certainly been accomplished, and the elasticity given the track is very noticeable.

We are unwilling to state that either the concrete sub-construction or the wooden tie construction is the most desirable under all conditions of track construction in paved streets. As a matter of fact, we believe that the special circumstances which warrant the introduction of each will be determined by experience. At present the concrete sub-base seems to have the advantage of durability. As it would have to be renewed when the rail wears out, however, there is no advantage in making it longer lived than the rail, which is the really limiting factor. On the other hand, if the life of the rail varies inversely with the number of tons passing over it, while in that of the sub-construction, time is the principal factor, the durability of the sub-construction is a more important question on roads of comparatively light traffic than on those of heavy traffic. It is not impossible, therefore, that we shall find practice in paved streets following the somewhat anomalous line of using the more substantial concrete construction on the smaller roads, and the lighter and more elastic wood construction on the roads of heavy traffic.

A Question of Units

Mr. Mackay, in his paper on "Car Mileage," makes a strong plea for the use of the "motor-car hour" as a unit in place of the "car-mile run," now in quite general service. The motor-car hour, as he defines it, is the car mileage divided by the average speed in miles per hour. If, for example, a railway runs its cars at an average schedule speed of 8 miles per hour, and they aggregate 2000 miles per day, there would be 250 car hours run, and the cost per car hour would in that case be eight times the cost per car mile. The advantage of this unit is found chiefly in comparing roads, or divisions on a large system, where schedule speeds vary greatly. There is no question that the principal part of the great variation in cost per car mile shown by different roads is due to the differences of schedule speeds. In a road running at 20 miles per hour, for example, and paying its conductors and motormen 20 cents per hour each, the transportation wages amount to only 2 cents per car mile, whereas in a city road running at, say $6 \frac{2}{3}$ miles per hour, the equivalent cost is 6 cents per car mile, with the same rates of wages paid. On the motor-car hour basis the transportation wages would be the same, viz.: 40 cents per car hour; the two roads will, to that extent, at least, be placed on an equal basis, and the effect of mismanagement or poor economy in departmental work will be more clearly brought out. This is Mr. Mackay's argument, and it is undoubtedly a strong one from some points of view.

The attempt to find a single unit of measurement which

shall gage the respective efficiencies of management of two street railway properties is, however, as futile as was the search for the philosopher's stone in the middle ages. The difficulties are inherent and insurmountable. Street railway operation is made up of so many processes wholly different in their nature that they cannot possibly be brought down to expression in any one form, even on a single property—much less in comparing two properties having widely different conditions. How true this is may be seen by inspecting some of the detailed operating expenses which go to make up a total. In the department of transportation we can, to be sure, pro rate nearly everything in car service upon a car-mileage or motor-car hour unit. If we pro rate operation of power plant also upon this unit, it will give us some results of value, from a transportation standpoint, although we cannot by this means gage the relative economy of different power stations, but must for that purpose use the kilowatt-hour unit. In the maintenance accounts, however, we run across trouble at once. Maintenance of cars and their electric equipment can be gaged by the motor-car hour or car-mile unit, but directors would get a much clearer understanding of the relative economies in different comparative reports of operation if the accountant should pro rate maintenance of track and roadway upon miles of track; maintenance of electric line upon miles of road; maintenance of steam and electric power station plant on kilowatt output, as a part of total cost of power; or should express all these costs, together with maintenance of buildings and fixtures, in the form of percentages on original cost. So, too, in the department of general expenses, what a board of directors would look for from their accountant is a statement as to what percentage of their gross receipts is being used for general expenses of administration in detail and in toto, and whether this percentage is increasing or decreasing. We do not mean to say that all these items in operating expenses are not to be expressed in the car mile or motor car-hour unit, for the manager and the directors often wish to get an idea of the relative proportions of each item of expense to the total, and this can well be shown in either of these units, but it is certain that, in comparing many of these items outside the transportation department, from year to year, in order to see where economies are possible, they will find the motor-car hour or car-mile unit absolutely useless. If these things are true of an individual road, how much more must they be true when comparing, as Mr. Vreeland said, a mountain road with a plain.

The truth is that we must have a large stock of units in order that the directors and managers of a property may be able to effect the economies which it is the object of all accounting to facilitate. The motor-car hour is a valuable addition to this stock, and Mr. Mackay is to be given due credit for bringing it so prominently before the accounting world and explaining its merits. While it is not, and never can be made to be, the touchstone which will measure efficiency of management of two different properties, it will help the manager of a large corporation to learn more about the work of his respective division superintendents, because they cannot plead differences of speed as being responsible for differences in result. We believe, however, that the car-mile unit is firmly entrenched in the practice of so many companies and is, on the whole, so satisfactory in making comparisons from year to year on the same systems, that it is not likely to be displaced.

In the final analysis the presentation of operating results by the accountant in any or all units is not the *end*, but only the *beginning*. It is the manager's duty to explain these results to his directors and stockholders, to show why the cost per car mile of car service, for example, was greater this year than last, or to state with due satisfaction that by such and such means he was able to bring the cost of power down this year to $1\frac{1}{2}$ cents per car mile, while it cost 2 cents last year. It is the business of the accountants to make this work of explanation as easy for the manager as possible, and for this purpose a table of detailed comparisons in appropriate units separate from the main presentation of results should accompany every profit and loss account.

How Can Street Railway Investments be Made Secure and Remunerative

The paper on this subject just delivered before the American Street Railway Association by Charles T. Yerkes, one of the most successful investors in street railway properties in America, is certainly worthy of careful attention, and is full of suggestions and ideas, upon which, however, public opinion is by no means unanimous. Mr. Yerkes first describes the tremendous physical and financial differences between the horse railways of twenty years ago and the cable and electric railways of to-day, referring especially to the great investments now required as compared with those necessary for horse railroading, and he considers that the investment risks now are such that if twenty-year franchises were fair under the old regime, two hundred-year franchises would be equally fair at present. A long charter or franchise tends more, he thinks, to the greater security of street railway investments than any other one element. Mr. Yerkes believes that street railway companies should pay for their privileges by turning over to the public treasury a fair percentage of the earnings of the company, but that it should be borne in mind that a company serving a large city must always carry a large amount of unproductive mileage, which the future only is to make valuable, and therefore cities should not make extortionate demands upon the companies. He advocates the appointment of State commissions to carefully and intelligently supervise the operation of street railways in much the same way as is now being done in several of our States. Finally, to the end of making street railway securities more secure, Mr. Yerkes advocates straightforward dealing with the public, and a broad and liberal policy in introducing improvements.

All these suggestions are good and valuable, but they do not reach the heart of the problem. The more we examine into the reasons for the increasing number of controversies between municipalities and private capital engaged in public service industries, the more certainly is the conviction forced upon us that *the only way in which most of the grave problems which confront street railways to-day can be solved, and street railway investments can be made both secure and remunerative, is by making friends with the public and taking it into a bona fide partnership of profits.* At the root of all our troubles of to-day—excessive taxation, labor strikes, "cruel and unusual" punishments of various kinds inflicted or attempted by politicians—lies a grossly

exaggerated idea of street railway profits, and this idea is fostered by *secrecy*. All of us in the business know that street railway profits are not excessive, but are, on the contrary, small, while the business itself may be classed as "extra hazardous." The comparatively few men who have apparently, or actually, grown rich from their street railway security holdings, have done so, as a rule, through the capitalization of expected profits, not the actual receipt of real ones. In nine cases out of ten where the annual profit and loss accounts have seemed to show a large return on investment, it is because depreciation of plant and equipment has not been properly taken care of, as is universally done abroad, or else because an open "construction account" has been charged with what are really operating expenses, in order to serve the purpose of those who are trying to unload their stocks upon the public.

It is hard—probably impossible—to bring these facts home to the public, particularly because the truth is kept from them by both politicians and street railway managers themselves, though for differing reasons. The manager is the agent of his company's security holders, and cannot take any radical action which would depreciate the value of their securities among investors. The politician, even if he knows the truth, which he rarely does, perhaps, would not ordinarily hesitate to climb to power on a purely demagogic appeal to public ignorance and prejudice. Meanwhile, secrecy is maintained, and the burdens of taxation are piled on heavier, until, from one cause and another, the final crash comes and the property is bankrupt.

A partial remedy for this state of things is the non-partisan State commission, which Mr. Yerkes advocates. Such a commission is found in Massachusetts and New York, and in Massachusetts, particularly, its functions have been so fixed by law and interpreted by the courts, as to really protect the public against overcapitalization and "wild-cat securities." It is impossible to-day to overcapitalise street railways in Massachusetts. The Railroad Commissioners will permit issues of stock and bonds together only to an extent warranted by the actual cost of duplication of all the tangible assets, and the bond issue must not exceed one-half the stock issue. Organization expenses even cannot be capitalized, and if there be at any time an impairment of capital account, as shown by inventories dividends must be reduced or suspended until the impairment is made up. The commission even fixes the price at which stock shall be offered to the public, never putting it below par, and frequently providing that a heavy premium shall be paid into the company's treasury—not into private hands. Such protection as this is genuine, permanent and desirable from every point of view except that of the man who wishes to make money too rapidly, and street railway investments are highly regarded in Massachusetts as being secure and reasonably, though not largely, remunerative.

In spite of these carefully made provisions, however, there is a growing agitation even in Massachusetts for public ownership of street railways, and unless a better and more logical plan than this semi-socialistic one is found, there is grave danger that the immense advantage to the public of private ownership or trusteeship of this industry may eventually be lost. We need not here repeat the arguments against municipal ownership of street railways, except to epitomize them by saying that never in the his-

tory of the world will a municipality, with its 50,000, 100,000 or 1,000,000 inhabitants as "stockholders," represented by fifty or one hundred councilmen, as "directors," handle any public service enterprise with the same promptness, decision, breadth of view and outlook for the future, as will be done by properly encouraged private capital, managed by a half dozen responsible trustees. In a thousand ways, more or less indirect and unrealized, the people will be the poorer for a municipal ownership experiment, even should their treasury be slightly the gainer.

What then is the true remedy if it is not found in the Massachusetts plan? In what way can municipal ownership agitation be stopped and the immense benefits of private ownership be retained for the public good? Is there any one plan which can be put in universal application with justice to all concerned?

Possibly not, but if such a plan be found it will surely involve the profit-sharing principle in some form, together with absolute publicity in every department of the business. In a plan of this kind the expenditure of gross receipts might be made on some such basis as the following, the charges on receipts taking precedence in the order given:

1. *Operating expenses*, including a proper allowance for depreciation.
2. *State and local taxes* paid on real estate and personal property—the ordinary burden of citizenship.
3. *A reserve fund* for accidents, uninsured losses of various kinds, and other contingencies.
4. *An amortization fund*, to insure a return of invested capital at end of franchise life.
5. *An employees' benefit fund* to provide against sickness, accidents and old age.
6. *A minimum* (e. g. 4 per cent) *annual return* on the private capital invested.
7. Equal division between the municipality and the private capital invested of the remaining profits.

With such a plan as this, embodied in contract form, between municipality and company; with regular monthly, quarterly and annual reports of operations, duly audited by city officials; with arbitration of disputed points by a State railroad commission; and, above all, with absolute good faith on the part of both city and company, is it possible to doubt that demagogues and political "strikers" would be driven out of business so far as street railway matters are concerned, while, the interests of the municipalities and the companies being substantially identical, the present distressing conflicts would almost entirely disappear, and street railway investments would become both secure and remunerative?

Finally, the policy of distributing street railway securities locally—a matter not referred to by Mr. Yerkes in his paper, but touched upon by Mr. Vreeland in his discussion—is one which should be adopted by every company, even at some sacrifice of time, convenience and money. In disposing of bonds to banking houses, as large a proportion as possible should be reserved for sale to local capitalists, either by the companies direct or by the bankers as financial agents, and as much stock as can be spared should also be placed at home. In cases of this kind it is dangerous to be *isolated* in a community, for a company is thereby subject to the attacks of "strikers" or demagogues, without friends to help it fight its battles. Fifteen or

twenty prominent local men as stockholders can bring immense influence to bear at times in preventing trouble, and if the number can be made 100 or 1000 or more, thereby making an even larger portion of the public sharers in the enterprise, so much the safer is the invested capital.

Franchise Valuations

A franchise may be defined as a special privilege granted by public authority to an individual or a body of individuals. The value of a franchise may be large, small, nothing or worse than nothing—the latter if it involves losses or obligations which cannot be escaped. The true value of a franchise, when it has a value, is an amount equal to *the capitalization of excessive—not of total*—profits. Every investor has a right to expect a reasonable rate of return upon his investment in tangible assets, organization expenses, etc., this rate varying with the current rates for money in the particular locality where the investment is made and upon the general estimate placed on the safety of his enterprise in comparison with that of others, into which he could put his money. If, because of the possession of a franchise conveying special privileges, he gets a rate of return larger than the average, the capitalization of the excess, at the ruling interest rate, is the value of the franchise.

Suppose, for example, that a company obtains a thirty-year street railway franchise, that it pays \$1,000,000 for plant and equipment, and earns \$50,000 per annum for thirty years, in a community where the ruling rate for an equally safe investment is 5 per cent. The value of its franchise is nothing, since the same return can be obtained from an investment involving no franchise. If it makes \$100,000 a year for thirty years, the value of its franchise is \$1,000,000, since, because of the franchise, 5 per cent can be earned upon \$2,000,000.

This is a fair and reasonable method of arriving at a franchise valuation, and where the true investment account can be ascertained, distinct from overcapitalization, the value of a franchise can readily be obtained at the end of its life. If, however, the attempt to do this is made earlier, estimates, based on more or less fallible judgment, must necessarily be employed. It may be expected, for example, that general market interest rates will fall during a long time franchise, thus increasing the franchise value by increasing the capitalization factor. The value of real estate may also go up, thereby increasing the selling value of that portion of the investment and increasing the total net profits for the period. On the other hand, equipment may deteriorate and earnings, gross and net, may be greatly reduced through accidents, competition or "improvements in the art" necessary to obtain at whatever cost.

At a time when municipalities seem to be combining to drive street railway companies out of business by excessive taxation, it is necessary to occasionally clear the atmosphere by defining first principles, and we trust that the time will come when there will be less loose and indefinite talk about franchise valuations than is now so generally heard.

A Word of Appreciation—and Explanation

It is with much pleasure—tempered, however, with some surprise—that we have received the congratulations of a thousand or more (so it seems to us) friends and well-

wishers at the convention and elsewhere, on what they are pleased to term "that magnificent 'World's Practice Number' of yours." Pleasure in such congratulations is always natural, for it indicates appreciation of good intentions, if not of good work. The surprise comes in finding that the achievement in this particular case should be considered so remarkable. It is true that our "World's Practice Number" was a large issue, containing no less than 163 pages of reading matter and 276 pages of advertising, but this result compares with our regular fall convention numbers of previous years only in about the same way that the general prosperity of 1899 compares with that of 1898. Possibly an issue of this kind, dealing as it does with electric railway practice all over the world, and bearing within it so many evidences of the close engineering and commercial inter-dependence of the different countries, in these days of enterprise, competition and intelligent study of results, is needed to demonstrate the broad international character and world-wide connections of a periodical which is universally recognized, we believe, as the leading exponent of the street railway industry. The very fact that British, French and German manufacturers used between forty and fifty pages of our October issue to advertise their material and supplies among tramway purchasers, not here, but in Europe, Asia, Australasia and South America, and that no other foreign or American paper is used to anything like the same extent, is certainly significant, but it did not occur to us, until hearing the many expressions of surprise at this large foreign patronage, that the position of the STREET RAILWAY JOURNAL abroad may not be fully understood in America. We may be pardoned then, perhaps, if we state here, for the benefit of those who have not closely followed our work in foreign fields, that for some years past we have been publishing two regular monthly editions of the STREET RAILWAY JOURNAL, one, the American edition, intended for circulation in the United States and Canada, and the other, the International Edition, for circulation in all other parts of the world. Each edition contains considerable matter not found in the other, though it is intended that nothing shall be omitted from either edition of interest to its special clientele. In each issue of the International Edition appears a digest of contents in German, Spanish and French, and for the benefit of the combined service we have a staff of regular editorial representatives and occasional correspondents in the principal capitals of the world, composed of leading engineers and managers, of the several countries.

Partly as a result of this more recent work, but largely through the inheritances of earlier years, our foreign subscription lists contain not only the names of practically all the principal European engineers, tramway managers and manufacturers interested in improved tramway and railway motive powers, but cover such distant countries as Persia, New Zealand, Java, Turkey, Trinidad, Siam, Japan, Hawaii and all parts of Africa and South America. The little unpleasantness now going on in South Africa, for example, directly affects us, inasmuch as we cannot be sure that our current issues will reach our numerous subscribers in and near the seat of war, in Kruegersdorf and Pietermaritzburg, Natal, Johannesburg and Pretoria, South African Republic.

The STREET RAILWAY JOURNAL is not a *local* paper.

"A better convention has never come to Chicago in the course of my experience." So spoke the genial chief clerk of the Auditorium on Friday night, and he followed it up in explanation by saying that it was a convention which "took care of itself," did not overstep bounds, made no complaints, understanding the difficulties of the situation.

Proposed Resolution for Bringing About a Standard Determination of Cost of Public Service

The following resolutions, prepared by Allen Ripley Foote, have been presented for action to a number of economic, municipal and private industrial associations, with a view to bringing about a scientific determination of the cost of public service, and of thereby furthering the comparisons between the cost of public and private ownership to the advantage of all concerned. Among others, the executive committee of the American Street Railway Association has these resolutions under consideration:

Whereas, The American Street Railroad Association has discussed certain features of municipal public policy relating to the ownership and operation of public service industries, and whereas, such industries must necessarily be owned and operated by public or private capital, and, in either case, the application of a definite system of regulation identical in all of its details for both public and private ownership is fundamentally essential to promote and protect the welfare of users, taxpayers, employees and investors,

Be it Resolved:

First—That practical civil service regulations, strictly and continuously enforced in the case of public ownership, and a just system of profit-sharing in the case of private ownership, are necessary provisions to safeguard the interests of employees, and to insure efficient economic management for the service of users and taxpayers.

Second—That a system of accounting, uniform throughout the State, prescribed and audited by authority of a general State law, designed to show the true and entire cost of every public service industry, identical in every particular for public and private ownership and operation, is an indispensable condition to secure intelligent and just regulation.

Third—That a general State law should specify that there should be included in all statements of costs, used as a basis for determining prices to users and taxpayers, interests on the investment at the rate paid on its bonded debt by the municipality in which the industry is located, a sufficient provision for insurance against loss by accidents of every kind; the amount of taxes relinquished if a publicly owned industry, and paid, if a privately owned industry; an ample provision for insurance against the impairment of investment; the true and entire costs of all materials used and salaries and wages paid, and an accurate statement of all miscellaneous expenses.

Fourth—That prices to users and taxpayers should be based on cost, plus a provision for the payment of all capital secured by taxpayer or the sale of bonds in case of all publicly owned, and cost plus a legally limited profit in case of all privately owned industries.

Fifth—That prices should be determined for periods of five years.

Sixth—That all service rendered to private and public users should be valued and paid for at prices determined, as specified in number four. All free service should be prohibited.

Seventh—That no service should be sold for less than its cost, and no discrimination in price shall be allowed between users taking service under like conditions.

Eighth—That the divisible profits of private ownership and operation should be determined and limited by a rate upon the investment, which shall be equal to twice the rate per cent paid on its bonded debt by the municipality in which the industry is located, in all cases where costs are calculated and allowed, as specified in number three.

Ninth—That all profits in excess of the legal profit should be divided equally between the municipality and the private owners.

Tenth—That in making contracts with private corporations for the purpose of carrying the foregoing regulations into effect, the initial investment used as the basis of calculations should be determined by process under the law of eminent domain, or by arbitration, as may be mutually agreed upon between the municipality and the corporation.

Eleventh—That this contract should provide that at the expiration of every period of five years the municipality shall have the option of paying to the corporation the full amount of its investment and thereupon taking possession of the property, and thereafter operating it as a municipal industry, and in case this is not done, that the prices shall be determined for another period of five years, and the contract continued in force without further change.

Twelfth—That this system of public regulation is preferable to public ownership and operation.

NOTES AND COMMENTS ON THE ACCOUNTANTS' CONVENTION

BY A. O. KITREDGE, C. P. A.

"Well, what did you do there, anyhow?" or some similar question, is likely to be the greeting of all of those who were in attendance upon the convention of the Street Railway Accountants' Association of America, as often as they are met by those who are interested in the general proposition of perfected accounts, and who were unable to be present. The subjects announced by the programme for discussion were such as are of interest to all street railway men. They are of special importance to those companies who have taken membership in the organization. But, at best, the attendance at the several sessions was only about one-third the membership. It would seem, therefore, that the question would have to be very widely answered if the general desire for information is to be satisfied. Right here becomes apparent the usefulness of the silent member, who takes notes while others talk, and the utility of the press, that makes known to all the results of his observations. What, then, was done by the accountants' convention? A verbatim report would fail to reflect the lights and shadows of the occasion, even though it recorded all the stated motions and faithfully reproduced the speeches. It is an effort to supply what the verbatim report cannot convey that these notes and comments are penned. First, let it be stated that what was done included a part of what was suggested by the programme, and much more that was spontaneous to the occasion. As I look back to the days devoted to the meetings I am inclined to the opinion that the less importance attaches to those matters which were in the original programme, including those that were covered by formal motion made and seconded, and the far greater importance to those matters which were unexpected, and which by the manner of their presentation amounted to little else than apropos suggestions and genuine thought provokers.

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There was more of the practical in the welcoming address of L. E. McGann, Commissioner of Public Works, who, as the representative of the city of Chicago, welcomed the accountants, than is usually found in such efforts. He invited the accountants, as well as members of the American Street Railway Association, to visit the City Hall to examine into the methods of doing business there in vogue, and particularly to inquire into the methods of granting railway franchises. He very appropriately remarked in connection with this invitation that the question of granting franchises is as great as that of accounts. He declared that much of the popular prejudice that exists with respect to such matters could be designated in a very few moments if only the methods were inspected. Only two or three of the accountants were able to find the time to accept this invitation, but those that called at the office of the commissioner reported both a profitable and highly enjoyable hour. President Calderwood's acknowledgment of Mr. McGann's welcome and invitation was in his happiest vein. In characterizing Minneapolis as a suburb of Chicago he touched the heart of every Chicagoan present.

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Several prominent thoughts were left in the minds of his hearers by the annual address of President Calderwood, among which were the following: The street railway business, notwithstanding the energy and capital invested in it to date, has not yet been developed, in the estimation

of men competent to express an opinion, to exceed one-fifth part of its possibilities. Accounting is the vital element of all branches of business, street railways not excepted, and the economies of accounting, both as to the character of the results obtained and stated, and the cost of performing the work, are of the utmost importance every where. Keeping in mind the fundamental principle of comparison, President Calderwood, often complimenting the association on what has been accomplished in the classification of expense accounts, pointed out that before the association will have fulfilled its mission it must have a unit of comparison. Just what that unit should be he did not in the least intimate, leaving its determination to the association, to be developed, perhaps, by the discussion of Mr. Mackay's paper on "Car Mileage." The address also referred briefly to the action of the Association of Railroad Commissioners in indorsing the classification worked out by the street railway accountants, and also to the work of the secretary in the matter of blanks and forms. President Calderwood closed with a feeling appeal to the members of the association to avoid hobbies in accounting, and to be careful to give the managing officers of the several roads only such salient facts as are likely to be useful to them.

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The report of the executive committee presented by Mr. Wilson was a model of brevity. A description of it would require more words than the report contained. The committee held three meetings during the year, and had five mail votes, admitting thirty-four new members (companies). A change in annual dues from \$10 to \$20 was recommended. The question of a change in time and place of meeting, so that the accountants would not assemble when and where the American Street Railway Association was holding its sessions, was recommended for consideration. The books of the treasurer were reported to be correct. The secretary and treasurer's report, on the other hand, went into details, and occupied much more time in reading. A detail list of the thirty-four companies admitted to membership was given. The fact that both the great companies of New York City were included, and that London, England, and Glasgow, Scotland, were also represented was received with special gratification. The association has had a total of 103 members since its organization. Three have dropped out, leaving the membership at the time the report was written at an even hundred. There were several additions during the days of the convention. The financial report showed a deficit of some \$75, which means that, with the rigid economy which has characterized the management from the start, many expenses belonging legitimately to the association having been paid out of private funds, the income does not suffice for the work of the body. This deficit was more than made up by voluntary subscriptions before the convention adjourned, and the proposition to double the dues (commencing Jan. 1, 1900,) was carried. One motive that influenced this latter measure, and which was prominently brought out in the discussion, was the tendency to consolidation among street railway companies, resulting in a lessening of the number of possible members. With an assured income of \$2,000 for the ensuing year, as against \$1,000 for the year just closed, it would seem that the work might go on without serious financial embarrassment,

The paper by Mr. Mackay, to which all had looked forward with interested anticipation, was in a sense an attack upon the "car-mile" as a unit of comparison, and a defense of the "motor-car-hour," with incidental reference to the shortcomings of such units as the "passenger-mile" and others more or less in use. Not a little interest centered in Mr. Mackay's account of the questions he had addressed to a considerable number of street railways throughout the United States and Canada, and the answers thereto. From these it appeared that out of ninety-four roads answering as to the basis upon which mileage is computed, seventy-three depend upon conductors' or motormen's reports, fifteen on foremen's, dispatchers' or switchmen's reports, and four upon time tables. Of ninety-seven roads answering the question of keeping a record of the mileage of each car, fifty-one reported that such records are kept, while forty-six replied in the negative. Of ninety-three roads answering as to means of verifying mileage figures, forty-five reported none but care in computing, twenty-eight depended upon time tables, eight on dispatchers' reports, four each on foremen's reports and pay rolls, three on motormen's reports, and one upon trip receipt returns. It further appeared that of ninety-seven roads answering the question of including "dead mileage" in their computations, fifty said that it was not included, thirty-six said they did include it, and eleven declared they have no dead mileage. In the matter of trailer mileage forty-six companies reported no trailers used, thirty-seven who use trailers more or less of the time, include trailer mileage in their figures, while eleven declared that trailer mileage was omitted, and one road reported that trailer mileage was taken at one-half. On trips lost, fifty-seven roads reported allowances, and thirty-seven said no allowances were made in this regard. The question as to what constitutes a car-day produced some peculiar figures. Forty-eight companies reported that "cars operated per day" is not used by them as a basis for comparison of earnings. Forty-four companies do use this unit, but give it different values. Thirty-one of these companies call the car-day eighteen hours, four put it at fifteen hours, and three have it at seventeen hours, while four others, being a single instance, each gave the figures sixteen, seventeen and one-half, nineteen and twenty hours. Two companies reported on the basis of miles in place of hours, giving the figures eighty and 115 miles respectively. These statistics are interesting, if for no other reason, because they show wide diversity in point of view, as well as the differences that exist in current practice.

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Mr. Mackay's conclusion from his investigation and study of the subject was that such mileage carefully computed, all dead miles included, and with the trailer eliminated, there would be available a unit uniformly applicable to all electric systems and available as soon as the question of speed is adjusted. In his remarks he had dwelt upon the question of speed as between city service and interurban cars, showing that increase of speed does not materially increase the cost of operation, and demonstrating that in the case of interurban cars running from two to four times the speed of city lines, the cost per car-mile would be less, while the showing on the basis of passengers carried would be more, by reason of the longer haul. The new unit, Mr. Mackay called the "motor-car hour," meaning car-miles divided by the average rate of speed. This unit he advocated using for both earnings and expenses, and in closing his address pointed out how various suggested difficulties could be met and overcome. That the convention did not agree with the speaker in his conclusions in all respects became apparent as soon as discussion was commenced. It also became very evident that

there were almost as many views as there were speakers, thus demonstrating over again just what Mr. Mackay's carefully gathered statistics had proven.

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Mr. Vreeland, of the Metropolitan Street Railway Company, New York, who opened the discussion of Mr. Mackay's paper, took a somewhat peculiar, but extremely interesting, course to show why and wherein he could not indorse the unit named for use upon the lines within his control. His opening remarks were slightly biographical. He briefly traced his own railway history, by way of explaining how and why he was tinctured with some of the views which prevail among the managers of the steam roads of the country, in the matter of records and units of comparison. He described the peculiar conditions under which street railways in New York are operated. He pointed out that as many as 5000 horses are yet at work in the street car systems of the metropolis, and that both cable and electric lines are in use. Congested traffic is the rule on all the down-town lines at certain hours of the day. When a car starts out it is uncertain whether it will make the entire trip or part of the trip, because of being turned back by an inspector at some point en route. Speeds differ not only as between different lines, but as between different sections of the same line, and as between different hours in the day on a given section of any of several lines. In view of all these perplexing conditions the speaker declared that he had found the "car-mile" the only satisfactory unit of comparison, or basis of statement of results. He mentioned that the unit in use in New York is also in use in Philadelphia and some other of the large Eastern cities. No trailers are used in New York. Mr. Vreeland said that at present cars of various lengths are in service, ranging from 18-ft. horse cars up to the long double-truck electric cars on some of the more recently equipped lines. He said, in answer to a question, that no attempt was made to take the element of speed into consideration in the statistical statements of his company, and pointed out that it would be impossible to do so for reasons already mentioned.

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The one remark dropped by Mr. Vreeland that attracted most attention, and that was referred to most frequently in the discussion in the convention, and also in the talk of the accountants as they rode together on the excursions, was that in which the operating expenses of a steam road in a mountainous section were compared with those of a road in a prairie country. The first, he said, might show operating expenses of 80 per cent, while the other was as low as 50 per cent. This demonstrated not that the first was poorly and inadequately managed, but that the cost of hauling freight and passengers up heavy grades was more than that of hauling them over a level road. Computations by percentages, he pointed out, were never satisfactory, because in percentage statements it is impossible to indicate the conditions under which the traffic is conducted and the physical condition of the road and its equipment. The comparison of mountain and plain was very quickly grasped, and the illustration was frequently employed in enforcing what many members contended is a fact, that no single unit is possible, taking all the street railways of the country into account. Differences in roadway and equipment are indisputable. Weather conditions, as between the extremes of North and South, are facts to be considered, and numerous other matters that will occur to the mind of every practical railway man are to be reckoned with.

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Mr. Wyman, of the New Orleans Traction Company, thought possibly the motor-car hour might overcome some

of the difficulties encountered with the car-mile unit. Mr. Duffy declared that the motor-car hour would help out a comparison between the road in the Rocky Mountains and one on the prairies of Illinois. Col. Heft, of the New York, New Haven & Hartford Road, declared that the question is one that is governed entirely by the conditions which exist upon the road that is being operated. He said the motor-car hour on the New York, New Haven & Hartford Road would be very misleading, because during certain portions of the day two trailers are used, while during other portions, three, four, or even five, are employed, while in still other cases the motor-car alone is enough for the traffic. The car-mile unit has been adopted by his company. He remarked further that all such questions as the unit of comparison or basis of statement of results must be settled in the light of the conditions that exist on each of the several lines, and that no fixed or stereotyped rule is possible. He would cordially welcome a rule universally applicable, to be used alike by all companies, but from present light such a consummation seems well nigh impossible.

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Mr. Wilson, referring to the Boston roads, said that over 300 routes per day were run, all of them being different lengths, and such cars running at different speeds. The conditions are such that no other unit than the car-mile would answer. He did not think it fair to compare city routes with interurban routes. Each class ought to have comparisons of its own. The same unit was not equally applicable to both. Mr. Ross remarked that the question of the car-mile and the motor-hour is entirely a local one. He believed the ratio of expense to earnings to be the only proper basis of comparison. He did not think it feasible to compare a large road with a small one, nor yet a road where there is no snow to one that is obliged to spend a large sum in removing snow every winter. When Mr. Mackay introduced his second diagram, in which were compared results of different months having different incomes or earnings, but with practically unvarying operating expenses, the discussion waxed warmer. The diagram showed earnings of \$100,000, \$120,000 and \$150,000 for January, May and July, respectively, and \$60,000 operating expenses for each. The percentage of the latter to earnings was shown to be 60, 50 and 40 for the three months respectively. The earnings per car-hour figured \$1.67, \$2 and \$2.50 respectively, the motor-hours throughout being 60,000. In explaining this diagram, Mr. Mackay pointed out the evident unfairness of comparing different roads upon the basis of percentage of expenses to earnings. To say that the month of May showed operations 10 per cent cheaper than January, as above, when the operation expenses were the same for both months, the amount of traffic or earnings representing the sole difference, would be absurd. Mr. Ross then asked why not make it on a per mile basis, instead of a per hour basis. Continuing, he enforced the point already made that there are different conditions distinguishing every road that is examined. He declared he could not see how the car-hour basis would bring the correct result. Mr. Mackay then alluded to efficiency of service, saying that in winter, when less cars are required, less are run. Mr. Hibbs, with, perhaps, a suggestion of impatience in his tone, here inquired if, as a matter of fact, there is any satisfactory basis of comparing roads that operate under different conditions?

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J. K. Newman, president of the New Orleans & Carrollton Street Railway Company, after explaining that a president must necessarily interest himself in the accounts of the

property in his charge, said: "You may establish any basis you please, whether it be car-hour or car-mile, but you cannot compare different roads operating under unlike conditions with each other." He declared himself in favor of the car-mile basis, and then explained how in his own office the car-mile, the car-hour and the percentage method were all used, each showing some fact not revealed by the others, and, taken collectively, giving the whole situation in a form to be available to the management. Mr. Mackay here interrupted to the extent of declaring that in the light of the speakers who had so far discussed the question it was apparent that nothing had been accomplished. Mr. Wilson, by way of pacification, said that he did not think that the work of the association would be thrown away, even though no basis was arrived at. Mr. Dimmock then inquired as to the comparison of mileage to be made between a long haul and a short haul, and whether with a long double-truck car the mileage would be counted the same as with a single-truck car, if both went only 1 mile? Mr. Mackay answered in effect that the small car would cost less than the large car, but that there would be less efficiency, and accordingly that the showing would be more particularly in the earnings. The expenses would not show in the large car as they should. Mr. Dimmock next inquired if both cars, long and short, run one hour or any other period of time, would be regarded as running the same. He said he knew of some roads where the short car was counted double the long car. Mr. Mackay replied that the comparison should be on the actual time the car was out, without regard to the length of the car.

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It was left to Mr. Ford, of New Orleans, to close the debate, and this he did by pertinent references to what is the rule with his company in these matters. He believed it impossible to find a rule that can be considered as applying to all street railways in the country as a basis of comparison. While using the car-mile, it is his rule also to submit an analysis of the monthly results upon a percentage basis. His statement also shows the earnings per car-day of eighteen hours, and likewise the expenses per car-day of eighteen hours. Both earnings and expenses are shown per car-mile. Continuing, after mentioning that trailers are used on one line, he said: "I can see that on almost any basis it would be hard for us to compare with another road that is not operating under the same conditions." His advice to the association was to show the managers what the figures really mean. Let them have the comparison of one month with another on the basis of motor-car hours, of car-miles, of car-days, the earning percentages, the expense percentages, and whatever else is possible and appropriate.

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In an account of this nature, written largely from memory after the final adjournment, it is sometimes difficult to discriminate between what was said in the meetings and what transpired relating to the same subjects as they were talked over in the hotel lobbies. Perhaps it is not necessary to try to do so. All that Mr. Ford had said was cordially indorsed by Mr. Duffy immediately after adjournment and before all the members had got their overcoats and hats on ready for departure. He said he had been in the habit of displaying results for the benefit of his managers in just as many different ways as possible, in the knowledge that what was not clearly indicated in one way would be brought out by another. Mr. Harder, of Kansas City, offered remarks of like import, as did also Mr. Simpson, of Augusta, Ga.

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In the hotel a president and two accountants continued

the discussion of a unit of comparison to be universally applicable. The street railway president, who is also an accountant, did most of the talking. "Why," said he, "the proposition of a single unit is preposterous. There must be taken into account a lot of things, among which are the weight of the car, the length of the car, the horse power of the motor, the efficiency of the motor, the grade of road, the character and physical condition of the track, and ever so many more. A comparison, to be of any real value, ought also to include in some way a reference to earning capacity. I can readily see how a conference might result in fixing a unit for the car, and one for the track, another for the power, and one for receipts, and still another for time and wages of the operation, and no doubt as many more as are necessary, but to get an expression that shall include all these in one, and be fair in all cases, seems to me not only impossible, but an absurdity on its face. The variations in the underlying conditions, impossible of expression, would render comparisons on such a basis of no value whatever. It is barely possible, if the railway accountant had all the receipts of the road and the contents of the National Treasury, in addition, to defray the expenses of his department, and a span of life ten or twenty times the usual average, a plan might be worked out for grading or judging street cars and their operation, after the general method that obtains with horsemen, bird fanciers, dog breeders, and others. The perfect car would have a hundred points. So many of them would apply to length, so many to weight, so many to the motor, and so on. Then any given car could be justly classed, and all the cars on the road could be graded collectively as being equal to 50 per cent, 75 per cent, or 90 per cent of the ideal, as the case might be. The physical condition of the track and the grade of track might be similarly indicated. The element of speed could come in on some similar basis. The earning capacity could be likewise shown, and so on to the end of the list of all the elements the street railway man has to deal with. In short, if we had money enough and time enough a plan might be worked out by which any two roads to be compared might be measured up, just as contesting yachts are measured, with the result declared that the boom of one is 2 ins. too long, and must be reduced; that the water-line of the other is 6 ins. short, and accordingly more ballast must be carried, and that when these adjustments are made, still, to be fair, it is necessary for one to allow the other ten seconds' advantage in the race. Everything is possible, if only the time and money necessary to the undertaking are conceded. President Calderwood cautioned the members of the association not to ride hobbies, but the question that has been trotted out for exhibition on this occasion may prove a hobby that will run away with all who venture to test the saddle which it carries. The fact is that each railway manager is up against special problems of his own. No two lines present the same conditions. Each man, therefore, must work out his own solutions, by which I mean very largely, establish units of his own. Everyone can learn something of his neighbor, but the universal unit, by which Montreal can be fairly compared with New Orleans, and New York with Chicago, is a will-o'-the-wisp that it will not pay to run after."

* * *

The report of the committee on a standard system of street railway accounting was in the form of a pamphlet eighty pages in extent, supplemented by a special sheet devoted to a classification of materials and supplies. The pamphlet showed on every page the evidence of the careful and conscientious work which has been given by this committee from the beginning. The report first recounted

the conference of representatives of the committee with committees of the Association of Railroad Commissioners, and of the Association of American Railway Accounting Officials, held in New York in July last, the particulars of which were published in these columns some time since. It then set forth the action of the eleventh annual convention of Railroad Commissioners, held in Denver, Aug. 10, last. This amounted to an indorsement and acceptance of the classification worked out by the Street Railway Accountants' Association, after being modified in minor particulars, as agreed by the committees in conference. These changes are essentially three in number. First, substituting the term "operation of cars" for "car service" in expense accounts Nos. 16 to 24. Second, transferring "stable expenses" from account No. 30 to account No. 8, namely, "maintenance of miscellaneous equipment," and, third, putting taxes back into the list of subtractions, that is, among "deductions from income." The report proper was supplemented by a revised classification of construction and equipment accounts, being the classification adopted at Boston by the association and recommended for use, with the changes above noted properly embodied therein.

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The reasons set forth in the report which induced the committee to agree to the treatment of taxes above named, and which it appeared had been a virtual concession to the preconceived idea of the committees of the other organizations which it met in conference, deserve special attention. The Inter-State Commerce Commission established this form of statement a long time since. The steam roads adhere to this rule. The various boards of railroad commissioners have followed the precedent of the Inter-State Commerce Commission, and, while in principle, from the accounting point of view it is not correct, still it is better to conform to established usage. The convention approved of the report of the committee, and therefore for the time being, at least, the mooted question of the place to put taxes is settled. All this brings to mind a little matter in connection with office work, an allusion to which will serve to make clear a thought that is pertinent. The first typewriter that gained a position of favor in the public mind has a key-board that in economy of use is perhaps as much as 30 per cent or 35 per cent below ideal conditions. By the time that a competing machine having a key-board that was ideal in arrangement of letters, and which was scientifically correct, had got on the market the typewriter operators of the country had become so accustomed to the pioneer machine that they measured every new-comer by it. A little detail like 30 per cent or 35 per cent saving in motion of fingers, hands and wrists in operating was not to be considered along side of their blind prejudices. They were wedded to what they knew, and were too narrow-minded to even investigate something else, no matter what its asserted merits might be. The new key-board accordingly was unconditionally condemned. It was doomed to failure from the outset. The facts are that it was ultimately replaced on the new machine by something equivalent to that with which the public had been made acquainted by the pioneer machine. Meanwhile the makers of the latter, in a masterful piece of enterprise, shouted, "standard," and so well have they continued to shout "standard" from that day to this that all the typewriters before the public use a key-board, not ideal in arrangement, but conforming to what was established by the mechanical limitations of the first machine. Unborn generations of typewriter operators, it would seem, therefore, are destined to waste 30 per cent to 35 per cent of the energy expended in their work simply because their predecessors did not know a good thing when they saw it.

The parallel is apparent. It has become "standard" to deduct taxes from income, and therefore it goes.

* * *

The election to honorary membership in the association of H. A. Davies, of Cleveland, was one of the pleasing incidents of the convention, as well also as a deserving tribute to the good work which an able man has performed in the interest of standardized methods. Mr. Davies has recently severed his connection with the street railway industry to become secretary of the National Carbon Company. For two years he served on the committee on standard accounts, and, in a letter, which he recently wrote and which Mr. Duffy read before the convention, he expressed continued interest in the purposes and work of the organization. Mr. Duffy made the motion to include Mr. Davies in the select class, heretofore composed of H. H. Windsor and Edward E. Higgins exclusively, and the vote in support of the same was unanimous.

* * *

Mr. Brockway's report as committee on blanks and forms was a model piece of painstaking work. No less a monument to his indefatigable industry and energy was the collection of blanks which he displayed. These were presented in some twelve or thirteen huge volumes of the scrap-book variety, while a cabinet of the general shape of a safe, shelved off to contain them, represented their resting place when not in use. The safe-cabinet, of wood, was mounted on heavy casters and provided with handles for convenience in moving. The door, hinged in place, was fitted with a good lock. The blanks and forms displayed were casually examined by almost everyone present, and several attempted to go through the collection in a systematic way. Mr. Brockway's comments and criticisms presented at the conclusion of his report were received in good part, and in several instances were applauded. The usefulness of this collection would seem to depend upon the circulating library feature, far more than upon the display at the stated conventions. How the duplicate set of blanks can be obtained for examination by the members was carefully set forth in the report.

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Not a few expressed serious disappointment that the promised paper by Mr. Barnaby was not forthcoming. It was evident that it had been a drawing card in the programme. Several members declared that to hear it and the discussion likely to follow was what brought them to the convention. There was manifested the disposition to discuss the question of "Store-Room Accounts," paper or no paper, but time did not permit. A number of questions were put and answered, among the most important of which was that by Mr. Newman. He inquired how many present kept store-room accounts, and how many did not. The show of hands in response to the president's suggestion of how the question should be answered indicated a nearly even division. This seemed to show that progress is being made in one direction, at least, for, as I recall it, a similar vote taken at Niagara Falls showed Mr. Ross, of Montreal, as almost the sole representative of store-room accounts at that time. It is true that the association is much larger now than at that date, and it is also true that the composition of the convention on the present occasion was more representative than on the former one.

The report of the nominating committee, to which had been entrusted the selection of a ticket to be balloted for, was accepted by a unanimous vote, and the secretary was instructed to cast a single ballot for the officers thus nominated. This vote placed C. N. Duffy in the presidential chair, thereby putting at the head of the organization the

man whose capacity, industry and unselfish devotion to the cause he has had so sincerely at heart, have done much to bring the association to its present position of vantage and success. In the dual position of president of the organization and chairman of the committee on standardization of accounts, Mr. Duffy for the ensuing year is likely to find abundant opportunity for continuing the work for which he is so well qualified. The secretary-treasurership remains with Mr. Brockway, who has learned the ropes, and knows just how to discharge the duties of his office to the satisfaction of all concerned.

* * *

The convention finally adjourned without, however, anything having been said about accounting applied to street railway operations. It is true, "accounting" as a term had been frequently employed in connection with various bookkeeping details. No one, however, had seemed to see the opportunity that exists for using what has been done by the association to date as the foundation of an accounting system, which by its analytical completeness shall give the management all those results which it wants, expressed in the simplest possible form, and which by the logical arrangement of its parts, established upon a correct scientific foundation, shall operate with the minimum of clerical labor. Ideas or methods that are in direct sequence to single entry principles predominated for the most part. The relation of the profit and loss statement to the balance sheet of a company was not once alluded to, although several questions that were broached, and which were left open, could have been easily and finally settled in the light of this fundamental principle. No one seemed to think of the importance of modern mechanical expedients and aids in the office—that is, labor-saving devices—and the possibility—much less, the necessity,—of adapting them to use in connection with a scientific accounting system for street railways, in order that the multitude of details existing in this work, evidenced by the classified list of expense accounts, may be handled at the smallest possible cost.

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Those mercantile and manufacturing establishments which have given attention to these problems, although, perhaps some of them are weak in the matters of co-ordinating their expense items, are, as a fact, in possession of far better and more complete statements of the progress of affairs than are the average street railways of the land. They have the further advantage of accomplishing their results with relatively a very much smaller expenditure than the railways. Like results and like economies, however, are in the reach of the street railways if only they will seek them along the paths which accountants in other divisions of industry have discovered and have blazed for the guidance of their fellows.

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However, comparisons in general are odious, and criticisms of any sort at this time and in this place may seem unkind. Suffice it, therefore, to say, in conclusion, that it is evident, from the work done at Chicago, that the association is making progress. Its members, individually and collectively, entertain broader views at the present time of the work in which they are engaged than it was possible for them to have three years ago or before the association was formed. Altogether, there is hope for the future. The time will surely come when the association will be able to put aside the swaddling clothes of mere bookkeeping classifications, with which it is at present encumbered, and undertake the higher work of investigating and promoting scientific accounting and its economical application to the industry in which they are engaged.

PAPERS READ AT THE CONVENTIONS

Investments in Street Railways, How They Can Be Made Secure and Remunerative

BY CHARLES T. YERKES

The subject you have given me for consideration, namely: "Investments in Street Railways: How They Can Be Made Secure and Remunerative," is one in which I take great interest, and for a very good reason—about all the investments I have are in street railway securities: You can therefore see that my faith is great, for it is from our actions that we are judged.

My experience with street railway securities dates back to a period almost forty years ago, at which time street railways were in their infancy—in fact, you may say, in their swaddling clothes. It was in the early sixties, when the scientific operating of street railways was unknown, and, in fact, not dreamed of. In those days the men were worked from sixteen to seventeen hours out of the twenty-four, and they, as well as the officers of the companies, did not seem to be aware of the fact that this condition could be bettered. The roads themselves were of a cheap character, and, while intended to be permanent, they were far from it, but were equal to the demands of the public and requirements of street railway transportation. In those days even a car register was unknown. The street railways in each city were owned by a few influential persons, generally men of large means, and the stocks and securities of the companies were but little distributed. Few people knew of their value or cared to have much to do with them. To hypothecate street railway stock as collateral with banks was unknown, and it was not until ten years after, in the early seventies, that the banks would look at them. The dividends in the meantime were generally fair, particularly with companies doing a large business in the thickly populated part of the cities in which they were located. To my mind, the chief reason of their unpopularity was that the building of street railways in those days was always opposed by the people in the vicinity of the location, and particularly on the streets where the rails were to be laid. I remember very well the first track laid in the city of Philadelphia, where I then lived. It was the Fifth & Sixth Street line. The people tore up the track at night which the company had laid during the day, and it was not until after there had been several riots and the authorities had awakened to the fact that the law must be sustained, that the company was able to finish its road. The Chestnut & Walnut Street line in that same city was bitterly opposed by the citizens, and everything was done in the Legislature and in the courts to prevent the charter from being granted and the tracks from being laid; and this has been the experience in most all large cities. Consequently, the people who were promoting the laying of street railway tracks were looked on as a sort of "free booters," and their securities with much distrust. To some slight extent this feeling still exists, notwithstanding that there is scarcely a road which was laid years ago that could be taken up to-day without great objection being made on the part of the people.

It was not until the early eighties that street railway securities were seriously considered as popular investments, and since that time their popularity has continued to increase as time developed the great resources which lie within them. The quality of the street railway plants of those days consisted in the kind of track, the condition of the cars and the class of horses which were used. These differed most materially. On some roads it looked as though the cars were never repaired or painted, and the broken-down horses were very much in the majority. Added to that was the uneven rail, spiked to a string-piece, which almost made the rider seasick during a passage over it. Then again, there were other companies where the track was well laid and kept in good order, the cars in good state of repair and well painted, and the horses of the highest class for their work. These two conditions were almost invariably the result of the adversity or prosperity of the different companies, and while the latter class—that is, those that were prosperous—came to be sought as an investment sooner than the other, the anxiety of the public to so invest was never active. But about 1880, when consolidation of different roads came to be more in fashion and the economies produced thereby and also the studious consideration which was given as to how to operate roads, it was more a matter of reality. The attention of capitalists and the people generally was drawn to the stocks and securities of street railway companies, and this condition has been on the increase ever since that time. The fact that great improve-

ments have been made after the horse was relegated to a past era has had much to do with this, and naturally so. The mechanical propulsion of street cars has attracted the attention of the whole civilized world, and the question naturally arose in the minds of those who witnessed these changes, and who had money to invest—"Isn't this a good place to invest our money, and isn't there profit in it?"

The change in the mode of propelling the cars and, in fact, the whole outfit of street railways, has created what might be safely termed a "revolution." To look into the history of all the street railways of twenty years ago and see the changes which have taken place is certainly wonderful. I can see before me a plant that was run with one-horse cars, a driver, no conductor and a pay-box in the front of the car, where the passenger was required to advance and deposit his fare. I see that line changed to two horses and obtaining the dignity of a conductor to collect fares from passengers. That was a great improvement, and then we had straw in the bottom of the cars in winter—not over clean, because we could not afford to put fresh straw in every day, but still this was a luxury,—an oil lamp at each end of the car, which supplied the double purpose of lighting the car and showing the signal on the outside. We went at the rapid rate of 6 miles an hour when we could make it keep on the track. The motion of the car was most agreeable to a person who desired to ride on the billowy waves. We see this changed so that the track was smooth, the straw was taken out, floor always clean, and a stove, giving comfortable warmth placed therein in winter time. This was advanced luxury. We were pleased with all this, except when the snow would come, or the days were hot in summer, when the horses were not able to pull us to our destination.

We see another change—the great power of electricity was brought into use, the horses were gone, and instead of making our 6 miles an hour we would go twice that rate. The oil lamps were removed and electric lamps put in their places. As like begets like, the condition of the cars was improved; cleanliness—always an adjunct of electricity—was substituted for uncleanness. The districts of the city were expanded, lines were made in the suburbs, creating new towns, improving the property of the people, increasing the amount of the assessment on real estate, until we seemed as though we were living in another world. Aladdin's lamp did not produce any more wonderful changes, and this could not have been done had it not been that the attention of investors, both great and small, had been attracted to the street railways.

And what of the great benefits to the people. Instead of the slow, uncomfortable manner of travel, rapid and easy means are given. Points that could not be reached with the old system are brought within easy access. Everything is better and cheaper. While in days gone by it cost 5 cents to travel 3 miles, with the new improvement four times that distance can be traveled for the same money. Then it cost a person to ride about 2 cents a mile; now it costs $\frac{1}{2}$ cent per mile. Why then, I ask, should not a continuance of this condition be encouraged?

And I now come to the second and most important part of my subject: "How Can They Be Made Secure and Remunerative?" To my mind, security is most to be considered. The remuneration must be brought about by hard and close attention to the corporation. We cannot do much to increase our receipts. They come from natural causes, but we can control our expenditures, and that really, together with knowing where and what to do, is the science of street railway management.

But in regard to making them secure, we must depend very much upon the justice of the people, and the fact that we, as managers, are willing to do what is fair with the public. There seems to be an idea in the minds of many legislators that a street railway is a very simple affair and of very little account. This feeling has been engendered by their knowledge of long ago, and that knowledge has not advanced with the change in street railways. In fact, these changes have come and been accepted as such a matter of course that little attention is given to their worth.

The most important matter in regard to the security of street railway securities is the length of charter under which they are operating. This question is of as much importance to the people as it is to the street railways themselves. The longer time that is given to a charter to run, the greater improvements and the more expensive plant can be operated by the companies. That is to say, it can be made more permanent than if the charter was of short duration, and naturally it would be. If a company has a charter with but a few years to run the improvements will be of a cheap

character commensurate with the length of that charter, and the better the improvements the better it is for the people. Not only for those who own property, but for those who ride and have no property. We see this exemplified daily. Let us ask the question: How many bridges of iron or stone would the steam roads have if their charters ran for only a few years? There would certainly be none, and the speed of trains would be greatly reduced. Years ago 30 miles an hour was considered rapid traveling, with 20 as an average. Now the rate has been run up to more than 80 miles, with 45 miles as an average on fast trains. This latter condition would never have existed if the steam roads had not had charters long to run. Why should not the charters of street railways be equal to those of steam railways? In fact, considering them all in all, they should be longer. The cost of a steam railroad of to-day is not nearly equal to the cost per mile of a street railway, even counting all the appurtenances that go with each. One hundred years has been the time granted in this State for a charter to a street railway, and the municipality grants an ordinance for twenty years. That this was wise or unwise at the time that period was designated, I will not argue, but considering that it was a proper time for what we had in street railways then—rails weighing 40 lbs. to the yard, laid on a wooden string-piece; this string-piece laid on sleepers 5 ft. apart, cars of a cheap class, a lot of horses, good ones, if you please, and a 5-acre lot in the suburbs, where the car-barns were erected,—this practically constituted their outfit. At the end of twenty years, if there was to be no renewal of the ordinance and the charter was allowed to lapse, what would be the loss? The track, considering that it had been kept in good order, would sell for, say 20 per cent of its cost; the cars for about 30 per cent of their cost, the horses for about 25 per cent of their cost, and the real estate, which had been bought by the company twenty years ago, and where in all probability a settlement had since gathered, would sell by the front foot, realizing without doubt twenty times as much as it had cost. There, you see, there would not be much loss if this road had to be given up. But what are the conditions to-day? The street car tracks are laid with heavier material than that used by the steam roads, the power-houses cost hundreds of thousands of dollars, where the old structure cost but a few thousand; the electric plant on the cars and in the power-houses and the wires and poles cost immense sums. So that it can truly be said that the electric plant cost more than ten times as much as the horse-car plant. If, therefore, it was right to give a horse-car plant a charter for twenty years, the electric plant should receive a charter for 200 years and city ordinances should correspond.

It has been argued that if grants were made extending over a long period of time, other means of transportation might come into existence and these charters would interfere with the adoption of these improved methods.

Let us suppose fifty years ago perpetual privileges had been given to operate exclusive omnibus lines in this city, or privileges of the same character had been given to operate ferries across the Chicago River. What would they be worth to-day? Long ago the charters would have been forfeited, simply for the reason that improved methods had rendered them worthless.

But while I feel that the Legislatures should treat the street railways fairly, I also feel that the street railway companies should treat the municipalities and States in the same spirit. I believe that a fair amount of the earnings of the companies should be given to the municipalities in which they are located. There is no doubt but that the street railways are of great benefit to these municipalities and to the people generally and to the property owners, but at the same time it is my opinion that a spirit of liberality should be engendered by the street railways toward the municipalities, for the reason that it is through the municipality that they are permitted to transact their business. It is a mutual benefit, with the burden on the corporation. There is no doubt but that the extending of the lines in a large city is a great hardship to the railway company. There is little money to be made out of them for years, and while the company is waiting, the property owners and people are being benefited. The very mention of the fact that a line is to be extended in a certain district causes advances in the value of real estate, and these advances are emphasized when the extensions are really made. There is nothing that has added so much to the health of the inhabitants of a city as the extension of street railway lines. In this city the tenement house district, which would have been a perfect pest-hole, is scarcely to be found. The prairies have been covered with street car tracks, which forces the opening of streets. Cheap lots and cheap homes for the working people and the poorer classes, as well as the well-to-do, are everywhere in evidence. While there may be efforts to influence the people against street railways, they cannot but see these conditions, which are so plainly visible to them, and seeing them, fail to properly appreciate them.

I believe in educating the people, of whom the legislators are the

representatives. Every State wherein there are large cities, which necessarily have important street railways, should have a commission appointed to ascertain the condition and requirements of this industry. The commission should be appointed by the Governor of the State, and should be composed of intelligent business men of first-class standing, who are not interested in street railways. Under no condition should a person holding office, or who is ambitious to do so, be named. A man of this character is never to be trusted in any affair where courageous opinions are expected. The reports of such committees should have great weight with the legislators.

I believe that all corporations which receive their life from the commonwealth should be subservient to that commonwealth, that there is nothing in their formation or general business which should not be reported to the proper authorities and be subject to investigation. I believe that the law should provide that an intelligent commission be appointed by the Governor of the State, in the same manner as is now done in this State in regard to the commissioners of the park system. The duties of this commission would be to see that the laws concerning street railways are carried out and that the companies have the protection to which they are by law entitled. The commissioners should have terms of fifteen years, so as to insure their becoming experts, and receive such salaries as would enable them to live well and take care of their families in a good manner. They should understand, when appointed, something of the street railway business, and as years pass by their knowledge would increase, as also their worth. They should have the power to dictate to the railway companies where new roads should be laid, if at all, and also the kind of new improvements to be used when a railroad contemplated making any change in motive power. They should have the power to regulate the devices to be used for saving life and preventing accidents. With an intelligent, honest commission of that kind, street railway managers would be made more comfortable, the people would be benefited and the securities of the corporation would be more solid. The advice of these commissioners would be sought, and the advice of such men with the experience and knowledge they would naturally have, would be most valuable to any railway manager. Their reports would be explanatory, and much of the ignorance regarding street railways, which is fostered by our enemies particularly in this part of the country, would be done away with.

To make securities more secure we must have these different matters fully understood. We must do our business in a straightforward manner, with due consideration to the public, who are our patrons, continuing to increase facilities as opportunities offer, and adopting the most improved kinds of transportation which experience teaches are proper. And last, but by no means least, holding with the kindest regard our employees, who are faithful to us to the end, that there may be perfect harmony between them and the management, and seeing to it that our corporations are able to earn honestly a fair remuneration for the money, time, experience and labor that have been spent upon them.

Train Service and its Practical Application

BY IRA A. MCCORMACK

It is an unquestioned fact that a well arranged train service is as essential to the commercial success of a street railway enterprise as is expert management of the power-house and equipments, the use of economical machinery or any other vital detail, and it is perhaps one of the hardest problems that street railway managers have been called upon to solve.

In presenting this paper the writer would not wish to be understood by the members as presenting a sovereign solution, but rather as submitting methods which he has found to be useful in cases that have come under his observation. The conceded fact that all discussions must have a nucleus and that the experiences of no two persons are alike, whereby the natural law obtains, that one is certain to learn something from another, must be the apology for what follows.

In mapping out the train service of street railway systems in a large city the problem will be found very intricate. Some lines have continuous traffic at almost uniform proportions at all hours of the day; some have rush hours at morning or night or both; some have hours of over-crowding at more frequent intervals, and with some the traffic is exceedingly irregular. There is the passenger who rides but a few blocks; there is the through passenger and transfer passenger. The problem is further complicated by the location of parks, places of amusement, shopping or residential districts, branch lines, and the summer and winter seasons, and it is perfectly evident that no general methods can be laid down.

The problem naturally divides itself into two parts; first, the ascertaining of the conditions of traffic which are to be met, and second, the means for meeting these conditions in the best possible manner.

No matter what the character of the service may be, suburban, excursion, or local, there is one ideal condition to be aimed at, and that is that each car be full of passengers. If there be less than a full car the equipment is not run to best advantage, and fewer car miles would render the same service, while if the car is crowded, the traffic of those who dislike a crowded car may be lost and the management is likely to be criticised unfavorably by the public and press. It is important, therefore, to determine with as much accuracy as possible the traffic conditions, that is to say, how many of the public want to ride, where they want to ride, where they wish to take the car and where they wish to leave it.

For convenience in making specific illustrations and also to enable the discussion of different conditions as far as possible,

termini can be conveniently listed and totalized. This slip is conveniently arranged so that on it are registered the following data:

1. Name of operating line.
2. Run number as per time table.
3. The date.
4. The time due to leave terminal.
5. The actual time of leaving terminal.
6. Passengers carried on down trip.
7. Passengers carried on up trip.
8. Totals.

This slip, signed by the conductor, is turned into the proper office. This, of course, gives general information as to the traffic. It shows whether it is heavy or light, whether it is falling off or increasing, whether it is increasing on the down or up trip, and also gives a check on the register. This information is usually collected in one way or another by almost every street railway management.

The records are duly tabulated on a printed blank and daily compared, and if it be found that the traffic is increasing it may be wise to put more cars on the route, and if the traffic is diminishing, a longer headway might be good policy. The next thing to determine is how these changes had best be made, and if

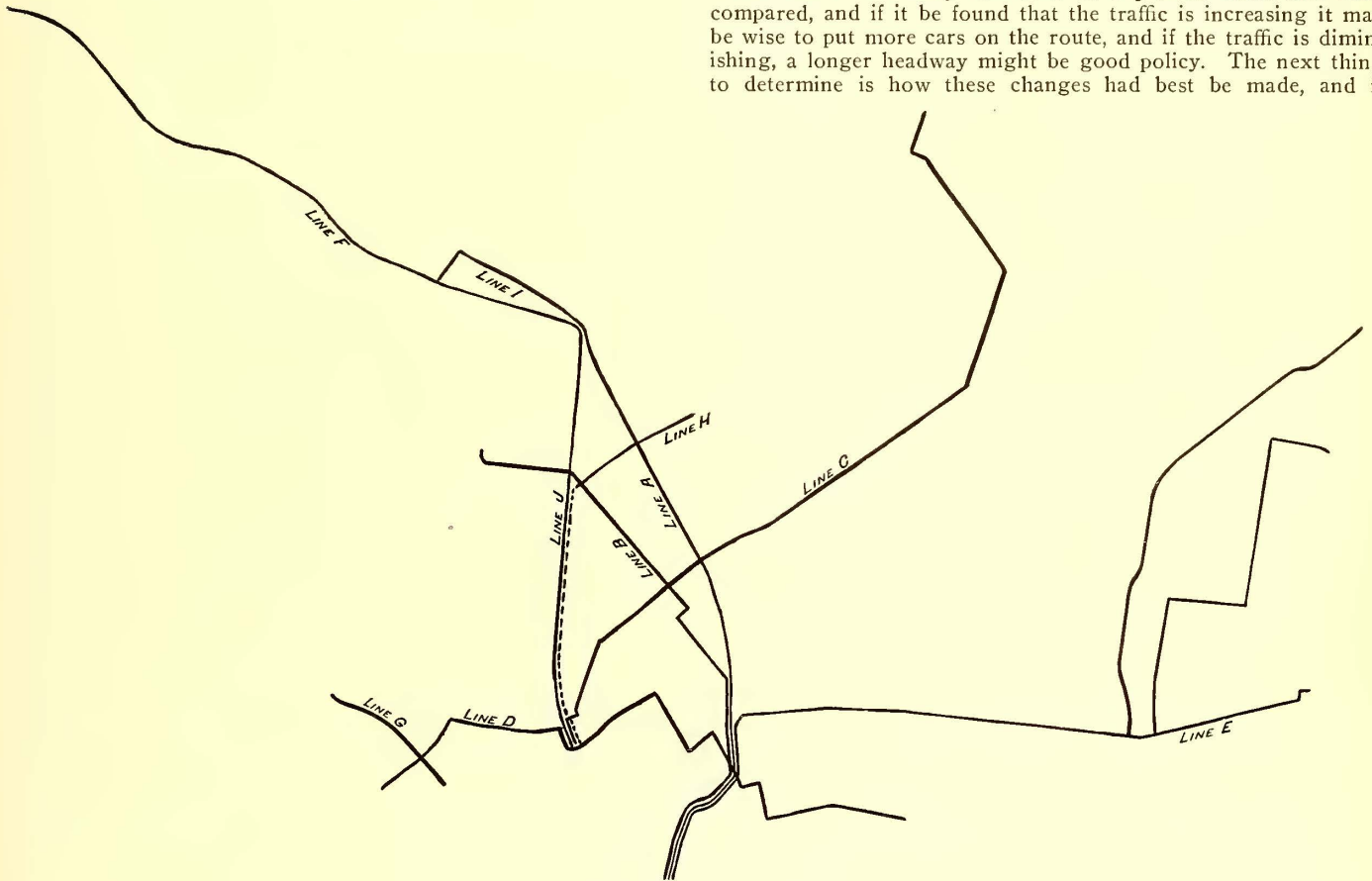


DIAGRAM OF LINES SERVED

the following different characters of service may be cited:

Line A.—A line of heavy traffic in shopping districts in close competition with elevated railroads.

Line B.—Doing a heavy traffic in residential districts without competition.

Line C.—A cross-town line serving as a transfer system to connect other lines together and add to their attractiveness.

Line D.—A cross-town line connecting with centers of transportation, such as railway stations, ferries and the like.

Line E.—An excursion line, half of which is residential, on which the excursion traffic varies with the season.

Line F.—A suburban line of considerable length and operated at moderately high speeds.

Line G.—A line not over remunerative and operated for such reasons as public or press opinion, or hope of its future value.

The conditions that will obtain on these various lines are obviously widely different. It will be first necessary to evolve a method of determining what these various conditions are.

At the start, the manager is as helpless as an outsider. He can merely generalize and deduce a time table which to his best knowledge of the system will fit the conditions, but having thus formed an existing time table the knowledge of how it operates and how it can be corrected is rapidly and easily acquired by the best of all methods, that of practical experience. In collecting the necessary data a method which the writer has found of value is to provide each car conductor with a blank which contains spaces on which the number of passengers carried on the car between the

possible to ascertain the specific reason for the increase or loss in traffic. To do this the inspectors are provided with blanks and are sent out on the line. Various points are chosen, and at those points the passenger record is very carefully taken. This slip provides for the record of the following data:

1. The place of record.
2. The name of the line.
3. The date.
4. The observed headway.
5. The number of passengers on the cars at points of record.
6. The fares rung up on the register at record points.
7. The totals.
8. The general average of these quantities.

On the back of the slip the inspectors find the following instructions and queries to be answered:

Note. Inspectors will be careful to show correct count. Make report plain and clear, but use as few sheets as possible.

If record of but one line is being taken, show the name at top of page.

If record of several lines is being taken, indicate name of each line in blank space at head of column.

If conductors are found short, give conductor's badge number and state particulars.

Give any and all information of this report that will prove of value in permitting change of headway and condition of cars, etc., to improve the service.

Is the headway well maintained?.....

Is there enough or too much service at any hour?.....

Are cars running to proper terminals to accommodate the public?.....

General condition of cars.....

Conductor found short

Car No.	Conductor No.	Particulars.
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It is sometimes instructive to plot the results in the form of

curves. Suitable section paper is selected and the number of passengers per hour are plotted as abscissae, and the hour of the day as ordinates. This gives opportunity to examine a large number of figures at a glance, and is sometimes useful in drawing general conclusions.

These reports give much valuable information. They show the average number of passengers on the cars at the point of record, thereby determining whether the cars are overcrowded or not. It gives the total number of passengers carried up to the point of record and an approximate idea of where they left the car. If the traffic on the line is irregular it shows in a measure where it is heavy and where it is light, according to how near together the points of observation are selected, and it further shows the exact time at which these traffic conditions obtain.

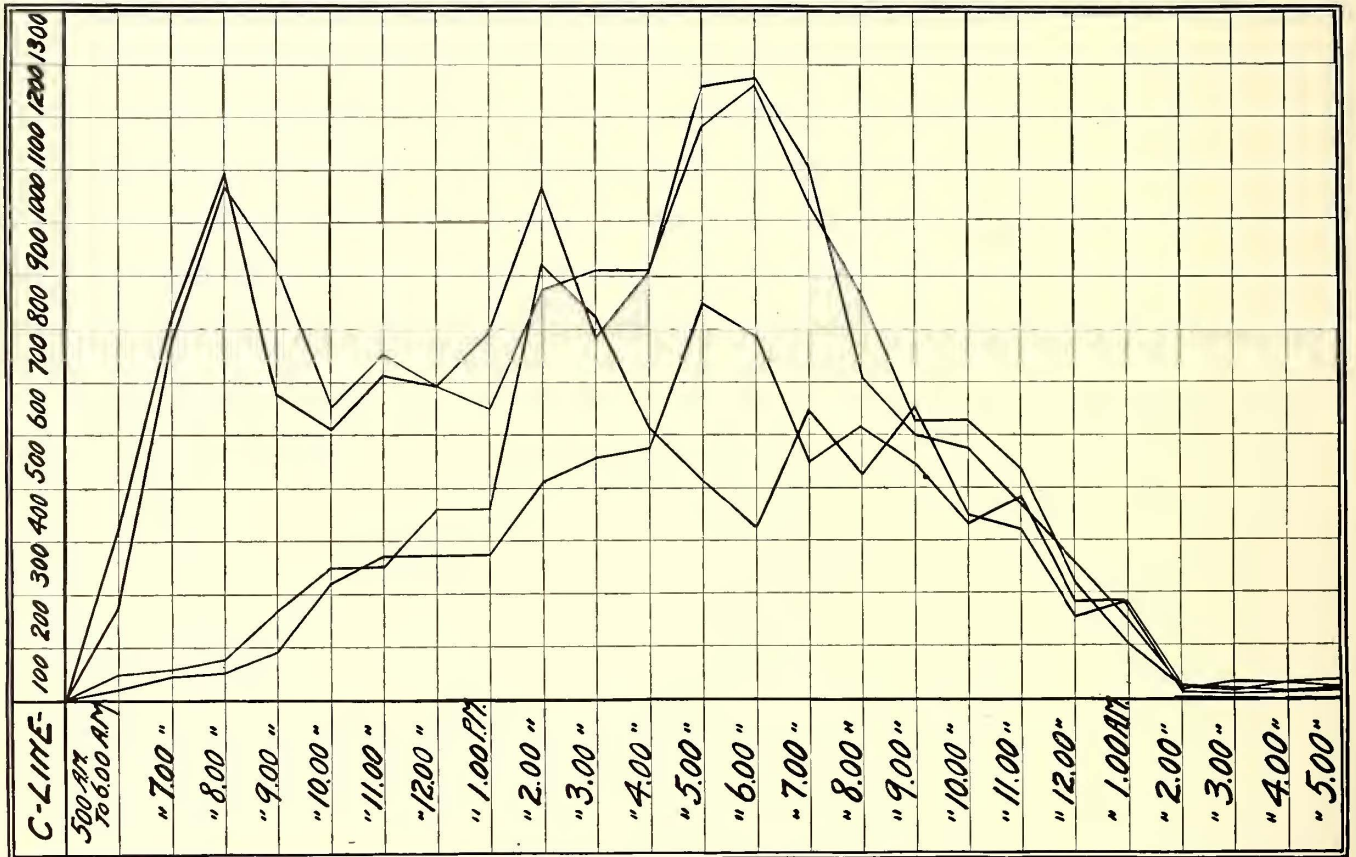
In order to obtain trustworthy results it will be necessary to take these records for some time, possibly for a week, for a single record might be completely misleading, because of condition of weather or a yearly Sunday school picnic or similar flush of traffic not likely to be repeated. It remains to be said, however, that as a rule weekly records check very closely. Having

certain rules, which long experience has shown are almost imperative. There are certain traffic conditions which are temporary, and others which are permanent. There are competition conditions, and in many ways there is much else besides these records to consider.

For instance, I have classified those who travel on street cars as follows:

1. The workers, who travel from 5 to 7.
2. The clerks, who travel from 7 to 8.
3. The bankers, brokers and proprietors, who have sometimes been facetiously termed the "shirkers," who travel from 9 to 10:30.
4. The shoppers, who travel from 10 to 12.

The greater part of these people remain in the city, coming back in one grand rush hour, which begins between 4 and 5, and reaches its culmination point a little after 6, and sometimes lasts until after 7. Then the theater and places of amusement begin to influence the traffic, which swells in the direction of the metropolis till a little after 8, and outward again, from 10 to 12. The regular night hawks, who take care of the traffic



METHOD OF TABULATING RESULTS

obtained a fair average of the number of passengers to be carried between two points, the proper headway between these points can be computed, and the next question that obtains is how to get this headway.

It may be advisable actually to put on more cars, or again it may be that the increased traffic occurs between such points on the line when it would be advisable if possible to loop down upon this section a few more cars from some adjacent line. This would be desirable especially if at the corresponding section on the adjacent line the headway was found to be too short.

So far, the method seems to be a simple mechanical process in which the steps for remedy are as obvious as in a station test. It is unfortunate for the sake of simplicity that this is not the case. In making a station test the diagrams and curves obtained invariably show the condition of the machinery or apparatus tested. The curve traffic above described would show the condition of traffic were it not for the fact that the public and many local conditions, which would seriously effect the traffic, must be considered. As an instance of this, when the information is being gathered to plot out the curve traffic, a fair, festival or entertainment of some nature may be in progress, which would cause traffic to go in the direction of the entertainment. Therefore, the curve traffic without considering the local, and all traffic conditions, might lead to an erroneous conclusion. The maker of a new time table must know the lines, root and branch. There are

of the city between 12 and the early hours of the morning, it is usually wise never to disturb.

It is sometimes possible to meet the traffic conditions on a line without increasing the car mileage, by simply changing the character of the cars which are running upon the line. Long cars with double trucks are advisable on through traffic, and it should be the aim of the manager to run them at the times when they will collect through passengers. Short cars should be run for the convenience of short riders, and if it be found on any line that at a certain hour of the day a large percentage of short riders take the cars between certain points, a little ingenuity in adjusting the long and short-car service may frequently accomplish a great deal.

On Sundays and holidays the traffic conditions change radically. On some lines the traffic falls off a great deal, and on others it becomes exceedingly heavy. On lines running to places of outdoor amusement, such as parks, beaches, race tracks and the like, it is well to watch the weather, for it is obvious that if the day is pleasant the traffic will be much heavier than otherwise.

The best men are picked out to run on the lines of heaviest traffic, in order to have the benefit of their experience in handling the public, knowing that they will be more safely handled and more convenient service given them than if a poor class of motormen and conductors are operating the lines of heaviest traffic. A street railway manager would—were it in his power—locate

amusements and entertainments upon the best built and best equipped lines, for it is on these lines that the best service to the public is given.

Of the last statement it may well be said that the duty of a superintendent may be divided into two equally important portions. First, the arrangement of the system for the good of the company and public, and second, for the good of the men. These duties are not all incompatible, although by some this has been thought to be the case. It is very important for the company to have a force of competent, well satisfied and not overworked men. I contend that a man earning \$40 a month and who is satisfied with his surroundings and conditions is a better employee for any company or corporation than a man who is earning \$500 a month and who is discontented and dissatisfied with the surroundings, and, on the other hand, it is important for the men that the company shall be prosperous, for otherwise there will be less regulars and more trippers.

It frequently happens that the time table of a road can be corrected to meet the conditions of traffic by delaying the cars at certain points and increasing their speed at others; thus, for instance, it has often been found beneficial to instruct the motormen to stop their cars at junction points and wait for the car on the cross road, in order to exchange transfer passengers, or perhaps to wait a stated time, say two minutes, and then to proceed. It is plainly to the advantage of the road to exhaust all such devices as this before actually running more cars to meet the increased conditions of traffic. If more cars are actually to be run the question should then be considered as to what kind of cars, that is to say, long cars or short cars, and if the road be a main artery receiving the traffic of several branches or cross lines, whether these cars should be main line or branch cars, and if branch cars, which branch.

From a practical knowledge of the conditions, and from the data as has been outlined, a new time table can be made up, but it is not to be expected that it will prove of lasting value. The traffic must be carefully watched; the conductors' reports carefully compared, and whenever an increase or decrease of traffic is shown, the advisability of sending out inspectors with passenger record slips should be at once considered.

Traffic may be increased temporarily, particularly in manufacturing districts, when some large manufacturer will put at work a large number of men, or may be decreased temporarily by the closing down of an industry, the workers of which industry were mostly patrons of the road. By the use of conductors' slips the superintendent will be at once advised of these changes.

These conditions show the necessity of an intimate knowledge of the entire system. The management, however, should not deceive itself in case mere adjustment is not successful. If the cars are still crowded, in spite of all manipulation of length of car and variation of headway, more cars should be put on.

However instructive it may be to make general remarks on these matters, specific cases and their solution are always interesting, and to provide this the writer has selected from his records a number of cases illustrative of different conditions which may be of interest to the members.

A practical condition that obtained recently was the case of a line, H, which formerly had its route down another line, J, to a ferry terminus. The inspector's report showed, first, that it was necessary to increase the service on a certain intersecting line, B, and second, that a great many passengers from line H transferred to line B, in fact, more than continued down line J. When these facts were known the solution was obvious. The traffic of line H was cut off from line J and sent down line B, thereby giving the desired service, avoiding the transfers, and only very slightly increasing the mileage and not at all increasing the number of trips or equipments.

Another interesting case may be cited of a line I, a short line running from the terminus of a main artery upward into the country. The traffic was found to be so great that it was necessary to diminish the headway. This was done by running some of the main artery cars over line I. This had the effect of slightly increasing the car mileage, but did not require any new equipments and gave through service from terminus of main artery to the further terminus of line I, which was beneficial.

Another interesting case is that of a cross-town line, C. This line carries through passengers to its terminus and also acts as feeder to the various lines which it crosses; therefore, in one portion of its length the traffic is exceedingly dense and the headway must be correspondingly short. This object is simply attained by running short lines which travel back and forth through the sections of heavy traffic, and the through service is run on a headway suited to fit the conditions of the more extended portion of the line, and also helps to diminish the headway in the more heavily patronized sections. Line D—the other character of cross-town line—is also very interesting. The line starts at a railroad

terminal and distributes incoming passengers to their destinations. It passes through a large factory district and transfers a great many passengers to other lines crossing it at different intervals; it also traverses shipping districts and gives access to the docks. It is essentially a day line, and it has been found that in such a case the traffic has been met to best advantage by a practically uniform service. This is a unique exception in railway work. As a final illustration we may take a line, E, on which the traffic varies. The first section of this line is residential. The last is excursion. In the summer season the headway on the residential district has to be quite short to accommodate both classes of traffic. In the winter season the conditions are met by cutting the line in two and running a suitable headway through the residential district and a shuttle service of a few cars over the excursion section.

The street railway manager will easily see that these methods are typical, but by no means exhaustive. There are many methods of manipulation, and the opportunity for ingenuity on the part of the maker of the time table is exceptional.

Besides ascertaining the traffic conditions on the various lines it will be found necessary to pay strict attention to the actual management of the system, in order to obtain the train services that may be desirable.

In the first place, the power-houses must be located at such points as to conduce to equal distributions of voltage. Low voltage on any line means slow time, no matter how good the motorman or the equipment, and everything that may produce this trouble should be carefully avoided. Every precaution must be taken in the operation of the power-house to prevent shutting down. Power-house attendants often become careless and are slow in replacing a circuit breaker when it is blown out, not realizing that they may be wasting the time of as many as 1000 persons. The writer has known cases where the circuit breakers of two different lines were thrown at one time. The man who watched only noticed one of them, and, replacing that, failed to close the other, resulting in a most serious delay to the line which it supplied. It has been suggested that a switchboard should be equipped with an automatic device, which, in the event of a circuit breaker being thrown, would close a circuit and cause the ringing of a large gong, which would show to the switchboard tender or employees of the power station, whose duty it is to see that the circuit breakers are kept in, that there is some breaker or some line, which is not furnished with power. In this and in scores of other ways the station attendants are responsible for the accuracy of the train service in fitting it to an approved schedule.

There are also other cases which are incident to the power-house, and are in no way attributable to the men in direct charge. One of these which may be mentioned is false economy in purchasing a poor quality of coal, which, in spite of all that can be done, allows the steam pressure to drop and does not supply the engines with sufficient energy. Similarly, the use of poor oil may allow important bearings to become heated, which results in crippling the line or overloading other machinery, thereby causing a reduction in voltage, or it may be that the headway for the time will have to be lengthened, thereby departing entirely from the approved schedule. In short, everything must be done at the power-house to provide at all times sufficient current at a sustained voltage at the cars. Without this, any schedule however accurate and elaborate will fail in carrying out its object. The details of producing such service are so voluminous and have been so ably discussed by other writers that anything further than the statement of the condition would be superfluous here.

The track and overhead construction should be secure and serviceable. It is obvious that a good track is essential to good, comfortable riding, which will please patrons. Special work should be maintained in first-class shape and renewed promptly. It may be mentioned that it is not a wise practice to allow work of this nature to become worn to its last stages before steps are taken for its renewal. An order for special work of necessity cannot be filled promptly, and it may easily be that if there is delay in placing the order, the old frogs and crossings will become very much worn, cars will be derailed, axles bent or broken, motors dropped, and, aside from the actual expense of repairs and maintenance, the train service, which is the prime factor, will be interrupted.

The writer's experience has been that considerable trouble has been encountered in maintaining a train service by reason of the spread of the rails and consequent accidents and delays. Where the traffic is at all heavy this accident is very liable to occur unless the rails are bound with tie rods.

Both the track and the overhead construction should be of the very best. A broken trolley wire is even worse than a disabled truck, for it may tie up not only one car but a whole section, and anything which will minimize the liability of wires coming down is advisable. In order to preserve the train service the work of re-

pacing the overhead construction should be performed at such times as will least interfere with the service. This is usually at night.

In order that overhead maintenance can be performed to the best advantage, emergency stations should be located, each of which is assigned to certain territories. The station covering the heaviest travel should be able to reach its outer boundary in eight minutes, while in suburban districts the furthest limits should be reached in from fifteen to twenty minutes. The construction wagons should consist of an extension platform, from which the overhead work can be reached without standing the wagon in the trackway.

Track and overhead repair men should be impressed as strongly as possible with the fact that in making their repairs it should be done in such manner and at such times as will interfere least with the operation of the cars. The judgment of some track and overhead repair men cannot always be relied upon to carry out this injunction. Train service is often interrupted by track and linemen, in making repairs to the track and overhead system, by attempting to make too permanent repairs at a time when the service is heaviest and should be interrupted least, when a temporary repair would have done just as well until such a time as the service was light and permanent repairs could be made without interruption to the service.

The writer knows of one particular case where the ear of a double pull-off on a curve had become so bent and out of its proper position that when the trolley wheel was riding under it the trolley would come off and one of the arms of the pull-off and the bent ear would serve as the prongs of a boot-jack, the trolley harp and wheel catching in the arms of the pull-off and doing one of two things, pulling down the overhead work or pulling the trolley pole from out of its base.

It is a common fault to pay too little attention to the application of guy wires on curves, and serious delays due to failure of overhead construction on curves are very frequent. Sometimes the work is satisfactory for short cars, but on long cars the motion of the trolley, being somewhat different, is likely to throw the wheel off the wire. Frogs should be placed in the overhead work where the lines diverge at a point that will insure the trolley wheels following the desired route.

Another and exceedingly important feature of good train service is the selection of motormen and their instructions in running the cars. Many elaborate papers have been written on how to run a car to use minimum current and to produce minimum wear and tear on the equipment. These instructions, while ingenious and accurate from a technical point of view, and possibly of wise application in small country roads, are not at all suited to the heavy traffic conditions which obtain in large cities.

In such cases the most important duty of the motorman is to make schedule time, keep a sharp lookout for passengers and avoid accidents. It is interesting to note in this connection that the best motormen are often men who can neither read or write, and are found among teamsters, drivers of horse railways and the like. These men are accustomed to do implicitly as they are told. They are accustomed to watch the street carefully and keep good track of vehicles and persons, by which means they avoid accidents and secure passengers.

The semi-technical man, who is "learning the business," makes the worst motorman of all. His mind is more active, he is interested in the performance of his motors and equipment and neglectful of his primary duties as motorman. He is always on the lookout to take note of matters which, though they may be valuable to him in his personal advancement, are entirely foreign to his duties. More than that, he is a dissatisfied individual, looking for better employment in the near future, and for that reason he is not inclined to learn his business of motorman thoroughly; regarding it as scarcely worth his while.

Of course, it is necessary that the motorman have certain instructions with regard to managing the controller. He should know that it is not advisable to give the motors too many notches at once; that he should, wherever possible, allow the motor to gain speed on one notch before passing to the next; that he should run the car on certain notches as far as possible, and that he should not allow the controller handle to dwell on spaces between notches, but it is not at all necessary for him to know why the motors are more economical at full series or full parallel or just what misconnections are likely to obtain if the controller is run between notches. It is sufficient that certain things must be done and that certain other things must not be done.

It is, nevertheless, a fact that a good motorman will run a car with less energy than a poor one and still maintain schedule time. A good deal of this may be ascribed to the careful use of the brake. It is necessary in making a fast schedule with many stops to shut off the power and use the brake almost before the car has gained headway. This frequent use of the brake is a temptation to many motormen to keep the slack of the chain taken up, so that

a slight pressure on the brake handle will put the brakes on hard. This keeps the shoes in contact with the brakes at all times, giving excessive friction and loss of power. A good motorman will coast his car as much as possible when the schedule will permit it. It is certainly advisable to keep accurate record of the way the motorman manages his equipment, but inferences must not be drawn too hastily from such records. If a motorman in charge of an equipment wears out his brake shoes rapidly and comes in with the regulating resistances sizzling hot, the schedule on which he has been running must be considered. If he has been on a fast schedule with many stops, and has followed it closely, the condition of his car signifies very much less than would be the case if he had an easier run and had failed to make schedule time. In forming an estimate of the qualities of motormen, train inspectors, conductors, and particularly of officials having men in charge, the writer has found first impressions to be exceedingly valuable. The well-known saying that the sober second thought is seldom wrong is not always correct. Judgment should, of course, be suspended until the second thought has been well considered, but the first thought may be right after all. It certainly has the advantage that it usually represents the only impression that the majority of people will consider, and hence may be the popular impression, which in street railway work at least must be catered to.

After all has been said and done with reference to the manipulation of train service it is interesting to know what results may be expected from good work in this department, and to exemplify these matters, the writer again cites from his records cases which he ventures to think will justify the statement that the matter of train service is of great importance.

It is not always easy to record the income of a line; for instance, a passenger may take line A, and ride on it for 100 yds. and pay in his fare simply and solely because he can obtain a transfer on line D. Line A gets the credit on the books and line D, which actually performed the transportation, carries the debit side of the account. There is nothing on the transfer to show whether the passenger rode a longer distance on line A than on line D or vice versa. To be strictly accurate, the fare and the expense should be charged to each line in proportion to the distance the passenger was carried on each, and while attempts may be made to equalize the accounts, in this respect absolute accuracy cannot be hoped for. The results are therefore submitted subject to this criticism and are the best that can be obtained under the circumstances. The following examples are taken from monthly comparison sheets. These sheets are made up from the reports of the conductors, the inspectors and the books of the company, and comprise the following data:

1. Receipts.
2. Total passengers.
3. Mileage.
4. Receipts per car milc.
5. Number of trips.
6. Receipts per trip.
7. Average length of trip.
8. Average number of cars per day.
9. Average mileage per car per day.
10. Time table cost.
11. Columns for the record of increase or decrease of these quantities over the same month in the previous year.

If the comparison sheet shows increased receipts, diminished mileage, diminished number of trips and diminished time table cost, the result must be ascribed in a large degree to the management of the train service. I may cite as examples the following:

From a monthly sheet on a certain line the increase in gross receipts was \$3,586, the decrease in mileage was 18,920 miles, due to the substitution of short lines for longer ones. The decrease in time table cost was \$1,612, representing an actual increase in revenue to the road of \$5,198. This amount as a monthly incentive for ingenious manipulation of the train service is certainly attractive. On another line almost as large the increase in gross receipts was \$13,765. It was, however, accompanied by an increase in time table cost of \$1,902, representing a net gain of \$11,867, certainly a wise investment for the added expense. The large gain in gross receipts was due to changing of the terminus to a better center of distribution. This manoeuvre not only filled up the empty cars that were running formerly, but necessitated the running of additional equipments.

Another case may be cited in which the gross receipts showed a loss of \$7,087 and the time table cost a decrease of \$2,814, representing in total a loss of \$4,273, as compared with the same month of the previous year. This, while not so pleasant for directors' contemplation, is very important to know. The reason for this was found in the fact that a number of large factories on the line had been shut down. It might have been due to local conditions or that the train service could be improved.

In like manner a yearly comparison sheet can also be drawn

and careful management can often in a well established road increase gross receipts or largely diminish time table cost. From such a sheet involving a yearly total from thirty-seven different lines may be cited an increase of more than 10 per cent in gross receipts and a little over 1 per cent in time table cost. The receipts per car mile showed an increase of 5.8 per cent. The receipts per trip were increased 16.5 per cent. The average mileage per car increased 15½ per cent, whereby about 144,000 trips and the incident expenses were saved.

Such figures as these on a system in which the building of new lines had been relatively small can hardly be ascribed to growth and extension, and could scarcely be obtained except by running the cars longer distances and by suiting the public taste, whereby larger loads of passengers were carried, or briefly and in other words, by improved train management.

Construction and Maintenance of Street Railway Tracks

BY EDWARD BUTTS

The construction and maintenance of street railways involves two words, construction and maintenance, which are inseparable in considering a street railway enterprise in its relation to capital.

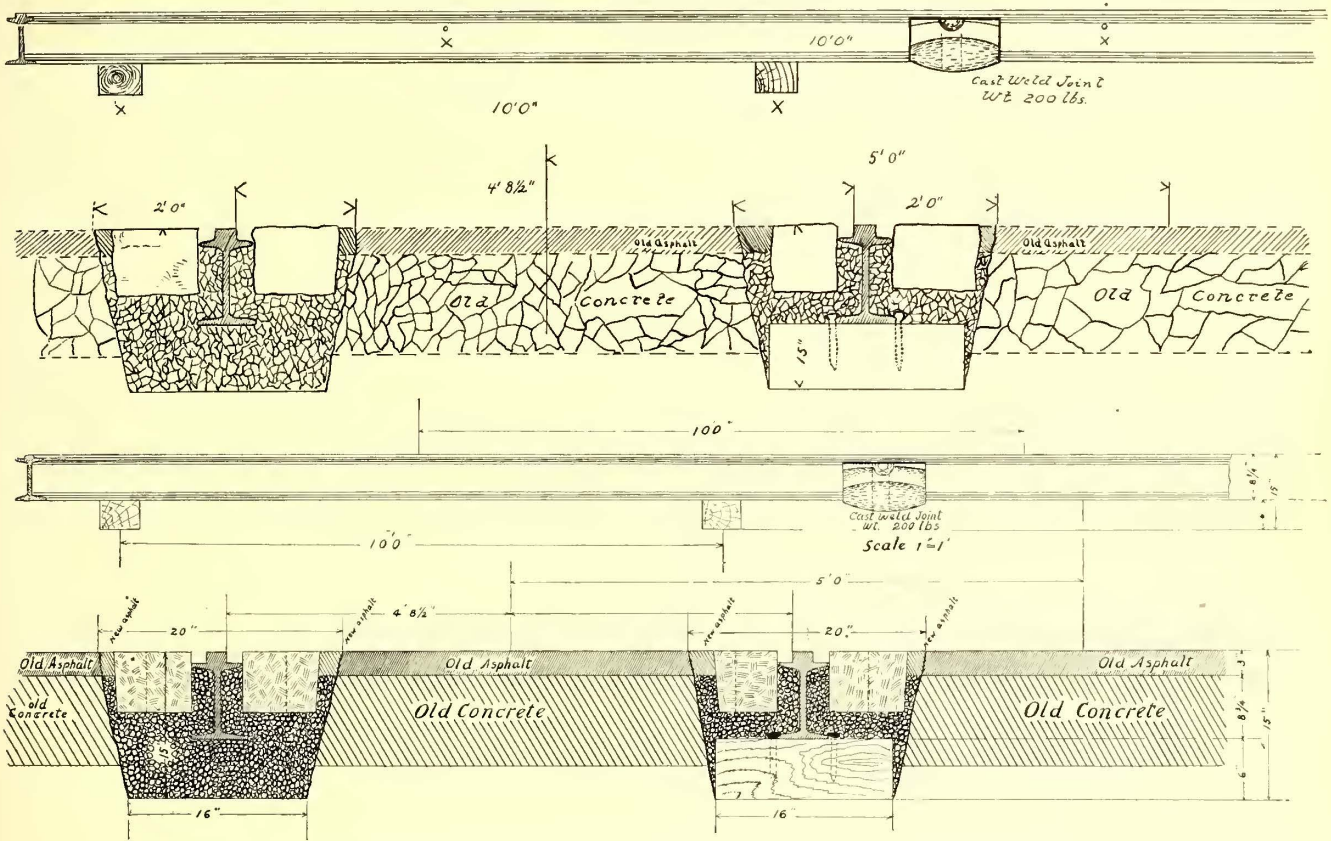
Is the street railway to be built for temporary purposes? Is it

base equal to the exposed upper surface. Where streets are paved with asphalt and a stone tooting course placed adjacent to the rails, the rails must be at least 9 ins. in depth, in order that the base may be securely imbedded in the concrete below. Rails should be center bearing, rolled in 60-ft. lengths and so handled that they will be perfectly straight when placed in final location.

Tie-rods 1 in. in diameter should be placed 6 ft., center to center, along the line and supplied with hexagon nuts, which, when in place, should clamp the rails securely on both sides. The tie-rod threads should extend far enough from the rod ends to allow the rod to be put in place without bending it. The theory of this rigid tie-rod is that the street traffic and pressure on the outside of the rails should be provided against, as well as the car thrusts on the inside. The top of the tie-rod should be placed half way between the top and base of rails to better accommodate the paving, especially if the wearing surface is brick or stone.

For rail foundations a trench should be dug, 20 ins wide on top, 16 ins. wide on bottom, and deep enough to be 6 ins. below the rails when the latter are at the established grade. In this trench, at 10-ft. intervals, should be placed wooden blocks, 8 ins. x 10 ins. x 16 ins., to which the rails can be securely spiked. These blocks serve to hold the rails in position while they are being laid and tamped to surface, the joints being held in position by temporary splices.

After nicely gaging, aligning and surfacing the track, the



ELEVATIONS AND SECTIONS OF TRACK CONSTRUCTION, KANSAS CITY

to be built simply to float on the market or to turn over to our successors and assigns, or are we to build a street railway to endure to the extremity of the present advanced stage of science, speaking particularly of the use and durability of materials? The latter view will be accepted in preparing this paper.

In street railway construction, the first thing to do is to consider carefully all the local influences which may become factors in maintenance, or involve future changes, and so considering the subject from this fundamental position, the question naturally divides itself into urban and interurban street railway construction.

It is desirable in all cases to construct the street railway in such a manner that when it becomes necessary to reconstruct the interurban portion the termini shall need the same attention at the same time, and as a general proposition it may be said that the urban end of a line is the governing factor when durability is considered. The reason for this is, of course, because of the concentrated travel there.

For the present, then, we will consider urban roads from a standpoint created by practical experience and expenditure of capital.

The rails should be not less than 6 ins. in depth, with a width of

trenches should be filled with concrete, bedding the base of the rails up to the bottom of the proposed paving. The concrete, which is placed in the trenches around the rails, should be composed of crushed stone, measuring not more than ½ in. in greatest dimension, with Portland and domestic cement, and sand, mixed as follows: Two parts sand, one-half part Portland cement, one-half part domestic cement and five parts crushed rock, all by measure. Great care should be taken to get the mortar flushed close against the rails and to bring it full up under rail trams. The concrete in the trenches should be allowed to set about six days; this time, however, depends upon the condition of the atmosphere, as the concrete will set much more rapidly in warm than in cold or chilly weather.

The concrete for paving foundation may also be composed of one part domestic cement, two parts sand and four parts broken stone, by measure, the broken stone to be not larger than 2½ ins. in the greatest dimension. All concrete should be thoroughly tamped until the mortar flushes to surface.

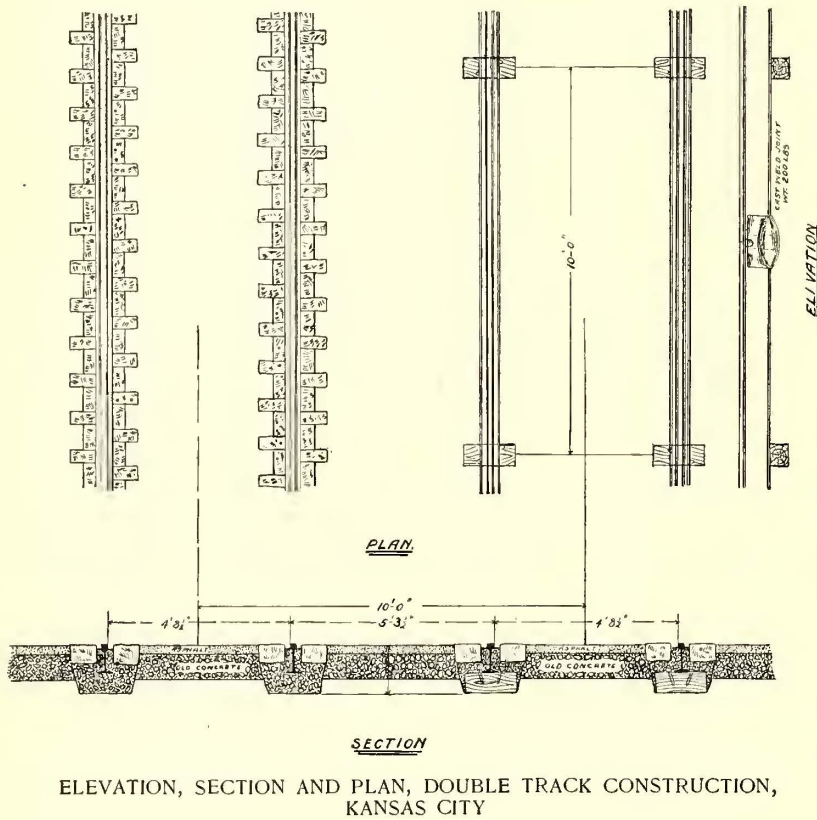
After the concrete has set, cast-weld joints should be poured at all joints, including those of the special work which may be needed.

The Care of Car Equipment

BY J. H. VANDER VEER

The cast-weld joint on 80-lb. rails should weigh 150 lbs, and on 100-lb. rails, 200 lbs., the metal cast about the joint should be composed two-thirds of pig iron and one-third common scrap iron. The metal should be heated to a bright yellow temperature and each joint formed with one pouring. The depressing clamps should remain in place for at least one hour after the pouring, and the surface of the rails finally dressed smooth, so that the passing of the car will be the same as on a continuous rail. In preparing the joint better results as to smoothness are obtained by inserting a thin shim between the rails, than by placing the rails too close to admit of such a shim. These cast-welded joints should be so formed as to present the least amount of interference with the wearing surface of the pavement.

In general, the wearing surface of the paving between the rails should not be of better material or smoother than the balance of the street, otherwise there will be an undue amount of vehicle travel on the street railway tracks and consequently more frequent accidents will occur. Attention should be paid at all times to drainage, and at street crossings where the established grade is level, the surface of the tracks on one side should be elevated several inches to prevent the retention of water pools. At all changes of grade the rails should be bent to form vertical curves, and these vertical curves should contain no joints, as otherwise it would be



ELEVATION, SECTION AND PLAN, DOUBLE TRACK CONSTRUCTION, KANSAS CITY

almost impracticable to secure uniformity in curvature without resort to shop work.

There is no economy in trying to construct a railway hastily, as in so doing the work is often slighted in some particulars, and this involves future expense.

The special work, turnouts, crossings and cross-overs should be of cast steel construction, except at steam railway crossings, where the best built-up work located on foundations should be used. The tongue of turn-out switches should be placed on the high or super-elevated rail of the curves, otherwise the guard rail of the mate should extend the full length of casting on which the tongue is located. All curves with a radius of less than 300 ft. should be provided with a guard rail, and curves of less than 50-ft. radius should be double guarded.

A very important matter in the construction of street railways is that of drawing up the specifications and final contracts. Great care should be taken that these cover all the material and labor necessary to complete the entire line. Neglect of this precaution often entails serious trouble and is expensive.

When a line is constructed as herein provided its maintenance is a question almost entirely of car equipment, involving the wheel base, double or single trucks, diameter of wheels, properly applied springs and weight of cars. The longer the wheel base the less durable the curve. Single trucks will batter out frogs, switches and joints more rapidly than double trucks.

In giving the writer's views as to the proper care of car equipments he expects them to be thoroughly criticised, though it should be borne in mind that different conditions obtain in different cities.

On the railway with which the writer was first connected, all the cars owned were kept in service except from 8 P. M. to 6 A. M., during which time all inspections were made and all possible overhauling done. If a car broke down during the day every one possible, including the motorman and conductor, was put to work on it. As the motormen in those days carried kits of tools with them and inspected the motors at the end of each round trip, they were very helpful when it came to overhauling. That period, however, has passed away, together with the double reduction motor.

In the maintenance of motor equipments to-day, where almost continuous service is demanded and high mileage made, only those equipments which are fitted with both oil and grease boxes will safely run over forty days without a thorough overhauling. This overhauling, on a large road, must be done at a number of different points, at each of which it is advisable to have extra trucks mounted with motors, all in first-class order, ready to run under a car body whose equipment needs inspection. To properly lift the body from the trucks four duplex chain hoists, or air jacks, conveniently located, together with two cross timbers and four stirrup irons, form as good a combination as can be found, and will do the work with the least possible injury to the car body. When the car body is lifted, the truck to be overhauled is run out and the good truck substituted, the car lowered, connected up and turned over to the operating department. The operation takes about one hour, and for that length of time only is the use of the car body lost. A suitable crane, properly located and equipped with a carriage and a second duplex or air hoist, will also be found of great convenience. Such a crane can be readily made in any blacksmith shop and for the arm a piece of old rail can be used. When the motor is opened, the armature should be lifted out and placed on a suitable rack, where the commutator can be cleaned and armature tested for insulation. The fields should also be tested for drop in voltage, and where there is a drop those fields and armatures should be used in motors by themselves, keeping new and rewound fields and armatures in motors by themselves. This prolongs the life of the equipment and reduces the number of crippled cars taken off the road. The motor shell should be thoroughly cleaned out, either by compressed air or by washing with kerosene. The grease in the grease boxes should be taken out and put in the gear case and the grease boxes thoroughly washed out with kerosene. The brush holders should also be taken out and thoroughly inspected and cleaned.

The writer has found that the work described cannot be properly done in the pit, with the car body on the truck and the bottom half of motor dropped. He recommends, therefore, the removal of the car body, as described, a step which also saves tying up a complete equipment while the motor inspection is being done.

In general, a car, starting in perfect order, will safely run five days before requiring inspection.

The force required to inspect from twenty to twenty-five cars per day would be about as follows: One man can be responsible for the proper inspection of all trolleys, including the taking out and replacing of any defective poles, wheels or springs, and the straightening of all bent poles. Another man should be responsible for the proper inspection of all circuits, together with hood switches, fuse boxes and lightning arresters. Another should give his whole attention to controllers. A fourth, with an assistant, should be able to keep all brakes in good shape and replace all worn out shoes. This force should keep the truck and motor equipment in good shape, if the night men take equally as good care. The writer recommends doing as little work as possible at night. At a car house operating say one hundred cars, three men should be able to grease motors, inspect brushes and make any small trolley repairs. Car cleaning should come directly under the operating department. The night car cleaning should be limited to sweeping out, cleaning windows and dusting cars, and all washing should be done in the day time while the car swings or is on the stand, if the car house is at one end of the line. If the cars are

of the closed type, the seat risers, drop sash and the space under the seat should be cleaned once a week, as the traveling public has a tendency to drop newspapers, apple cores, etc., behind the seat back, not to mention the bits of lunch the motormen and conductors drop there if their runs compel them to eat on the car. The best way to avoid this and to also save the annoyance of a rattling sash, is to make the sash stationary and cover over the space between the top of the seat back and sash rail. This, of course, does away with blinds and compels the use of curtains. The cost of maintenance is less with curtains, however, than with blinds.

A car house from which one hundred cars are operated should have, among its employees, a good carpenter to make small running repairs and to take care of bell cords and register ringing devices. Any car that has been in a collision and damaged so badly that it cannot be repaired in one day should be sent to the general repair shop. All cars should be taken to the general repair shop once a year, the body put in thorough repair and the car varnished or burnt off and painted anew, as the case may demand. While the car is in the carpenter's hands the wiring should be gone over carefully and put in shape. If the car goes to the shop with its regular truck and motors, the former should be run out and gone over thoroughly. In case it is a built up truck, all rivets and bolts should be carefully inspected and renewed where necessary. In the case of a solid side frame truck, it should be carefully squared to see that it has not sprung. The brake rigging should be taken apart at this time and if it is a truck with brake beams working in slides the beams should have what are termed "Dutchmen" jumped into the ends to bring the wearing parts back to their original thickness, as the beams will probably be found to have worn wedge shaped. If the brake beams are hung by links, these should be renewed if they show signs of wear. At this repair shop should be concentrated all classes of repair work, not only repairs to bodies and trucks but all electrical repairs. The writer believes it pays all railway companies to make their own repairs to electrical apparatus, including the making of armature coils and renewing of commutators.

In connection with the latter the writer has found that hard drawn copper makes the best commutator. This is bought in lengths and the bars sawed off with an ordinary metal saw. It will be found that the same bar will often do for several types of commutators. In making commutators it is well to increase the diameter over those turned out by the factories as much as can safely be placed between the brush holders. Drop forged bars can also be purchased for any width of commutators desired.

As regards controllers, hood switches, etc., most roads will find it cheaper to buy the ordinary repair parts and then assemble them, themselves.

In conclusion, the writer has found it is advisable to make car body repairs, rewind armatures, make commutators, armature coils, field spools, etc., by piece work. If good inspection is provided and the prices honestly watched, both the company and its employees are gainers by this method. The writer has in mind a case in point. A shop was operated by day work and the regular carpenters' wages were \$2.25 per day of ten hours. Cars that were being remodeled were costing \$120. This was changed to piece work and the same results secured by paying four men \$110 per car. It was found that the men could do the work easily for this and make about \$6 over their regular wages. They soon became so expert at this line of work that the price was gradually cut to \$80 per car. Cars are being turned out at this price now, and the men are averaging \$2.50 per day. Close inspection, however, is a necessity.

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Car Mileage

BY H. C. MACKAY

One of the greatest problems affecting the street railway interests is an equitable and standard unit for comparing results, and the subject assigned will be treated in its general relation to accounting as such.

Car mileage has been adopted by practically every road in the country as the unit of comparison, but a study of the methods used in computing the mileage made by the different systems will convince anyone that under the present conditions it is misleading and unreliable. It makes but little difference what is used as a basis, as long as its purpose is simply to show if the earnings or expenses are proportionately above or below that of a similar period; but to make a comparison with another system, whose speed, length of day operated, size of cars, etc., are different, or where the physical conditions are dissimilar, it is absolutely necessary that the unit be identical.

It is not practical to make general comparisons of any given expense item as to the amount in dollars and cents, for the reason that there are so many factors to be considered which have a direct bearing on the cost; hence, it is necessary to reduce same to a basis alike to all systems. When this has been accomplished, the result of the operations of the various systems will establish an average for each division or item of expense, which will be an accurate guide to the manager; an indicator showing all expense items in which reductions should be made. Here is where the greatest value in a standard unit lies; the cause of an abnormal expense is at once detected and the energies otherwise wasted in an endeavor to locate the trouble can be applied in the correction of it.

The principal objection to "car mileage" is the variation in speed. Between city and suburban lines there is a difference of from 8 miles to 30 miles, or even more, per hour. The increase in speed does not materially affect the cost of operation. The liability of accidents due to increased speed are more than offset by the difference in density of population of district traversed, while the principal items of expense, such as "wages of conductors, motormen, car-house employees, etc.," are the same in either case; hence, the suburban or interurban line would show from two to four times the number of miles run, at only a slightly increased cost as compared with a city system. The question may be asked, why the interurban line should not be entitled to the credit of operating at a less cost (as the object of a standard unit is not to make expenses uniform, but to show the actual conditions). I will answer the above by saying that while the cost "per car mile" would be less, on the basis of passengers carried, it would be more, by reason of the longer haul, thus indicating that its expenses are not proportionately less except upon a basis favorable to itself.

Another disturbing element is the "trailer." Where trailers are used regularly and to any considerable extent, they are considered as a separate car mileage, being computed for both motor and trailer in nearly every case. Theoretically, a system whose equipment is exactly adapted to its needs, would assign to runs cars of just sufficient capacity; the trailers being abandoned, and in the place of, say a 22-ft. motor and 18-ft. trailer, a 40-ft. motor car would be run, thus eliminating the expense of one conductor, as well as the extra maintenance charges.

New cars are rarely purchased for use as trailers on electric systems. Those in use are either relics of horse-car days or an indication of an extraordinary growth of the city, and consequently of the system; an indication that the capacity of the car is not equal to its requirements while it is still in good condition and too valuable to be consigned to the scrap pile or even to be sold at forced sale, so its motors are placed under a longer car body and it is transformed into a trailer, to be brought out and used as an attachment or extension wherever the motor car's capacity is liable to be overtaxed.

Surely, no one will contend that it is cheaper to operate a motor and trailer, whose combined length is 40 ft., than a motor car of the same length. If it were true, the same rule must apply to a 24-ft. car, and we would be substituting a 12-ft. motor and 12-ft. trailer in its stead, yet the method of computing both motor and trailer mileage attempts to show just this result. To better illustrate, we will take for example two roads, one using 40-ft. motor cars, the other a motor and trailer whose combined length is 40 ft. They are operated at the same speed, headway, etc., yet the first shows a cost of, say 12 cents per car mile; the other, by reason of the double mileage, a little more than one-half of 12 cents, though with the additional expense of an extra conductor. My contention is, that a road using trailers is naturally handicapped and should not be expected to produce as good results as one whose equipment is nearer adapted to its needs, and that the trailer is but an extension of the motor car and the extra expense of running it should show as the result of unfavorable conditions.

To secure data, the writer sent to most of the railways of the United States and Canada a circular letter, requesting answers to the following questions, viz.:

1. Is your mileage computed from conductor's trip reports? If not, how? Answers were received from 103 roads, and were as follows:

Conductor's or motormen's reports.....	73
Foremen, dispatcher or switchmen's reports.....	15
Time tables	4
Unanswered	11

From the above we see that over 70 per cent of the total number and still greater per cent of the answered reports arrive at mileage from the trainmen's reports. Some few companies have adopted a system whereby the conductor reports his route run by numbered points, each switch, cross-over, etc., being given a

number, permitting the accounting department to accurately trace the car. It requires, however, a careful examination of each trip sheet, which, to a large system, means the expenditure of considerable time. I suggest that the trainmen be required to report only the exceptions to their regular trips, either lost trips or extras made, thus, instead of going over all the trips made during the day, only the deviations from the regular schedule would be examined and computed. This result may then be added to or subtracted from the regular schedule. The method adopted would depend upon a conclusion as to the following question:

2. Do you keep record of mileage made by each car? Answers:

Affirmative	51
Negative	46
Unanswered	6

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Of the above fifty-one roads that keep such records, twenty-six are in cities of less than 50,000; ten are in cities of 50,000 to 100,000, and fifteen are in large cities.

Neither of above questions has any bearing on "car mileage" as a unit, except so far as accuracy is concerned. A great amount of data is usually prepared by the accounting department to which reference is seldom made. Mileage by cars is valuable and necessary to determine the life of wheels, gears, pinions, etc., but these tests are of a semi-occasional nature, and special records can be kept in such cases at a less expenditure of time and money.

3. What method have you of verifying above figures?

Answers:

None but care in computing	45
Time tables	28
Dispatcher's reports	8
Pay rolls	4
Foremen's reports	4
Motormen's reports	3
Trip receipt returns	1
Unanswered	10

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It would seem that the simplest method of verifying the results would be by a report from the foremen showing deviations from the regular schedule, and this result checked by trainmen's reports.

4. Do you include dead mileage, i. e., from station to where car strikes regular route?

Answers:

Negative	50
Affirmative	36
Have none	11
Unanswered	6

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The reason assigned why dead mileage should not be included is that the car is not earning revenue, and that it would be unjust to decrease its earnings per car mile. Nevertheless, the mileage had to be run before it could earn revenue; the expenses were the same as when on regular service, and I consider it legitimate mileage. Thus, the systems whose stations are advantageously situated would receive whatever benefit there was due to that fact.

5. Do you include full trailer mileage? If not, what proportion, and give reasons why full mileage is not used?

Answers:

Trailers not used	46
Affirmative (of which number only 50 per cent use trailers regularly)	37
Negative	11
Unanswered	8
One-half	1

103

The percentage of roads using trailers regularly, as shown above, is only about 20. As stated before, the trailers should not be computed for general use.

6. Is any allowance made for partial trips lost?

Answers:

Affirmative	57
Negative	37
Unanswered	9

103

This question is covered under No. 4. Allowance should be made for partial trips lost, or, in other words, mileage used should be the actual mileage made by motor cars.

7. What is your average motor mileage per day? Trailer?

8. What clerical help is required for mileage work and approximate cost per month for same?

9. How long does it take to ascertain the total mileage for the day?

The object of the preceding questions was to determine the relative cost and adaptability of method used, but, owing to the different construction placed upon question No. 7 (answers covering average motor miles per day per motor and total miles per day) no conclusion can be drawn except that the speed varies, so that the average motor miles per day per motor ranges from 65 miles to 300 miles.

10. Do you use "cars operated per day" as a basis for comparison of earnings? If so, what constitutes your car day?

Answers:

Affirmative	44
Car day of 20 hours	1
" 19 hours	1
" 18 hours	31
" 17½ hours	1
" 17 hours	3
" 16 hours	1
" 15 hours	4
" 115 miles	1
" 80 miles	1

44

Negative

Unanswered

48

11

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Car days, especially in the larger cities, are gradually lengthening, and will no doubt reach the maximum of twenty-four hours.

The adoption of the "passenger mile" (being the passenger trip distances divided by the number of passengers carried) is precluded, owing to the impracticability of obtaining the length of the separate passenger trips.

This applies to the "ton mile" as well, if the element of "passenger weight" is taken into consideration. If the "ton mileage" is based upon the dead load hauled, I do not consider it complete. In fact, the showing made on the basis of "ton mile" would have a tendency to mislead the management. For example: One system operating "20-ton motor cars," with a corresponding large ton mileage, would show a small cost per ton mile. Another system, operating "10-ton motor cars," would show nearly double the cost per ton mile, when as a matter of fact the lighter car may be the more economical; but, with the mileage computed carefully, all dead miles included, and the elimination of the trailer, we have a unit which will be uniform and applicable to all electric systems as soon as the question of speed is adjusted; hence, we have but to divide the above figures by the average rate of speed and this result, verified by the motormen's time, will be a standard unit. This is equivalent to a "motor-car hour."

To illustrate the method of ascertaining and verifying the "motor-car hours," at the same time showing the effect that speed has upon car mileage as a unit, I submit the following exhibit:

TRAFFIC SHEET

	A. B. Ry. Co. Operating City Line	C. D. Ry. Co. Operating Interurban Line
Number of cars operated.....	3	3
Speed per hour (miles).....	8	24
Length of trip.....	24	24
Number of trips per day (regular).....	18	54
Extra trips made	2	6
Trips lost	½, 1½, 19½, 1½, 4½, 58½	
Miles per day.....	19½ x 24, 468, 58½ x 24, 1404	
Motor car hours.....	468 ÷ 8, 58½, 1,404 ÷ 24, 58½	

PAY ROLLS

Motormen's Time	
Regular trips	18
Extra trips	1½
Total trips.....	19½
Motor car hours	19½ x 3, 58½, 58½ x 1, 58½
Assuming the cost of operating above cars at \$60 per day, the cost per car mile would be.....	\$.12.82
The cost per hour would be.....	1.02.56

From the foregoing exhibit we see that the time table of the city system shows eighteen regular trips per day. From the conductors' and foremen's reports we find two additional trips were

made and a half trip lost, a net addition of 1½ trips, or a total of 19½ trips, amounting to 468 miles. This amount, divided by the speed, equals 58½ motor-car hours. This figure is verified by the pay roll. Time allowed:

Eighteen trips, at three hours (regular).....54 hours
 One and one-half trips, at three hours (extra)..... 4½ hours

Total58½ hours

For the purpose of comparison, the interurban line is based upon the same conditions, excepting speed, which is increased from 8 miles to 24 miles, thus increasing the mileage without changing the car hours.

It will thus be seen that on exactly the same cost the city system would show 12.82 cents "per car mile," as compared with 4.27 cents, while on a basis of "motor car hours" the cost is the same.

It has been contended that the unit for earnings should be the "motor car hour," and that operating expenses should be based upon the percentage of earnings.

The car hour certainly applies to earnings just as well as it does to expenses, but I do not think that a percentage of earnings is the correct basis. For a standard unit it is too fluctuating. If a road's equipment was always taxed to the limit, its earnings and expenses might be held at a fairly uniform basis, but these conditions would never exist for any length of time, and could not become general. Any large convention or carnival would swell the earnings abnormally, and while the expenses would increase at the same time, they should not in the same ratio; hence a comparison of the month's result under such circumstances with another system under normal conditions would be unfair.

Again, the geographical location would disturb fair comparisons, as the time of the year when expenses would be proportionately low in a Northern city would undoubtedly be just the reverse in New Orleans or other similarly situated places.

It has also been suggested that the sub-divisions of "general expenses" are not consistently covered by the "motor car hours," and that such items as "advertising and attractions" and "insurance" are not affected by the number of car hours run. So far as such accounts as these are concerned, the same may be said of any basis. Good management will always keep its car hours as near the point where profit and loss separate as is possible, whether on a large or small system, and while such accounts may not be affected by the car hours, nevertheless, the said hours being the index as to the management, the amount of such expenditures is proportionately and correctly shown.

Before concluding I wish to briefly refer to an article on the cost of electric power for street railways at switchboard, by R. W. Conant, read at the last convention of the American Street Railway Association; quoting therefrom: "The car-mile basis is not a fixed standard. A car, up hill, takes a great deal of power, while a car down hill should take none, and may be made a source of power." This is undoubtedly correct, as all grades and loads affect speed, and without this adjusted, mileage is not a fixed standard, but with the speed taken into consideration it would be practically the same as on a road without grades.

Report of the Department of Blanks and Forms

BY W. B. BROCKWAY

When the call was issued for the meeting which organized this association, it also included the suggestion that the companies represented at that meeting should bring samples of their blanks and forms in order that helpful and suggestive comparisons could be made. The idea was so well received that a long table was necessary to display the collection. As a means of exhibition the blanks of each road were placed in a pile by themselves, but the contents could only be ascertained by a detailed search of the pile. The popularity of the exhibit was attested by the constant attention it received and by the packages of exchanged blanks most of the members carried home with them.

At the first annual meeting held in Niagara Falls, Oct. 1897, the plan was again tried, but for various reasons it was not so successful as the previous experience at Cleveland. However, a committee was appointed to arrange the blanks presented, and their work was as well done as the blanks and room would permit.

In view of the accepted importance of the idea, it was decided for the convention at Boston, in 1898, that a special effort should be made to have the exhibit of the size and bear the results it deserved. Therefore, a committee of arrangements was appointed from among the gentlemen contiguous to Boston, who issued a special circular and those attending that convention are familiar with the thoroughness and popularity of their work.

It was really the object lesson given by the orderly display of the blanks of the Montreal Street Railway, at Niagara Falls, in 1897, and the classified collection exhibited by the committee at Boston in 1898, which called forth the resolutions establishing the Department of Blanks and Forms and making it a permanent part and feature of the advantages of membership in the association.

The blanks as they are exhibited this year are mounted in thirteen large books 20 ins. x 30 ins. and one 30 ins. x 30 ins. These books are bound in canvas and are made from special 120-lb. manila paper, which will assure the wearing qualities needed for exhibition year after year. For the convenience and safety in transporting these many heavy books, there has been provided an oaken box with a shelf for each book, securely locked. And that there may be no reason for heavy handling, end over end, it is mounted on heavy castors that it may be readily moved.

In the whole physical make-up of the department, care has been taken to make the wearing quality as good and permanent as possible. And the assistance authorized at Boston and engaged by the secretary has been of high order rather than cheap, feeling confident that the result would be well worth the care and expense. The exhibition, it is hoped, will bear out the soundness of that reasoning.

As a foundation for the blanks preserved there was taken those exhibited at Boston, which, it will be remembered, amounted to several thousand; to this already fine collection there have been added the private collection of the secretary and the complete sets of very many other companies, so that at the present time there are complete or semi-complete sets of upward of eighty companies, many of which are the representative companies of the continent.

The secretary takes this opportunity to thank most sincerely the companies contributing for their cordiality and promptness in granting original and the many special requests made for additional copies of blanks, that duplicate and triplicate filing might be made where the construction of the blank demanded it. This co-operation has materially lessened the burden of preparation.

Many methods of classifying were considered, but there were but three which seemed feasible for so large a collection of diversified blanks as this one, viz.:

1. *By companies*, whereby the blanks of each company would be placed together in rotation.
2. *According to the standard classification*, in which those blanks relating to each account of that classification are filed under the different headings.
3. *Logically*, by which is meant the arrangement into classes all blanks of all companies intended for a similar use.

The last plan was adopted for the reasons that if the arrangement by companies had been followed it would still have been necessary to have followed some general classification of each company's blanks. But in the practical use of such a filing, a company satisfied with its entire form list, except this or that blank, would be unable to obtain a comparison without searching through every book in the collection, and even then to compare any two blanks on file, possession would have to be had of two or more books, which, according to the law of average, would be perpetually in use by some one else, which objection would make the annual exhibition a difficult one to make use of.

And in considering the arrangement according to the standard classification of accounts it was found that there were many blanks which applied to more than half the accounts which, to make the filing complete for each account would frequently require the possession of as many as forty copies of a blank that the face and back could be shown. This is illustrated in the blanks relating to labor, it being obvious that there are few of the thirty-eight accounts in which labor does not form a prominent part. This difficulty seemed so insurmountable that this plan could not be followed.

In view of the difficulties and objections found in other plans which, to make the filing understandable, had to be omitted in the plan adopted, it seemed to be better to make certain classes to contain blanks of all companies. This will permit the closest comparisons in each class and will at the same time include in one book all blanks of all companies which will in any way relate to that class. It is true this plan has broken up the continuity of the blanks in use by the individual company, but we have substituted a continuity in which all the companies join, for there is a certain channel through which the business of a company must run in its performance and the various changes in the direction of that channel have been followed as closely as was possible. For instance, in the books containing income it will be noticed that book A, starts with the first record of income, viz.: conductors' reports; these are followed at once by the report envelopes, the receipts of the receivers, the reports and records of the counting and verifying clerks, etc. Thus there has been a natural sequence kept in mind, but it is one in which all the railroads join for the benefits of a prompt and efficient comparison. It is sincerely hoped that the

reasoning by which this plan of filing has been adopted is sound for the amount of study and time involved is considerable.

The three fundamental divisions into which the collection has been separated are:

1. Income.
2. Expenses.
3. Records and reports.

These are separated further into classes which can be best shown by the following description of the contents of each book.

Book No. 1. Income A, consisting solely of those books relating to the handling, reporting, verifying and depositing of the actual cash income, and the daily, weekly and monthly reports of earnings only.

Book No. 2. Income B, contains tickets and transfers, their records of received, used and on hand, and physical records of registers.

Book No. 3. Labor A, includes the application, investigation, hiring, disciplining and discharging of employees.

Book No. 4. Labor B, covers all the various steps of paying the employees, from the time reports to the comparison of pay rolls.

Book No. 5. Materials, is for those blanks for material only, from the request for, through the purchasing, receipt and issuance to inventory.

Book No. 6. Maintenance, consists of the reporting of work done outside of and in the shops. The records of wheels and axles, and other blanks not strictly labor or material, but rather the result of their combination.

Book No. 7. Power-house, this book contains everything relating to the power-house—labor, maintenance, operation and efficiency. All blanks of each company are filed in this book by themselves.

Book No. 8. Transportation A, covers the actual operation of the cars from time tables through the various steps of dispatching and running.

Book No. 9. Transportation B, is the miscellaneous needs and results of the operation of cars, as instruction to trainmen, secret inspection, lost and found articles, cleaning snow and ice, car mileage, stables, benefit association, etc.

Book No. 10. Injuries and damages, takes the accident from the original report of to the settlement and records, and summaries.

Book No. 11. Vouchers, etc., is for the vouchers, bills, journal entries and various office stationery.

Book No. 12, contains monthly and annual reports and comparative statements of earnings and expenses.

Book No. 13. Records, includes voucher, accounts receivable, check, cash and other general records.

Book No. 14. Electric lighting, consists of all blanks relating to electric lighting as a business of itself.

To make the books useful for ready reference a system of cross indexing has been provided for each book, by the use of which a company intent upon only the conductor's reports of the X. Y. & Z. Railway can readily turn to it without searching for it until found. These indexes will be found inside the first cover of each book and will explain themselves, and as a means of assistance to the casual looker-on, each page has been labeled at the top to show what form that page contains, so that in the rush of convention hours "he who runs may read." Small figures in green will also be found in some corner of each blank to show the date of the original filing. This is done that an intelligent idea may be formed of the changes from year to year.

In many instances it has been important to make a duplicate and sometimes a triplicate filing. This is caused by the combining in one blank the information covered by two or more of the divisions into which the collection is separated. It was thought better to file as many times as necessary so that the specialist intent upon but one form will still find the collection as complete as possible within the limits of the blanks filed.

In all cases where a blank contains a form upon both sides, each side has been shown and an explanatory stamp has been impressed upon it, showing that it is the "front of" or the "back of" the form to which a hand points. This will save confusion. It is expected that errors of omission and commission will be found both in the classes selected and in filing, and it will be of great assistance if a memorandum be made of each error and handed to the secretary that attention may be given to the correction.

As to the practical working of the department there is to report that the books comprising the official file and annual exhibit are intended to remain in the office of the secretary for continual additions, and they will only be moved to make their annual appearances at the succeeding conventions. For the use of members there has been provided a reserve set, unmounted, which are at all times subject to the request of those entitled thereto. A letter of request is an application and the secretary makes a selection from this reserve set and forwards it to the applicant. Accompanying

them is sent a blank giving such information needed to make clear the length of time they may be kept and the cost (which is always nominal) to the applicant.

This reserve set is treated on a library basis and selections should be returned upon the date allowed (usually thirty days), as it sometimes happens there are other roads awaiting their return to get the set which is in use somewhere else. It will be of interest to say that this occurs oftener with those blanks relating to materials and supplies than to any other.

In a circular, No. 9, issued from the secretary's office, attention was called to the many requests for sample blanks which every company received. It may be well to repeat the suggestion made, that all such requests be referred to the secretary, who will gladly fill the request, if the company making it is a member of the association, or will courteously decline if not. By this action considerable trouble and expense is saved the individual company, and new members will be gained to the association.

While I do not feel qualified to make any extended criticism of the size, shape or other characteristics of the blanks on file, there are found in working over and studying so large a mass of blanks and forms, certain little kinks or tricks of practice which have become almost a habit and, while they are harmless and unnoticeable while by themselves in use on the roads where they originate, yet when included in a collection the size of this the comparison is more or less marked, and I cannot refrain from making a brief reference to some of them.

The most prominent of these is the omission of the name of the road. It is not a bad guess I am sure, to say that of the thousands of blanks filed, 30 per cent are without any mark of personality. Very many and devious were the schemes tried to locate blanks, of which another copy was necessary, for duplicate filing. For instance, one very important blank was recognized only when the water mark in the paper was compared with other blanks till one was found of the same kind, and from this blank we were enabled to find the issuing company. In another case an explanatory note was written on the face of a blank, of which we again needed additional copies, and in this instance no less than twelve different blanks were found with an explanation in the same handwriting, but not one had an identifying mark. The company was only found by comparing the handwriting with the correspondence on file in the secretary's office. It was absolutely necessary to the value of the collection that these two cited should be duplicated, hence the efforts made to locate them.

If there can be any second choice in the shortcomings now being referred to, it is perhaps best covered by the term "ambiguous." A number of these are of undoubted importance to the companies making use of them, yet in the hands of one unfamiliar with the ins and outs of the particular roads by which they are used, they become almost meaningless and many were the inquiries sent out by the secretary where a few words printed at the head of the blank would have made the use clear.

In the next thought the other extreme is brought out, and I can think of no better term with which to describe it than "persistent information," meaning thereby the repetition of information in two or three blanks. The persistency of some forms reminds one forcibly of the annual report required of the steam railroads by the Interstate Commerce Commission, wherein questions are asked in so many ways as to be almost bewildering at times. This class of blanks made their filing very difficult, requiring many times a duplicate or triplicate filing to properly care for the various information, most of which was contained in other blanks already on file.

While not the most important, perhaps the most prominent feature of the whole department is the tremendous lack of uniformity in the shapes and sizes of blanks intended for the same service by different roads. One of the largest city companies in the United States has a report measuring $2\frac{1}{2}$ ins. x 4 ins., while another road of about the same size requires a sheet 8 ins. x 12 ins. for but little more information. In another case one company uses two pages (meaning cross-pages) for a book of record, where another has precisely the same columns and headings and needs but one page, and that smaller, the difference being in the space allowed for the columns. The larger one has a date column of 3 ins. in width, and the number of reports from which the record is made has room enough to run up into the millions with still room to spare. These are extreme cases, but the principle is unchanged.

Careless press work and ridiculous selection of type make in some instances a jarring effect upon the other extreme, often found in that of beautiful and artistic work on the part of the printer, because he knows nothing but that kind of work will be accepted, and is governed accordingly. In this connection there is another practice, about which much pro and con can be said. I refer to the paper used. There is a vast difference in the cost of "cheap yellow" and ledger linen, but you will find forms intended for similar uses thus dissimilarly made. There is an average where ser-

viceability and economy can and do meet, but it requires an exacting—not pecty—management of this branch of the expenses of a railway property.

Further suggestions can properly be made to the desirability and usefulness of form numbers, whether to make them continuous or to have a set for each department as applied to a small road or a large one. And again to the multiplicity of blanks burdening a small road as compared to a large one with not enough to properly attend to its volume of business, both external and internal. Other suggestions readily occur to one while examining the collection, but I will call your attention to but one other to which I have applied the title "Confusion," or perhaps a better one would be "Lack of Care in Arranging." By this I mean the jumbling together of all kinds of information upon one large sheet, and further, the placing on both sides of that the information intended for the busy financial or operating man who depends upon your statistics for various information, and has literally to search for what he wants. This, it seems to me, is caused by a desire to utilize every inch of space of a larger sheet, rather than to cut it into smaller ones with information of a similar nature grouped together.

On the other hand, as compared with these few criticisms, there will be found very much to commend, admire and use in the mass of blanks brought together. There is in many an evidence of careful thought and artistic sense, which shows itself in the composition of the blanks of this or that road. There is as much need of genius in the building of blanks and forms, as much a demand for brains and foresight in the logical arrangement of columns and statistics upon paper, as there is in the management of an office, for on one side is "Stationery and Printing and Office Expenses," and on the other "Surplus from Operation."

Fuel Economy of Railroad Engines*

BY PROFESSOR R. C. CARPENTER

In the following papers are given the results of thirty-five tests of electric railroad power stations, which have been made during the past eight years under my supervision, by especially trained students in advanced work in Cornell University.

The tests which are cited were made under the ordinary conditions of operation peculiar to the system referred to. In every case the results were doubtless affected by the machinery employed, the method of operating the station and by the varying and continually changing load produced by irregularities in loading and moving of cars.

The tests show the fuel consumption of several classes of engines, operating under the usual condition of power-house work. There is shown a variation in the fuel economy by engines of the same class, operating in different stations, which in some instances is of considerable amount. This is probably to be expected, for it is well known that the economy is affected to a great extent by variation in load, since an engine fully loaded is in general much more economical than one partly loaded; no duty throws on an engine a more variable load than street railway work. A certain amount of the variation in coal per horse power, as shown by the tests, may be accounted for by individual differences due to poor or good firing; this may, and often does, make 20 per cent or more difference in fuel economy, and this condition affects the uniformity of the results in about the same proportion. The effect of employing different classes of engines is also well marked. The fuel consumption of different classes of engines is doubtless the most interesting and practical part of the investigation. If we can learn from the tests the probable fuel consumption of each class of engine, we can draw conclusions as to the saving which might be produced by change of power, and we can also predict with certainty the fuel charges for different classes of stations.

TESTS OF THE SIMPLE NON-CONDENSING ENGINE. SLIDE VALVE AUTOMATIC

The summary of the tests of the simple non-condensing engine shows on the whole an economy of steam and coal nearly equal to that usually attained with engines of this class in any work. The most probable values indicate an average consumption of 34.3 lbs. of steam and 4.63 lbs. of actual coal per i.h.p. per hour.

In tests made by the writer with an engine of this class operating with a steady load, the best results at the normal load corresponding to about one-quarter cut-off, was slightly over 27 lbs. of steam per i.h.p. per hour, the steam consumption was greater either with a lighter or heavier load. As an illustration, the

* This paper was to have been presented at the meeting of the New York State Street Railway Association, September 12-13. It was omitted on account of the unavoidable absence of Prof. Carpenter, but has been made part of the proceedings.

diagram on page 802 exhibits the results of a series of tests made on an automatic slide valve engine running non-condensing. Each test was continued sufficiently long at a given load to obtain the water consumption for that condition. The results are shown in the accompanying diagram, by employing horizontal distances to represent horse power, and vertical distances to represent steam used per horse power per hour. The scale on the left corresponds to the curves showing steam; that on the right, to curve showing total steam per hour.

The curves show graphically how the steam used changes with change in load. When the load is light the steam per horse power per hour is very great; when the load is normal, the steam consumption is lowest; when very high, the steam consumption per i.h.p. is increased. The total steam per hour increases faster than increase of load. The curve indicating steam per i.h.p. per hour shows slightly over 27 lbs. at 120 h.p.; nearly 30 lbs. at 150 h.p., 44 lbs. at 60 h.p., and 64.3 lbs. at 40 h.p.

Thus it is seen that a comparison of the results of the test of the automatic simple non-condensing engines in actual power-house work with those obtained under best conditions is in many respects favorable. The average results of all the tests show a steam consumption only about 25 per cent higher than obtained with this class of engine working under most favorable conditions.

This corresponds by the diagram to the results obtained with the engine tested at about 80 h.p., or at two-thirds its rated capacity. The average load as compared with the capacity of the engines in the various power-house tests was 54.2 per cent, which would correspond by the diagram to a steam consumption of 41 lbs. per horse power.

The following shows in tabular form the results of the tests of simple engines in a power house:

TABLE I
SUMMARY OF TESTS OF SIMPLE NON-CONDENSING SLIDE VALVE ENGINES

No.	H.p. of Engine	Steam per i.h.p. Hour	Actual Coal per i.h.p. Hour	Mean Observed i.h.p.	Per Cent Observed h.p. to Capacity	Boiler Evaporation per lb. Combustible from and at 212°	Kind of Coal
6	200	34.8	4.47	110	55	11.50	Pea A
7	405	34.5	(a) 6.54	257	63.4	(a) 9.11	Culm, East Ohio
11	1,975	35.7	4.60	862	51	9.46	Bit. W. Pa.
11	300	37.3	4.49	90	44	12.20	Bit.
11	300	34.3	4.72	95	46.7	10.20	Bit. Ill.
24	1,000	31.8	(b) 5.38	717	71.7	(b) 9.15	Bit.
31(c)	270	41.5	(c) 5.50	126	47.5	(c) 10.60	Ant. Buck.
33	270	31.6	4.61	147	54.5	10.70	Ant. Pea
Average		35.1	5.07	----	54.2	10.24	
Average neglecting (c)		34.3	----	----	----	----	
Average neglecting (a b c)		----	4.63	----	----	----	

Remarks.—Engine in test (31) in bad condition. Probable average coal per i.h.p. hour, when using anthracite or eastern bituminous, 4.63 lbs.; anthracite culm, 6.54; western bituminous, 5.38. Coal per kw. output averages 50 per cent higher, or 6.94, 9.81 and 8.07 respectively. Probable error for any given case not over 10 per cent Steam pressure, 90 lbs. to 120 lbs.

TESTS OF NON-CONDENSING SIMPLE CORLISS ENGINE. (SEE

TABLE II)

Three stations only were tested which were using non-condensing simple Corliss engines. These three stations show fairly uniform results both as to steam and coal consumption, and, as was the case with the simple slide valve engine, the results closely approximate the best results to be obtained with that class of engine. Thus, while this class of engines might produce a horse power under favorable conditions of loading for an expenditure of 23 lbs. to 25 lbs. of steam used, the tests show an average steam

TABLE II

SUMMARY OF RESULTS OF TESTS OF SIMPLE NON-CONDENSING CORLISS ENGINE

No.	H.p. of Engine	Steam per i.h.p. Hour	Coal per i.h.p. Hour	Mean Observed i.h.p.	Per Cent Observed h.p. to Capacity	Boiler Evaporation per lb. Combustible	Kind of Coal
17	300	30.1	3.09	139	46	11.45	Clearfield Bit.
19	150	26.9	3.5	90	60	9.73	Ant. Buck.
22	350	28	3.77	153	44.7	8.55	Ohio Bit.
Average		28.3	3.45	----	50.3	----	

consumption of 28.3 lbs. of steam per i.h.p. per hour, the average load being slightly over one-half of the rated capacity.

The coal per i.h.p. per hour averaged 3.45 lbs.; the evaporation per pound of combustible varied considerably, which was due in part to the variation in calorific value of the coal used. The summary of the results of the test is shown in Table II. on the preceding page.

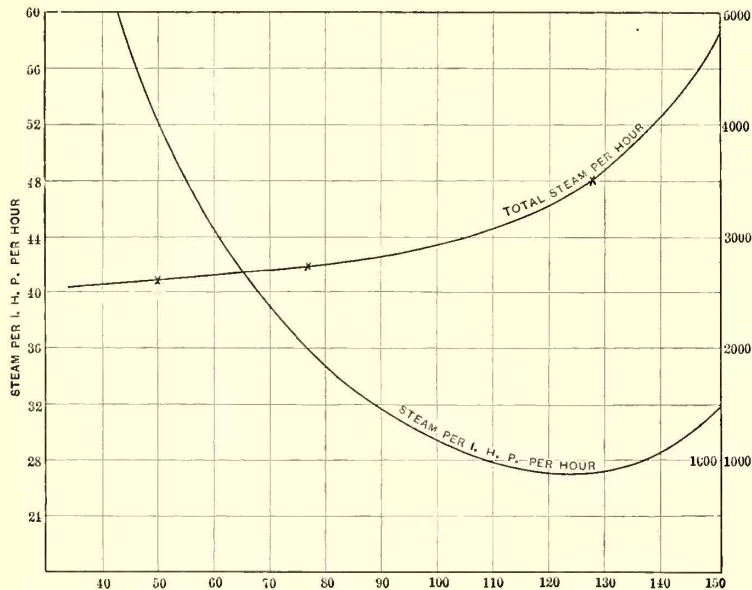
THE NON-CONDENSING COMPOUND ENGINE. (SEE TABLE III)

The data obtained relating to this class of engine is limited, and is probably insufficient to draw any general conclusion; four tests of power stations were made, in which such engines were used; these tests are numbered respectively 2, 4, 21 and 24.

The power-house tests No. 2 and No. 4 were made when both simple and compound engines were running; the results do not differ essentially from those obtained with simple engines and previously recorded.

Tests No. 21 and No. 24 were made on non-condensing compound engines, working under fairly favorable conditions. Test No. 21 does not show better coal or steam consumption than many of the tests recorded for simple non-condensing engines; compared with No. 24 it shows a better coal record, due principally to the fact that in test No. 21 the coal used was from Western Pennsylvania, while that used in test No. 24 was from Illinois. The difference was due principally to the quality of fuel used.

It would hardly be safe to draw a general conclusion from the results in the table regarding the compound non-condensing, as compared with the simple non-condensing engine for railroad purposes, but such conclusion as could be deduced would be but slightly in favor of the compound non-condensing engine.



TEST OF SIMPLE NON-CONDENSING 14-IN. X 16-IN. ENGINE, 120 LBS. STEAM PRESSURE, 120 WATER H.P., 210 R.P.M.

Some additional information was obtained on this question by test (24) which was made on both simple and non-condensing compound engines, each kind being tested separately, and so as to give an opportunity of comparison. The test on three simple engines showed an average steam consumption of 31.8 lbs. of steam per i.h.p. per hour, and a fuel consumption of 5.38 lbs. of coal. The test on one compound non-condensing engine (24 in. x 48 in. x 48 in.) 1200 h.p. showed a steam consumption of 30.37 lbs. of steam and a fuel consumption of 4.93 lbs. of coal per i.h.p. per hour. The actual evaporation per pound of combustible from and at 212 degs. F. being in the test of compound 7.75 lbs., and in the test of the simple engines 7.83 lbs. of steam. Reducing the results for uniform evaporation, the two tests would indicate that the compound, as compared with the simple non-condensing, was 9.4 per cent more economical in use of coal, and about 5.5 per cent more economical in use of steam.

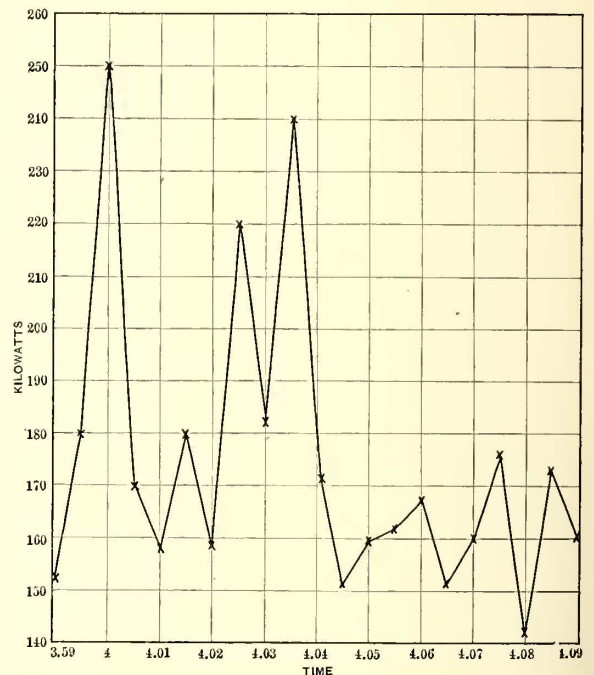
The compound non-condensing engine is much less economical, as shown by these tests, when employed in power-house work, where the load is variable, than when used for a steady load. Thus I have tested a compound non-condensing engine of this class working with a steady load and with about the same steam pressure as in the cases cited, and found a steam consumption under the best conditions of loading of 22 lbs. to 23 lbs. of steam per i.h.p. per hour, which is nearly 33 per cent better than shown by the same class of engines in power-house work.

We have seen that the simple non-condensing engine performs its work in a railroad power-house under conditions of varying load with an average steam consumption only about 25 per cent higher than the best average record for its class of engines with a steady load. The compound non-condensing engine requires, on the other hand, however, nearly 40 per cent more steam than when working under best conditions with a steady load. From this

TABLE III
SUMMARY OF RESULTS OF TESTS OF COMPOUND NON-CONDENSING ENGINE

No.	H.p. of Engine	Steam per i.h.p. per Hour	Coal per i.h.p. Hour	Mean Observed i.h.p.	Per Cent Observed h.p. to Capacity	Boiler Evaporation Lbs.	Kind of Coal
2	1,000	30.5	4.22	603.5	60.3	9.03	Bit, 3 parts Ant. Culm. 1 part. Bit. slack
4	1,250	36.8	4.33	674	53.8	9.92	
21	400	34.30	4.17	203	51.	10.23	Bit. Penn. Bit. Ill.
24	1,300	30.37	4.93	754	62.7	9.01	
Aver. 21 and 24.		32.28	4.55	---	---	---	

Remarks.—Test No. 2 was made on three simple engines 150 h.p., one cross compound 250 h.p. and one triple 300 h.p. Test No. 4 was made on three simple engines 250 h.p. each, and one compound of 500 h.p. Steam pressure, 100 to 125 lbs.



CURVE SHOWING VARIATION IN LOAD OF RAILWAY ENGINES. HALF-MINUTE READINGS OF OUTPUT WITH FIVE CARS

limited data it would appear that the compound non-condensing engine is only slightly better than the simple non-condensing, and except under extreme conditions not sufficiently better to warrant its use.

No stations were tested using Corliss non-condensing compound engines, neither were any tested using simple condensing engines, and no engines of this class are known to the writer to be in use in railroad power stations.

THE COMPOUND CONDENSING SLIDE VALVE OR HIGH-SPEED AUTOMATIC ENGINE

The average results of the tests which were made in power stations using automatic engines of the slide valve type show a steam consumption of 23.96 lbs. and a coal consumption of 3.41 lbs. per i.h.p. per hour. If we reject the three highest values as given in tests 3 (a), 18 and 21, and the lowest result, as given in test 8 (b) we shall have for the average 22.7 lbs. of steam and 3.25 lbs. of coal per horse power per hour, which can doubtless be assumed to be most probably correct for this class of engine.

Most of the makers of engines of this class will guarantee them to produce a horse power per hour for a consumption of 18 lbs. of steam under favorable conditions of loading, and engines of this class have in several instances produced a horse power for less than 15 lbs. of steam. It will be noted that the best results with engines of this class was 16.7 lbs. of steam per i.h.p. per hour, and

2.4 lbs. coal per horse power, which was obtained with an engine of 400 h.p. of the four-valve type.

The effect of the variable load and other conditions due to railroad work is to affect the economy adversely by 30 per cent to 40 per cent, as compared with the best results with a steady load.

TABLE IV.

SUMMARY OF TESTS OF COMPOUND CONDENSING SLIDE VALVE OR HIGH SPEED AUTOMATIC ENGINE

No.	H. p. of Engine	Steam per i.h.p. per Hour	Coal per i.h.p. per Hour	Mean Observed h.p.	Per Cent of Mean h.p. to Capacity	Boiler Evaporation, lbs.	Kind of Coal
3a	600	29.4	4.43	174	29	10.38	3 parts A; 1 pt. Bit.
3	600	23.2	3.50	190	32	9.93	1 part Bit.
8	400	20.2	3.14	154	38	8.29	Ohio Bit.
8b	400	16.7	2.40	180	45	7.75	Ohio Bit.
13	250	24.6	2.95	86	34.5	10.51	Bit. Penn.
16	350	22.7	3.41	164	47	9.50	Ant. Pea
18	1,200	25.6	3.61	904	75	10.58	Pea Penn.
21	400	29.3	3.81	188	47	10.23	Bit.
Average		23.96	3.41	---	---	9.64	
Average except 3a and 8b		24.26	3.40	---	---	9.82	
Average omitting 3a, 18, 21 & 8b		22.7	3.25	---	---	---	

Steam pressure, 100 lbs. to 130 lbs.

COMPOUND CONDENSING ENGINES, CORLISS, GREENE, MCINTOSH & SEYMOUR TYPES

The average results of the tests made on the compound condensing Corliss engines and other engines with similar valve gear, including McIntosh & Seymour and Greene, show a steam consumption of 18.8 lbs. and a coal consumption of 2.6 lbs. per i.h.p. per hour. Omitting test No. 10, for the reason that the coal was of a poor quality and the evaporation low, the average becomes 18.25 lbs. of steam and 2.36 lbs. of coal per i.h.p. per hour. The steam consumption of this class of engines working with a good load can safely be taken as 15 lbs. or less per i.h.p. per hour, in which case the actual results in power-house practice exceed the results when the load is steady by slightly over 20 per cent.

A study of these latter tests shows a higher evaporation per pound of coal than was obtained in power-houses using the cheaper grade of engines. This is probably to be explained by the fact that a better grade of engineers and firemen are employed to operate stations of this class, as compared with those using cheaper machinery, although it may possibly be an accidental variation due to the fact that only a limited number of stations were tested in each class.

The average evaporation from and at 212 degs. per pound of combustible was found to be as follows: for stations using the simple non-condensing engine, 10.26 lbs; for stations using the compound condensing slide valve engines, 9.82 lbs.; for stations using Corliss compound condensing engines, 10.54 lbs. of steam. It is not easy to explain why the evaporation is better from stations using simple engines than from those using compound engines of the same class, as the average grade of employees is rather better in the stations using compound than simple engines;

TABLE V

SUMMARY OF RESULTS OF TESTS OF COMPOUND CONDENSING, CORLISS, GREENE, MCINTOSH & SEYMOUR, AND SIMILAR VALVE MOTIONS

No.	H. p. of Engine	Steam per i.h.p. per Hour	Coal per i.h.p. per Hour	Mean Observed h.p.	Per Cent of Mean h.p. to Capacity	Boiler Evaporation, lbs.	Kind of Coal
10	825	22.7	4.0	482	58.2	8.29	1/2 Bit slack. 1/2 A Culm.
14	1,000	21.9	2.56	277	27.7	10.96	Bit.
14	1,000	20.0	---	314	31.4	10.96	-----
28	350	16.64	2.10	182	52.2	11.80	Bit.
27	500	16.90	2.61	290	40.7	9.39	Bit.
30	2,000	14.50	1.80	814	40.7	10.70	Bit.
34	200	17.30	2.91	145	72	11.14	Bit.
35	1,600	20.50	2.18	---	---	11.14	Bit.
Average		18.8	2.60	---	---	10.54	
Evaporation, 7.25 to 1 of coal.							
Average omitting No. 10		18.25	2.36	---	---	---	

Evaporation, 7.78 to 1 of coal.

probably the variation is an accidental one due to the limited number of stations of each class tested. The average range in the variation of results of the evaporation tests for the stations employing the three classes of engines does not exceed 7 per cent, and whether it can be accounted for or not it will not seriously affect the conclusions.

SUMMARY OF RESULTS

A summary of the average results of these various tests is given in Table VI., in such manner that the various classes of engines may be readily compared. The best results with each class of engine when sufficiently well marked are also given.

A column giving the proportional value of the engine on the basis of coal consumption with a Corliss compound condensing engine placed at 100 is also given. A column giving the probable coal consumption per kw. hour is also appended.

TABLE VI

SUMMARY OF AVERAGE RESULTS

CLASS OF ENGINES	Steam per i.h.p. Lbs.	Coal per i.h.p. Lbs.	Steam per i.h.p. Lbs. Best Load	Proportional Value of Engine	Probable Coal per kw., lbs.
<i>(A) Non-condensing</i>					
Slide valve simple, average	34.3	4.63	30	53.1	6.90
Best result	31.6	4.61	---	---	---
Corliss simple, average	28.3	3.45	25	64.5	5.65
Best result	26.9	3.01	---	---	---
Slide valve, compound, average	30.37	4.17	22	60.2	6.12
<i>(B) Condensing</i>					
Slide valve, compound average	22.7	3.25	16	80.5	4.57
Best result	16.7	2.40	---	---	3.60
Corliss, compound average	18.2	2.36	15	160	3.64
Best result	14.5	1.80	---	---	2.70

RELATIVE ECONOMY OF VARIOUS TYPES OF ENGINES

Assuming that the results of the tests which have been cited give average and best results for engines of the different classes tested when working under the conditions of street railroad work, it is easy to compute the probable yearly cost of each class of engine, and by this means determine the relative value from a financial standpoint.

From the table last given it will be noted that the steam consumption per i.h.p. per hour varies from 34.3 lbs. to 14.5 lbs. A boiler horse power under the conditions of steam pressure supposed to exist would be about 30.4 lbs. of steam, although this amount would vary slightly, depending upon the temperature of feed water and upon the steam pressure. This computation would show that 1.13 boiler horse power would be required in case a simple slide valve non-condensing engine were used, while 0.6 of a boiler horse power only would be required for furnishing steam for the compound Corliss engine or engines of its type in order to supply them with the same relative amount of steam. This indicates that a considerably less amount of boiler power would be needed for the more economical engine than for the more wasteful one, and this fact tends to equalize the cost of a power station on employing the different classes of engines.

From actual prices which have been quoted within the last six months the writer feels very certain that an engine of 500-h.p. capacity, of good quality in its respective class, can be purchased and, under ordinary conditions, can be erected complete on foundations for the figures which are given in the following table. A boiler horse power is considered as worth \$12 when erected for each class of engines. In view of the recent rise in prices this may be somewhat low, but the results are comparatively true for each class of engine. The figures in the table do not consider real estate, building or chimneys, which would vary largely with different conditions. Despite the fact that engines,

TABLE VII

COST PER HORSE-POWER OF 500-H.P. PLANT

	Boiler h.p. per Engine h.p.	COST PER H.P. IN DOLLARS				Total per i.h.p.	Cost for 500-h.p. Plant
		Engine	Boiler	Pumps and Heaters	Piping etc		
<i>Non-condensing Engines</i>							
Simple slide valve	1.135	8.00	13.60	2.00	5.00	28.60	14,300.00
Simple Corliss	0.933	12.00	11.20	2.00	5.00	30.20	15,100.00
Compound slide valve	1.00	11.00	12.00	2.00	5.00	30.00	15,000.00
<i>Condensing Engines</i>							
Compound slide valve	0.75	11.00	9.00	4.00	6.00	30.00	15,000.00
Compound Corliss	0.602	16.00	7.25	4.00	6.00	33.25	16,625.00

pumps, heaters and piping will cost more per horse power for the condensing engines than for the non-condensing engines, the total cost per horse power does not differ greatly for the various classes of engines employed; this is due largely to the fact that a smaller boiler plant is needed with the more economical engine.

Table VII. shows the cost per horse power and also the total cost of the machinery for a power plant of 500-h.p. capacity. It may be remarked that the cost of engines of larger units would be somewhat less per horse power and the cost of those with smaller units somewhat greater per horse power than the results shown in the table.

Taking the fuel consumption as shown by the average results and also the best results in the various tests mentioned, we can compute the yearly requirements in tons per horse power for each class of engine. This has been done in the following table, which is arranged to show the number of tons of 2000 lbs. each required per horse power per day for a day of twelve hours, of eighteen hours and of twenty-four hours. The fuel cost at \$2 per ton per horse power year for a day of eighteen hours is taken as a basis of comparison of fuel costs of the various engines which have been tested. A day of eighteen hours is believed to represent fairly well the average length of time which railroad engines are required to operate. It is also believed that \$2 per ton is not far from the average price paid for coal by railroad stations in this State. If anything, it is rather below than above the average price, and consequently lessens rather than exaggerates the proportional saving made by the most economical engine.

To the fuel cost of each engine must be added fixed charges of sufficient amount to cover interest and repairs, and this has been assumed to be in each case 8 per cent of the cost. No account is taken of that portion of the operating expense chargeable to employees and oil, for the reason that there is no known reason why such charges should be essentially different for the best or for the poorest engine. The following table shows these various quantities computed for the different classes of engines. The last column in the table shows the sum of fuel costs and fixed charges, and is one which may be taken to represent the proportional yearly cost of each class of engine.

By a study of the results in the latter column some interesting conclusions may be deduced.

First, as to the saving due to condensing water; we have only two results which can be compared to show the value of the condenser; these results are the cost of the compound slide valve non-condensing compared with the average value for the compound slide valve condensing. The results are respectively, \$29.54 and \$23.76; the saving due to condenser is \$5.78, which is 19.5 per cent of the cost of running a non-condensing engine, and 24.4 per cent of the cost of running a condensing engine. The saving would seem to be nearly 20 per cent, for reasons which have been already mentioned, would probably be more.

Second, the average yearly cost of engines of the compound condensing type with the Corliss, McIntosh and Seymour, or Greene valve gear as compared with the simple slide valve engines, show a yearly saving of \$14.69 per horse power.

The difference in costs of the power plants considered is \$4.65, which is the excess in cost of the compound condensing Corliss type over the simple slide valve non-condensing. The saving in fuel and fixed charges is thus seen to be sufficient in a single year to pay 3.15 times the difference in cost between the cheapest and best power plant. Comparing in the same way the average yearly costs of fuel and fixed charges for the compound slide-valve condensing engine and the compound Corliss condensing type, we find a yearly saving of 5.64 in favor of the better grade of engine. The difference in costs of the two plants is 3.25 in favor of the compound condensing slide-valve engine. Thus, in a single year the saving on the fuel and fixed charges of the better engine as compared with the poorer will pay 1.73 times the difference in costs.

Third, these figures would show that no station can afford to purchase and operate the simple non-condensing engine of any type as compared with the compound condensing engine, and, fourth, that the compound condensing engine of the best type and with improved valve gear such as the Corliss, McIntosh & Seymour and Greene, and one or two other makes, although costing somewhat more, is so much more economical to operate that, taking all things into consideration, it gives much better financial returns than an engine of any other class. These financial returns are so much in their favor that unless other conditions are exceedingly unfavorable these latter engines are the only ones which should be considered in purchasing machinery for power-house work. This general conclusion, that the compound condensing engine of slow rotative speed and with the improved valve gear is much more economical to use than any other type for power-house work, even when fixed charges are considered, is certainly the only one which can be adopted from the average results of the

tests which I have quoted. This conclusion is noticeable from the fact that in a comparison of costs of different types of railway engines made by Dr. Charles E. Emery, he concluded that the compound condensing engine of the slide valve type and with cylinders arranged in tandem was, when fixed charges were considered, the more economical engine to use. The tests which I have referred to point to a different conclusion, and indicate that the saving of the better type of engine will many times repay the extra expenditure of costs. In brief, the tests indicate that the engines of the best class are much the better investment.

TABLE VIII

FUEL AND INTEREST CHARGES FOR THE DIFFERENT CLASSES OF ENGINES

	Coal per h.p., lbs.	TONS PER H.P. PER YEAR			Fuel Cost per Year, 18 Hours per Day, \$2 per ton	Interest and Depreciation 8 Per Cent	Total Cost per Year per h.p.
		Day 12 Hours	Day 18 Hours	Day 24 Hours			
<i>Non-condensing Engines</i>							
Simple slide valve, average.....	4.63	10.4	15.21	20.28	30.42	2.29	32.71
" " best.....	4.60	10.7	15.10	20.14	30.20	2.29	32.49
Simple Corliss, average.....	3.45	7.55	11.33	15.10	22.66	2.42	25.08
" " best.....	3.01	6.59	9.89	13.18	19.78	2.42	22.20
Compound slide valve.....	4.17	9.05	13.57	18.10	27.14	2.40	29.54
<i>Condensing Engines</i>							
Compound slide valve, average.....	3.25	7.12	10.68	14.24	21.36	2.40	23.76
" " best.....	2.40	5.25	7.88	10.51	15.76	2.40	18.16
Compound Corliss, average.....	2.36	5.17	7.74	10.33	15.48	2.64	18.12
" " best.....	1.80	3.94	5.91	7.88	11.82	2.64	14.46

Address of the President of the Street Railway Accountants' Association

BY J. F. CALDERWOOD

Gentlemen of the Association: "Know Thyself," that simple injunction carved over the entrance to a temple of ancient Greece—so old that no one knows who wrote it—is a motto which has impressed me as ideally appropriate for this organization, the newest branch of a business, which is at once the effect and the cause in what might be called the latest phase of modern civilization—rapid transit.

The executive head of one of the larger street railway systems of America said recently that the industry had not developed beyond 20 per cent of what might reasonably be expected as the ultimate future of street railway business in America; in other words, that there still remains four times as much to do as has been accomplished in the perfection of the art of carrying the public. If this be true, no small part of the future development must be due to the work of the men who, by analysis of accounts, establish the data for future advancement. Managers are continually balked by new problems, and while the operating department is usually able to answer satisfactorily the question: can this or that be done? it is for the accountant to go further and ascertain what can and what cannot be done profitably; for, in the end, the wisdom of every policy must pass the ordeal of ultimate cost.

Andrew Carnegie, the captain-general of the iron and steel industry, paid this tribute to the calling here represented: "There is not a science or class of men on whom the business of the world is more dependent than the science of accounts and accounting." It is an axiom of modern business on which its success depends—I will go further and say, upon which its very life depends, that of having within it a well-devised system of accounting which will show at all times (with the least labor and the greatest accuracy) its true condition. In the idiom of the street, show me the management of any company, mercantile, manufacturing or transportation, that does not recognize this principle and act upon it, and time will show you its "finish."

More, perhaps, than any other, does the street railway business depend upon, and involve diverse and extraneous conditions, rendering it doubly necessary that a successful management, in order to secure the greatest revenue with a minimum of expense, should be prepared for prompt action and unerring judgment, by careful analysis and minute comparison of the various items of revenue and expense through its accounting department.

Pursuant to a general desire on the part of those who had struggled single-handed and alone through the maze of unsystematic street car bookkeeping in a desperate effort to supply these much needed data, a few accountants met in Cleveland, March 24, 1897, for the purpose of promoting an organization which would bring together, for exchange of ideas, those engaged in the ac-

counting departments of street railways. Many of you will remember that paper, fruitful of discussion, read by C. N. Duffy, upon the "Standardization of Street Railway Accounts," which, by common consent, became the chief subject of discussion at that meeting, as it has been ever since the foundation of the chief work of this association.

For the purpose of preserving the continuity of the developments I will remind you briefly of the appointment of a committee upon this subject consisting of Mr. Duffy, chairman; W. F. Ham, of Brooklyn, and myself, which reported at the convention held at Niagara Falls in October, 1897. The report of the committee was approved, but the question arose as to the probable action of the railroad commissioners of the various States, since these commissioners in many States, prescribe what system of classification shall be used by the street railway companies reporting to them. As a result of the debate it was decided to continue the committee permanently, its membership being increased by the addition of H. L. Wilson, of Boston, and H. J. Davies, of Cleveland. The permanent committee endeavored during the following year to have meet with it the railroad commissioners of the States which exercise any control over the accounts of street railways, but arrangements could not be made previous to the convention, which met in Boston. A full and complete report covering the matter of uniform accounting was presented at the Boston convention by the committee, and adopted, notwithstanding their inability on account of lack of time to secure the approval of the railroad commissioners.

You will have presented to you, at this meeting, a full report from the committee covering its conference with representatives of the State railroad commissioners, and also of the American Railway Accountants' Association. At this conference Mr. Duffy and Mr. Ham acted for our committee. I take pride in calling your attention to the recognition there accorded the action of our association in the adoption by the conference of the entire system of classification (with a very few minor changes) as prepared and promulgated by our organization. This tribute to our committee is admirably expressed in the language of William O. Seymour, chairman of the committee which reported to the railroad commissioners at their meeting at Denver, Aug. 10 last. Mr. Seymour, in his report, said:

"It was found that the form prepared by the street railway accountants was so much more advanced in its preparation, so complete and full in its details, and so well adapted for its purpose, owing to the familiarity of those who prepared it with street railway accounting, that we deemed it wise to abandon the work which we had commenced, and advise the indorsement and adoption of the form prepared by them."

The recommendation of their committee was adopted by the convention of railroad commissioners, and we have every reason to believe that the same action will be taken by the American Railway Accountants' Association, since its representatives at the conference concurred in the action then and there taken. We have thus established, through our committee, a recognized standard classification of the various items which enter into the three chief elements of street railway accounting, namely: the revenue, the cost of operation and the cost of construction.

This important feature is now substantially fixed, subject, of course, to slight modifications from time to time as new and varying conditions make it necessary to modify slightly the present established classification, and to that end I would recommend the continuance of this permanent committee on the standard system of classification.

While our association has accomplished much by the practical establishment of a permanent classification of accounts, we are far from having concluded the work necessary for a complete system of accounting, such as would be available for purposes of comparison. What we now need and must have before we shall have fulfilled our mission, is the establishment of a unit of comparison. We may have properly classified the cost of maintenance of way, transportation and general expense, and severally and collectively determined the amounts of each for a certain period as compared with another similar period; the comparison of the totals of one period with another may be in the aggregate more or less. This means nothing in itself, unless we can reduce these several sums to a unit of comparison. Now, whether this unit shall be the ratio which each item of expense shall bear to the total revenue, or whether it shall be so much per car-mile, per motor-mile, per motor-hour or ton-mile, is the next great and important question for the association to consider and to settle. To H. C. Mackay has been assigned a paper bearing upon this subject, which will be read at this convention, and we trust he will suggest a solution of this most perplexing proposition. I would recommend the appointment of a committee on the establishment of a unit of comparison. When this is done I shall feel that we are nearing our goal. With the classification and the unit established, the next

important feature is a statement blank that will enable the accountants to present, in a uniform, simple and concise manner, the various results and comparisons.

We have established a department of blanks and forms, and to our energetic and persevering secretary, W. B. Brockway, the association is indebted for a remarkable exhibit of the blanks and forms of various street railway companies. These he has arranged and will present with his report, the first important feature, as well as one of the most interesting on the programme for Thursday's session.

I cannot conclude this task without yielding to a duty which I feel to be incumbent upon me at this time. I desire to remind the members of this association that the enthusiastic accountant, charmed with the possibilities for analysis and classification which lie within apparently meaningless statistics, is frequently tempted to indulge in hobbies, which, while pretty enough from the accountant's standpoint, and frequently necessary in part, are worse than useless so far as giving practical information to the management. The ideal accountant wastes no energy upon unnecessary labor. His aim should be to prepare and present to the management only such salient facts as will enable the man in command to make instant comparison upon the three fundamental elements of street railway operation, namely: the revenue, the labor cost and the material cost; all else is subsidiary.

The revenue statement should show, by hours or otherwise, the number of passengers carried, so that the management may be enabled to secure the largest revenue with the least expenditure.

The labor statement should show, in a systematic and comparative manner, the number of men employed and the amount of wages paid in each department, that the management may compare with corresponding periods, and be able to control labor expenditure and keep within a fixed ratio.

The material statement, by showing the kinds, quantity and cost of materials bought and the consumption of the same, enables the management at all times to regulate the stock of material on hand.

I shall be pleased if what I have just said, fragmentary and brief as it must needs be in an address of this character, will create a discussion; if not at this meeting, at some subsequent meeting of our association. I believe we get more out of the "experience-meeting" feature of our gatherings than from the set papers, valuable as they are.

In ending my term as president, I wish to express my especial appreciation of the good work of C. N. Duffy, that perfect type of an aggressive, progressive and intelligent all-around master of accounting and business man, who laid at Cleveland the cornerstone of this structure, and to his worthy associate, W. F. Ham. To these two gentlemen this association is indebted for the larger part of the great work which it has accomplished since its birth, and I hope that this association has only begun in a field of usefulness which broadens as we advance. Purely practical and limited in scope though it be, it has afforded us a vehicle for good fellowship which I have enjoyed quite as much as the professional stimulus and suggestion. I look forward to future meetings with pleasure, and I thank you all for uniform courtesy extended to me since I have had the honor to preside over your deliberations.

Report of the Secretary and Treasurer of the Street Railway Accountants' Association

BY W. B. BROCKWAY

The past year has been an exceptionally busy one in the secretary's office, not alone in the regular work falling to such an office, but to the preparation of the department of blanks and forms, which is explained in the report of that department, to be made Thursday.

Thirty-four companies have been admitted to membership since the last meeting, as follows:

Tiffin, Fostoria & Eastern Railway Company, Tiffin, Ohio.
 Omaha Street Railway Company, Omaha, Neb.
 Stamford Street Railway Company, Stamford, Conn.
 Cleveland City Railway Company, Cleveland, Ohio.
 Citizens' Rapid Transit Company, Nashville, Tenn.
 Ottawa Electric Railway, Ottawa, Ontario, Canada.
 City Electric Railway, Port Huron, Mich.
 Fair Haven & Westville Railroad Company, New Haven, Conn.
 Milwaukee, Racine & Kenosha Electric Railway Company, Racine, Wis.
 North Hudson County Railroad, Hoboken, N. J.
 Metropolitan Street Railway Company, New York, N. Y.
 Norfolk Street Railway Company, Norfolk, Va.
 Tri-City Railway, Davenport, Iowa.
 Metropolitan Street Railway, Kansas City, Mo.
 Syracuse Rapid Transit Company, Syracuse, N. Y.
 Quebec, Montmorenci & Charlevoix Railway, Quebec, Canada.
 Union Traction Company, Philadelphia, Pa.
 Vicksburg Railroad, Power & Manufacturing Company, Vicksburg, Miss.
 North Chicago Street Railway Company, Chicago, Ill.
 Savannah, Thunderbolt & Isle of Hope Railway Company, Savannah, Ga.
 San Diego Electric Railway Company, San Diego, Cal.

Duluth Street Railway Company, Duluth, Minn.
 Glasgow Corporation Tramways, Glasgow, Scotland, England.
 Calumet Electric Street Railway, Chicago, Ill.
 Brightwood Railroad, Washington, D. C.
 Mobile Light & Railway Company, Mobile, Ala.
 Butte Consolidated Street Railway Company, Butte, Mon.
 Schenectady Railway Company, Schenectady, N. Y.
 Central London Railway, London, England.
 Third Avenue Railroad Company, New York, N. Y.
 The American Railways Company, Philadelphia, Pa.
 Alton Railway, Gas & Electric Company, Alton, Ill.
 Kansas City & Leavenworth Railway Company, Leavenworth, Kan.
 The Albany Railway, Albany, N. Y.

And but two have resigned:

Birmingham Railway & Electric Company, Birmingham, Ala.
 Manchester Street Railway Company, Manchester, N. H.

A statement of the growth of the association is as follows:

Companies forming the Association at Cleveland, March, 1897.....	25
New members reported at Niagara Falls, October, 1897.....	12
New members reported at Boston, September, 1898.....	32
New members reported at Chicago, October, 1899.....	34

Total	103
Withdrawn	3

Total members to be reported Oct. 17, 1899..... 100

But a new problem of consolidation is confronting us, a problem which is having a tremendous effect upon the whole street railway world, and I would commend to your earnest consideration the suggestions made in the report of your executive committee.

The finances to be reported are:

Balance from Sept. 9, 1899.....	\$51.84	
Received from applications for membership.....	340.00	
Received from 1899 dues.....	730.00	
Received from 1898 dues.....	60.00	
Received from department of blanks.....	3.91	
Received from bills payable.....	225.00	
Received from interest on deposits.....	.27	
		\$1,411.02

Expended for salary of the secretary.....	\$200.00	
Expenses of the secretary's office.....	83.24	
Printing circulars and stationery.....	95.65	
Postage for reports, circulars, etc.....	79.03	
Executive committee meetings.....	46.05	
Stenographer for Boston meeting.....	305.00	
Printing report of the Boston meeting.....	224.67	
Printing 1898 report of the standardization committee.....	74.49	
1898 expenses of the standardization committee.....	68.50	
Secretary's traveling expenses.....	156.90	
Department of blanks and forms.....	157.21	
Bills payable.....	100.00	
Cash in Home Savings Bank, Toledo, Ohio.....	19.28	
		\$1,411.02

Bills payable.....	\$125.00
Cash in bank.....	\$19.28
Unpaid dues.....	30.00
	49.28

Deficit

Thus, I cannot report the association as having been a dividend payer, but I am sure the results of the work of the committee on a standard system of accounts and the department of blanks and forms, which now has something tangible to offer, will well repay any reasonable stringency which we may encounter. The circulars sent out from the secretary's office to explain the benefits of membership have all resulted in the increase of applications. We seem to have almost accomplished most of the expensive work made necessary by the creation of the departments of standardization and blanks, and eventually we will sail on the smoother waters of "well-to-do."

It is again my bounden duty to express my doubly grateful thanks to all who have in so many ways assisted in the performance of the work of the association. It has all been so cheerful that the thanks are the more heartfelt, and in all true sincerity I say, thank you.

Report of the Standardization Committee of the Street Railway Accountants' Association

The report to the convention of 1899 of the committee on a standard system of street railway accounting consisted of a final draft of the classification and equipment accounts for overhead, underground, third-rail, storage battery and surface contact electric railways, this draft including the amendments agreed upon by the committees on standardization of the Street Railway Accountants' Association, the Association of American Railway Accounting Officers, and the National Association of Railroad Commissioners. This final draft is the same as that printed in the STREET RAILWAY JOURNAL for October, 1898, pages 632 to 638, with the corrections embodied in the following report of Chairman C. N. Duffy, presented to the 1899 convention in Chicago.

CHICAGO, Oct. 18, 1899.

To the Members of the Street Railway Accountants' Association of America:

Gentlemen.—In response to the invitation of William O. Seymour, of the Board of Railroad Commissioners of the State of Connecticut, to attend a meeting at the Manhattan hotel, New

York City, on July 11, 1899, to confer with the committee representing the Convention of Railroad Commissioners and the committee representing the Association of American Railway Accounting Officers, for a general discussion upon the subject of a classification of construction and operating expenses of electric roads, your committee begs leave to report that two of the members attended the meeting.

The following gentlemen were present at the meeting: Wm. O. Seymour, member of Board of Railroad Commissioners of the State of Connecticut and chairman of committee on classification of construction and operating expenses for electric roads; Ashley W. Cole, chairman Board of Railroad Commissioners of State of New York and a member of Mr. Seymour's committee; H. M. Kochersperger, Comptroller New York, New Haven & Hartford Railroad Company and a member of committee representing Association of American Railway Accounting Officers; J. D. Green, auditor of disbursements Pennsylvania Railroad Company and a member of committee representing Association of American Railway Accounting Officers; Wm. F. Ham, representing the Street Railway Accountants' Association of America; C. N. Duffy, representing the Street Railway Accountants' Association of America; H. T. Billings, clerk Board of Railroad Commissioners, State of Connecticut.

After a morning and afternoon session, in which the report of the committee on a standard system of street railway accounting, covering the classification of construction and equipment accounts, classification of operating expense accounts, and forms of monthly and annual reports made to the Street Railway Accountants' Association of America, at its second annual convention, held in Boston, Sept. 6-9, 1898, was fully discussed, the following modifications and changes were unanimously agreed to by all the gentlemen present:

1st.—The title of the sub-heading, "Car Service," which includes operating expense accounts numbers 16 to 24, both inclusive, the second sub-heading under the main heading, "Transportation," was changed from "Car Service" to "Operation of Cars."

2d.—The cost of replacing horses lost by death or worn out in service, and the depreciation in the value of horses, was transferred from account No. 30, "Stable Expenses," to account No. 8, "Maintenance of Miscellaneous Equipment."

3d.—The number of operating expense accounts was changed to 38, numbers 1 to 38, inclusive, account No. 39, "Taxes," being eliminated from operating expense accounts, and classified as a "Deduction from Income."

4th.—In monthly report, under "Deductions from Income," the first item is to be "Taxes."

5th.—In annual reports, under "Deductions from Income," the first item is to be "Taxes."

In explanation of the modifications and changes that were agreed to, we beg leave to submit the following:

1st.—Changing the title of the sub-heading, "Car Service," from "Car Service" to "Operation of Cars." It was stated that the title "Car Service" would conflict with a technical term used in the operation of steam railroads, and with an account that steam railroads carry on their books. In addition, it was suggested that the title of the sub-heading, "Operation of Cars," was preferable to "Car Service," and was in uniformity with the title of the first sub-heading under "Transportation," "Operation of Power Plant." Your committee readily agreed to this suggestion, as we both considered not only the objection to the old title founded, but the name of the new title an improvement over the old.

2d.—Transferring from account No. 30, "Stable Expenses," to account No. 8, "Maintenance of Miscellaneous Equipment," the cost of replacing horses lost by death or worn out in service, and the depreciation in the value of horses. The gentlemen criticised the action of your committee in classifying this item under account No. 30, "Stable Expenses," a "General Expense" account, for the reason that they thought that the cost of maintaining horses was a maintenance charge, and should be classified under the same account that carried the cost of maintaining the wagons and harness. They pointed out that the wagons, harness and horses were one, in the sense that the wagons and harness were useless without the horses, and that in their opinion account No. 8 should carry the cost of maintaining wagons, harness and horses, in order to have the classification consistent. In this, your committee thought they were correct.

3d.—Eliminating account No. 39, "Taxes," from operating expense accounts and classifying same as a "Deduction from Income." In view of the fact that under the Inter-State Commerce classification of accounts, the universal standard followed by steam railroads and the position taken by all boards of railroad commissioners throughout the United States who exercise any supervision over the books and accounts of street railways, that "Taxes" are considered a "Deduction from Income" and not an "Operating

Expense Account," and for the sake of bringing about a uniformity of methods and secure the co-operation of the convention of State Railroad Commissioners and the Association of American Railway Accounting Officers, all of the gentlemen representing these two associations being unanimously of the same opinion as to the disposition of "Taxes," and in addition being firmly fixed in their opinion that "Taxes" should not be a part of the operating expenses of a road, your committee agreed to change the classification of operating expense accounts, taking therefrom account No. 39, "Taxes," and treat "Taxes" as a "Deduction from Income," making it the first item under that heading in monthly reports and annual reports.

At the eleventh annual convention of Railroad Commissioners, held in the city of Denver, Aug. 10, 1899, Mr. Seymour, chairman of committee on classification of construction and operating expenses of electric railways, presented his report, in which he reviewed the work of his committee, referred to the meeting with this committee, spoke in the highest terms of the form of classification of accounts adopted by this association, advised its indorsement and adoption by his association, and submitted verbatim the printed report this committee made to the Boston convention, Sept. 6-9, 1898, with the changes and modifications as agreed upon at the meeting held in New York City July 11, 1899, embodied in the printed report.

The Convention of Railroad Commissioners unanimously adopted Mr. Seymour's report, commending it most highly.

Mr. Seymour's report proper has been made a part of this report.

The committee representing the Association of American Railway Accounting Officers, who were present at the meeting held in New York City July 11, 1899, stated that they would report to their association, at its next annual convention, to be held in May, 1900, the result of the conference with the committees from the Convention of Railroad Commissioners and the Street Railway Accountants' Association of America, and that as a committee they would recommend the adoption and use of the standard system of street railway accounting adopted by the Street Railway Accountants' Association of America, with the modifications and changes as agreed upon embodied into the system.

Your committee desire to take advantage of this opportunity to express their appreciation of the hearty co-operation extended to them by the gentlemen representing the Convention of Railroad Commissioners and the Association of American Railway Accounting Officers, for Mr. Seymour's kind words and strong indorsement of the work of this association, as expressed in his report to the Convention of Railroad Commissioners, and also to the members of that association, for their action in unanimously adopting Mr. Seymour's report as presented.

Through the co-operation of the Convention of Railroad Commissioners and the Association of American Railway Accounting Officers, with this association, and in view of what this association has already accomplished, the standard system of street railway accounting adopted by the Street Railway Accountants' Association of America will undoubtedly be used by all street railway companies, thereby securing a uniformity of methods, which has been so much desired and for which we have so earnestly labored.

The classification of accounts accompanying this report embodies all the modifications and changes as agreed upon at the meeting held in New York City, July 11, 1899, and as adopted by the Convention of Railroad Commissioners, at the meeting held in Denver, Aug. 10, 1899. Your committee asks this association to indorse and approve what they have done by ratifying and confirming their action and adopting this report as presented.

Respectfully submitted for the committee,

C. N. DUFFY, Chairman.

Supplementary Report of Committee on a Standard System of Street Railway Accounting

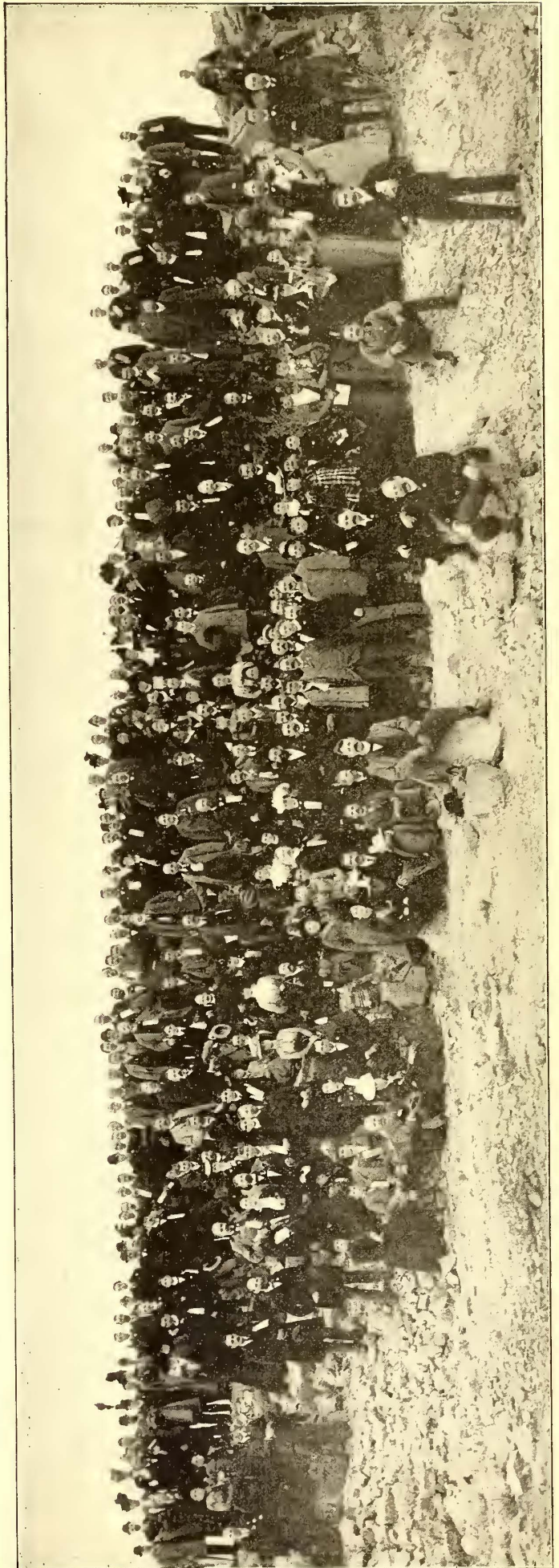
Mr. Duffy also presented a supplementary report in the convention as follows:

CHICAGO, Oct. 18, 1899.

To the Members of the Street Railway Accountants' Association of America:

Gentlemen—In addition to the printed report made by your committee and presented to this convention, we desire to present for your consideration other questions in connection with the standard system of accounting, not touched upon in the printed report.

First—Construction and Equipment Account—"H"—"Investment Real Estate." The instructions classifying this account read, "Charge to this account all expenditures for land and buildings not used in operation of road."



GROUP OF DELEGATES AT CHICAGO CONVENTION, TAKEN WHILE VISITING DRAINAGE CANAL

The committee want it understood that this refers to land and buildings purchased in connection with securing right of way, and real estate used in operation of road, but not a part of either, although incident to the construction and equipment of the road. This does *not* refer to the purchase of land and buildings bought for the purpose of investing surplus funds of the company, which should be charged to a special account; for example, "Surplus Investments." It having been suggested to your committee that the instructions concerning this account were not sufficiently clear or explicit, and that "Investment Real Estate" was not a construction and equipment account, we submit the above for your information.

Second—Monthly Reports—Debiting and crediting the month's proportion of each item under "Income From Other Sources," "Deductions From Income," and "Deductions From Net Income," currently, each month, and charging to accounts Nos. 36 and 37, respectively, the month's proportion of the total annual charge of these accounts, estimating such debits, credits or charges, if the exact amount per month is not known.

The instructions regarding these questions appear to be complete and sufficiently clear and explicit. As far as your committee know, they are fully understood, but they are not always properly carried out. The debits, credits or charges referred to, should be estimated and apportioned monthly, as closely as possible, from the best information obtainable, and the amounts taken up each month by journal entry, so that they would appear on the books. In many instances, these amounts are pro-rated on the monthly report, without having been put on the books at all.

Third—Classification of Material and Supplies—A classification of material and supplies is submitted, because your committee consider it of the greatest importance in connection with the use of the standard system of accounting adopted by this association. Material and supplies have been classified under thirteen departments, A to M, inclusive. The items properly classified under each department, should be alphabetically arranged as they are under each account. In addition, the items should be indexed, showing the department or departments that each item properly belongs to. This detail would have been carried out by your committee, if sufficient time were at our disposal to do the work.

This supplementary report is presented for your careful consideration. We hope that the questions referred to will meet with full discussion, and we will be glad to have the report subjected to any criticism that you may see fit to make.

Respectfully submitted for the committee,

C. N. DUFFY, Chairman.

CLASSIFICATION OF MATERIAL AND SUPPLIES.

Department.

- A. Material and Supplies for Maintenance of Track and Roadway.
All material and supplies as classified under Account No. 1, that properly belong *only* to Track and Roadway.
- B. Material and Supplies for Maintenance of Electric Line.
All material and supplies as classified under Account No. 2, that properly belong *only* to Electric Line.
- C. Material and Supplies for Maintenance of Buildings and Fixtures.
All material and supplies as classified under Account No. 3, that properly belong *only* to Buildings and Fixtures.
- D. Material and Supplies for Maintenance of Steam Plant.
All material and supplies as classified under Account No. 4, that properly belong *only* to Steam Plant.
- E. Material and supplies for Maintenance of Electric Plant.
All material and supplies as classified under Account No. 5, that properly belong *only* to Electric Plant.
- F. Material and Supplies for Maintenance of Cars.
All materials and supplies as classified under Account No. 6, that properly belong *only* to Cars.
- G. Material and Supplies for Maintenance of Electric Equipment of Cars.
All material and supplies as classified under Account No. 7, that properly belong *only* to Electric Equipment of Cars.
- H. Material and supplies for Maintenance of Miscellaneous Equipment.
All material and supplies as classified under Account No. 8, that properly belong *only* to Miscellaneous Equipment.
- I. Material and Supplies for Shop.
All material and supplies as classified under Account No. 9, that properly belong *only* to Shop.
- J. Fuel (Coal, Coke, Charcoal, Kindling).
All coal, coke, charcoal and kindling, including coke for welded joints, charcoal for electric line; charcoal, coal and coke for shop; fuel for power; charcoal, coal, coke and kindling for heating cars; coal or coke for heating buildings, and fuel for drying sand.
- K. Lubricants and Waste (Oil, Grease, Waste, Rags).
All oil, grease or other lubricants, and all waste or rags used

with lubricants, for shop, power plant, cars, track, wagons, etc.

L. Printing and Stationery.

All printing and stationery of every description, including tickets, transfers, legal papers, signs, posters and other advertising matter.

M. Miscellaneous Material and Supplies.

All material and supplies as classified under Accounts Nos. 14, 21, 22, 23, 24, 28, 29 and 30, that properly belong *only* to those accounts, and all material and supplies *not* classified specifically under Departments A, B, C, D, E, F, G, H, I, J, K or L.

The following is a list of some of the items that it is proper to classify under Department "M."

Arc lights and fixtures.	Matches.
Babbitt (metals).	Medicine (stable).
Badges (employees').	Metals (babbitt, brass, copper, etc.).
Batteries (for car bells).	Mops.
Bedding (stable).	Nails.
Bell cord.	Nuts (for bolts).
Belting.	Oil cans.
Blankets (stable).	Packing (for engines).
Bolts.	
Brass (metals).	Painting material { (linseed oil, tur-
Brick.	pentine, varnish,
Brooms.	white lead, paint-
Brushes (car washing).	er's brushes and
Brushes (flue).	supplies).
Brushes (generators).	Paving material.
Brushes (horse).	Pokers (car stoves).
Brushes (motors).	Polish.
Brushes (scrubbing).	Portable registers.
Buckets.	Rags.
Carbons (arc light).	Rivets.
Cement.	Salt.
Chamois skins.	Sand.
Conductor's books.	Sandpaper.
Conductor's punches.	Screws.
Copper (metals).	Shakers (car stoves).
Cotters.	Shovels (car stoves).
Curry combs.	Soap.
Emery cloth.	Spikes.
Feather dusters.	Sponges.
Feed (stable).	Sprinkling cans.
Fire buckets.	Steel.
Fire extinguishers.	Stone.
Fuses (cars).	Stove blacking (car stoves).
Garnet paper.	Tape (insulating).
Globes (arc light).	Tools (hand).
Horse shoeing supplies.	Towels.
Hose.	Trolley rope.
Iron.	Uniforms.
Lamps (incandescent).	Washers (iron).
Light { (lanterns, oil, wick, torches,	Washers (car washers).
candle s, incandescent	Waste cans.
lamps).	Water gauge glasses.
Lumber.	Wire.

Respectfully submitted to the Street Railway Accountant's Association of America, by committee on a standard system of street railway accounting.

C. N. DUFFY, Chairman.

Annual Convention of the Pennsylvania Street Railway Association

The regular annual convention of the Pennsylvania Street Railway Association was held at the Stevens House, Lancaster, Oct. 11 and 12. In the absence of President Silliman, Vice-President W. B. Given introduced Simon Schissler, Mayor of Lancaster. Mr. Schissler welcomed the delegates to the city, and the response to his address was delivered by J. H. Stedman, in behalf of the association.

The roll-call followed, showing the following active members of the association were represented: Altoona & Logan Valley Traction Company, Harrisburg Traction Company, Lebanon Valley Traction Company, Pennsylvania Traction Company, The Scranton Railway Company, Schuylkill Traction Company, United Traction Company (Reading), Union Traction Company (Philadelphia), Wilkesbarre & Wyoming Valley Traction Company, Williamsport Passenger Railway Company, York Street Railway Company.

The associate members and others in attendance represented the following: J. G. Brill Company, Philadelphia; General Electric Company, Philadelphia; Pennsylvania Steel Company, Steelton; Lobdell Car Wheel Company, Wilmington; Westinghouse Electric & Manufacturing Company, Philadelphia; McKee, Fuller & Company, Catasqua; Philadelphia Car Wheel Company, Philadelphia; Pittsburgh Car Wheel Company, Pittsburgh; Pennsylvania Car Wheel Company, Pittsburgh; Providence Engineering Works, Providence; STREET RAILWAY JOURNAL, New York; Smith, Wallace & Bonta, Buffalo; Jackson & Sharp Company, Wilmington; Lykens & Williams Valley Street Railway, Lykens; J. H. Stedman, transfer expert, Rochester; York Car Brake Company, York.

Three papers were read, one on "Street Railway Trucks." by W. H. Heulings, Jr., of the J. G. Brill Company; one on the "Railway Engine of To-day, a Combination of the Principles of High

Speed and Corliss Practice," by W. P. MacKenzie, assistant manager of the Harrisburg Foundry & Machine Works, and one on "Track Construction," by Frank Silliman, Jr., general manager of the Scranton Traction Company.

MR. HEULINGS' PAPER

Mr. Heulings dwelt upon the necessity of good trucks and stated that even comparatively light car bodies, if mounted upon rough riding trucks, will pound to pieces the best roadbed and twist and bend the heaviest rails more or less out of shape within a surprisingly short length of time. He said that this result had been reached within two or two and a half years on roads within his knowledge, where only moderate speeds were used, and where the car bodies were quite small. The first electric truck introduced upon street railways was of the four wheel non-pivotal type and was a natural development of the old horse car running gear. He described what he considered the proper construction which included a solid side frame, preferably forged, making each wheel piece a single bar, and with the two wheel pieces connected by heavy end irons. This makes the truck a self-contained motor vehicle with sufficient strength to support the machinery and haul the trailer if necessary. The springs are an important feature and the writer recommends the use of eight journal box springs, and placing the car springs on the solid frame. Of the latter springs, the outer springs should be half elliptics, those on each side of the jaw, spiral. Although numerous attempts have been made to secure equalizing four-wheel trucks, the speaker thought that these attempts had been unsuccessful. He also said that most of the destruction of street railway tracks comes from badly constructed trucks and not from any heavy trucking which goes over them. He doubted whether four-wheel cars are suitable for any service on modern street railways and strongly recommended double truck cars, claiming the cost of propulsion by steam or electricity varies according to the number of units rather than their size, and is practically independent of the load carried. Moreover, the four-wheel truck, whether of large size or small, should not be run at a high speed because its destructive power increases in proportion to the square of the speed.

Mr. Heulings then discussed the maximum traction truck and stated that a maximum traction car requires no more power for its operation than a four-wheel car. To fortify this assertion he cited the case of the New Orleans Traction Company, which, in 1894, contracted with the Louisiana Electric Light Company to purchase power for its cars at a given rate per car per day. The fact of the traction company introducing maximum traction truck cars was the foundation for litigation brought by the light company, which claimed more compensation to cover the increased consumption of electricity. The traction company's engineer, B. Willard, and the light company's engineer, J. B. Craven, with Walter H. Knight, then of the General Electric Company, conducted a series of tests. Their report was: "We cannot find that the 22-ft. cars on maximum traction trucks consume any more power than the ordinary 18-ft. car bodies on single four-wheeled trucks, such as used on some of the New Orleans Traction Company's lines." Experiments by the Consolidated Traction Company, of Jersey City, showed that the repairs to motors and trucks varied directly as the number of motors and was independent of their size, that the eight-wheel car had a repair account practically twice as large as that of the four-wheel cars. The maximum traction truck permits the use of two motors to the car. It carries a longer and heavier car body and without increasing the weight on the driving wheels over the weight on the wheels of a four-wheeled car, allows the whole weight of the car body to be increased by 33 1/3 per cent.

Ample traction is secured with this truck for the most rapid running, as shown on the Washington, Alexandria & Mt. Vernon Railway, where maximum traction trucks are running at a speed of 40 miles an hour. Another advantage of these trucks over those with four wheels of equal size, is that the car can be brought so low that a single step of usual height gives access to the platform. For high speed service he recommended the Brill "perfect" truck, which has been described in these columns.

From this truck the company has developed the No. 27-G truck, especially for city and suburban use. The No. 27-G truck has four motors, an inside brake and so short a wheel base that it can be used on cars which have to pass short city curves. The swing of the wheels is so short as to make it possible to use them under cars of ordinary width without unduly raising the car body. The equalizer is replaced by long half elliptic springs which also take the place of the elliptics on the spring plank. The four motors employed give the car the greatest possible tractive force and fit it for running at any desired speed. For certain purposes it is possible to modify this truck in such a way as to make it perform many of the functions of the maximum traction, using only one motor per truck. In this case the motor is carried outside the

axle, thus bringing a considerable increase of weight upon the driving wheel while the center bearing and center radiation is retained. The spring links, the swing motion and the perfect equalization, three sets of springs, together with journal springs of ample size arc features which are retained and which together are the reason for its exceptionally easy motion. The "perfect" truck has shown itself capable of meeting a surprisingly large variety of conditions. At all times it retains its characteristic ease of riding.

While Mr. Heulings had no figures to present relative to the diminished flange wear of wheels in these trucks, he stated that owing to the softening of the side motion by the spring links, little pressure is brought upon the flanges. The truck may be forced violently from side to side by the irregularities of the track, yet so perfectly is the body hung that it only follows the truck slowly or allows the truck to move without itself moving at all. Incidentally in the construction of this type of truck great gain was made in strength. Instead of transmitting the weight of the car body through the transoms to the center of the wheel piece and then from the wheel piece out toward the spring pockets, a considerable distance, in the present case the weight where the spring links⁵ throw it upon the wheel piece is but a short distance from the jaws. The wheel pieces are consequently subjected to very little strain and the truck is much stronger in consequence. In fact, getting out of square from the strains set up in running ought to be and is practically unheard of.

MR. MACKENZIE'S PAPER

Mr. MacKenzie objected to the prevalent designation of engines as "high speed" and "low speed," and prefers the terms "short stroke" and "long stroke," for the short stroke engine is often a low speed engine, having a less piston travel per minute, although the rotative speed is higher. In the short stroke engine the steam is admitted to the cylinder much oftener than in the long stroke; there is therefore less opportunity for the cylinder walls to cool, and consequently less cylinder condensation occurs. The economy of this, however, is somewhat offset by the usual higher temperature of exhaust and greater clearance space necessary. These last, in turn, however, became of less importance when a condenser is used or when the exhaust steam is utilized for heating, which are conditions very generally found to-day.

The usual type of governor employed with this engine is an automatic shaft governor.

Corliss or long stroke engines have, in the matter of steam distribution, undoubted advantages, and in their sphere give satisfactory results, although this sphere is limited. As built to-day, they are practically the same in the arrangement of their mechanism as the original one from which they derive their name. The old vacuum dash pots and tripping device remain, and it is not considered practical to speed the engine much over 90 r.p.m., or at the most 100 r.p.m. The old style Corliss engine also takes up more space and is more noisy than the modern short stroke engine. With the high rotative speed of the latter, smaller diameter fly wheels are possible, and with the same rim velocity the danger of bursting wheels is reduced, as it is easier to make the smaller castings perfect. The short stroke engines also regulate closer on account of their use of an inertia shaft governor. Compared with the long stroke engine, however, they are usually less economical in coal consumption per i.h.p.

The writer then stated that three or four styles of combination engines designed to embody the advantages of both the short stroke and Corliss engine had been placed on the market, and of these described that manufactured by the Harrisburg Foundry & Machine Company.

Probably the most novel feature in this engine is the steam accelerated valve gear, so-called because of auxiliary steam cylinders, so arranged as to give a most positive and instantaneous cut-off to the steam admission valves. The engine is provided with two eccentrics, each having unvarying motion, being fixed to the shaft. That eccentric which operates the mechanism controlling the steam valves is connected to a rocker arm on the side of the engine frame, and from this point a connecting rod transmits the motion to two levers, which are pivoted to the valve stem brackets. On the outside of these levers protrudes a small steel shaft, at the end of which is a multiple sided steel block made with renewable wearing surfaces. To the outer end of each valve stem is securely keyed another lever, through which passes a small rod. To the lower end of this is attached a hardened steel toe-piece, with a face to correspond and engage with the multiple sided steel block above alluded to. This toe-piece is actuated by a cam by means of a shaft and lever; the cam is pivoted upon the valve stem bracket, and receives its motion from a rod connecting through a bell crank to a centrally balanced centrifugal inertia governor. By a connecting link the cams are made to operate in unison. The governor is mounted upon a heavy bracket shaft, securely fastened to the side of the engine frame and is driven by a belt from a pulley keyed to

the engine shaft. From the mechanism above described it will be apparent that if no auxiliary motion were provided, the cut-off of steam in the cylinder would occur in a hesitating manner, due to the slow travel of the eccentric through its arc of motion. It is this difficulty that the steam acceleration overcomes, as a brief description will make evident. Attached to the heaviest portion of the valve stem bracket is a frame having two small cylinders, one intended for air and the other for steam. The piston rod common to both connects at a central point by a sliding block to a lever, extending upwards and keyed to the valve stem. The auxiliary steam cylinder is supplied by steam direct from the boiler. This auxiliary cylinder has no piston but the piston rod common to both cylinders passes into the steam end by means of the ordinary stuffing box, and thus presents only the end sectional area to the pressure therein. No new steam is required nor exhaust necessary, hence no losses from this source are possible. The constant pressure in the auxiliary steam cylinder compels contact of the toe-piece and multiple faced block, which continues until released at a position determined automatically by the centrifugal inertia governor. The steam pressure then instantly impels the steam valve to positive cut-off, instead of allowing the more leisurely action of the eccentric alone. This steam accelerated motion of the cut-off device is arrested by the compression of air in the cylinder provided for that purpose, forming a cushion which prevents all jar, vibration or damage.

The exhaust valves of the engine are controlled by a motion beginning at the outer eccentric, which, as already stated, is fixed to the crank shaft and has therefore a constant motion. Through the medium of a rocker arm and two connecting rods, this motion is directed to the long arm of a bell crank attached to the valve stem bracket a little to one side of its center. To the short arm of this bell crank is attached a link, which transmits the motion to a lever keyed to the valve stem; the valve being thus oscillated by the compounding of the angularity of the several levers gains a greatly to be desired quickness of motion at the points of release and closure. The forward exhaust valve is connected to the other by a common link so that they work in harmony with one another.

The governor is of the centrifugal inertia type and is centrally balanced, which balance is maintained in all positions of cut-off, the governor operating with equal ease and isochronism from zero to 75 per cent cut-off. The rotative speed of the governor is about three times greater than that of the engine, insuring unusual sensitiveness. The variation in speed by the use of this style of governor, no matter how sudden or great the change of load may be, can be easily kept within the very close bounds of 1 per cent, and under exceptional circumstances, where the service demands it, the range can be reduced as low as ½ per cent.

The form of valve used is similar to Corliss practice, being a multi-ported rotary valve, by the adoption of which the clearance spaces are very much reduced, over those usually found in high speed practice, thus resulting in improved economy.

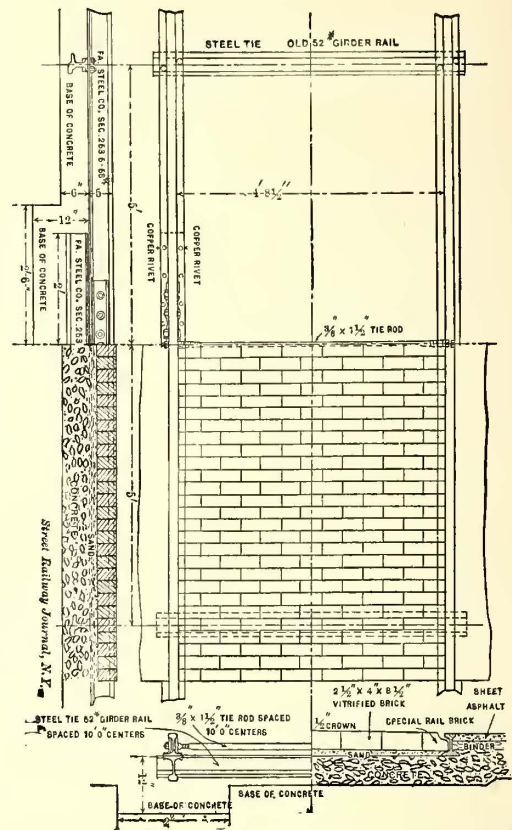
In summary, Mr. MacKenzie claimed for the type of engine described, the following combination of virtues: Compactness, simplicity, ease of access, quiet running, great range of speed, smaller diameter fly-wheels possible, when direct-connected lower first cost of generators as rotative speed can be comparatively high, low friction losses, almost perfect regulation, and economy equal to the best known practice.

MR. SILLIMAN'S PAPER

In the design of a construction of track that has been used in Scranton on the lines of the Scranton Railway Company, to a considerable extent during 1899, the two main points sought were a rigid joint without the use of unduly heavy rail between the joints and the employment only of such materials as are practically imperishable.

The rail used has been a 5-in. high T-rail, having a base of width equal to the height of the rail, and weighing 57 lbs. per yard, with a stem ¾ in. thick, and having parallel sides. The joint consists of the ordinary six-bolt joint that has been heretofore furnished with such rail, except that it has been rolled to a little heavier weight. Entirely in addition to this joint, is what is claimed to be a novel feature of it, and that is, a 4 ft. long piece of the same section of rail, inverted and placed under the joint, and secured to it by eighteen ¾ in. rivets, which are driven by a pneumatic bridge riveter in the field. Four of these rivets are of copper, and constitute bonds of the joint. As long as the rivets hold tight, this makes a rail at the joint, that is 10 ins. in depth, securing a girder as deep as the heaviest sections of rail that are rolled. In between the joints, it is, of course, not necessary that the rails should be as heavy, and the great waste in the ordinary 9-in. or 10-in. rail track construction, is owing to the fact that there is so much of this great weight of rail used in between the joints, in order that the joints themselves may be of the necessary stiffness

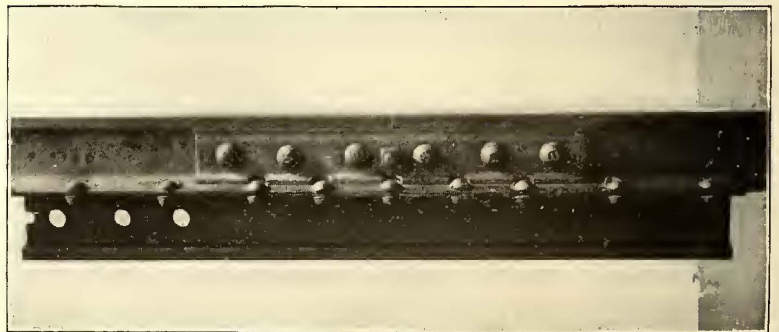
and rigidity. The rails being in 60-ft. lengths, make the economy of this construction still greater, due to this feature. Through the middle of each joint is a tie-rod, and every 10 ft. of track contains a tie-rod. Ten feet apart and intermediate between the tie-rods are ties, which are made, in the case of the Scranton company, of a 52-lb. girder section that has been taken up from old track. Almost any rail section may be used for these that has a sufficient width of base to allow the bolt holes to be drilled in it. The ties are bolted to the rails, and not riveted. The tie-rods are the same as



SECTION AND PLAN OF TRACK CONSTRUCTION, SCRANTON

those that have been in use for many years, being flat bars, so as to interfere as little as possible with the pavement.

This metal part of the construction having been assembled, as heretofore described, and surfaced and lined on blocks on a bed prepared by grading and by rolling with a 10-ton roller, is filled under with a sub-structure of concrete, having a uniform thickness of 6 ins., except at the joints and at the ties, where the thickness of the concrete is increased to 1 ft. The work of concreting



SIDE VIEW OF RIVETED JOINT EMPLOYED IN SCRANTON

having been completed, the whole is allowed to stand for a week if possible, and for at least five days, before any traffic is allowed on the rails. The top of the concrete is the bottom of the rail, of course, and this leaves a height of 5 ins. from the top of the concrete to the level of the surface of the street.

The pavement between the rails is made of brick, which are 4 ins. in width, and this leaves 1 in. for sand on top of the concrete. The brick next to the rail are of special form, made so that the surface of the pavement is the same as the surface of the head of the rail, with the exception of a groove for the flange along the

inside of the rail. On the outside of the rail, plain brick are used, which come up against the head of the rail, and the space between the head and the base, out to a line flush with the head of the rail, is filled with cement mortar. The whole brick pavement is grouted with cement grout, and rolled to a level surface and uniform crown by a 5-ton roller, running on the rails of the track.

The work of construction is very much facilitated by the machinery used and the uniformity of the work is, no doubt, very much greater than in the case of hand work. The concrete mixer

treasurer, W. H. Lanius, York Street Railway Company, York; secretary, S. P. Light, Lebanon Valley Traction Company, Lebanon. Executive committee—W. B. Given, Frank Silliman, Jr., S. P. Light, W. H. Lanius, John Rigg.



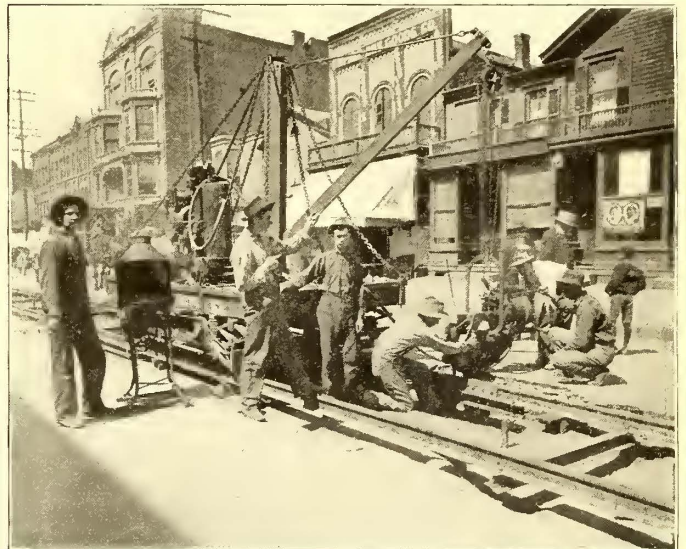
VIEW OF BALLAST CAR



VIEW OF COMPLETED STREET



DUMPING BALLAST FROM CAR



RIVETING RAIL JOINTS BY PNEUMATIC POWER

is mounted on a low car, and driven by a No. 3 Westinghouse street car motor, while the pneumatic riveter is mounted on a car having on it a derrick for handling the riveter, and a motor-driven air compressor for furnishing the air.

This construction has given a great deal of satisfaction to the authorities of the city, and seems to be very popular with those who have to drive on streets where tracks are located. More can be said of the durability of this construction in the course of a few years time, but it being entirely free from such perishable material as wood, should last a long time. The lightness of the rail is compensated by the fact that it is supported under every inch of it. Additional width to the base of the rail would still further improve the construction.

OFFICERS

Officers for the ensuing year were then elected as follows: President, W. B. Given, Pennsylvania Traction Company, Lancaster; first vice-president, E. C. Felton, Harrisburg Traction Company, Harrisburg; second vice-president, E. H. Davis, Williamsport Passenger Street Railway Company, Williamsport;

The place selected for the next meeting was Pittsburgh, Pa., and the time the third Wednesday in September, 1900.

The Exhibit of Street Railway Apparatus at the National Export Exposition

The National Export Exposition, which opened in Philadelphia, Sept 14, and closes Nov. 30, is being utilized by many manufacturers of mechanical appliances for the exploitation of their products in foreign lands. Leaders, as we have been, in the field of mechanical traction, devices and materials for use in this field are on the foremost wave of the rush of export business that seems to have set in since the Spanish-American war. Many companies do not exhibit, for the reason that the home demand is at present so great and the price of raw materials so high that efforts to obtain export orders are discouraged, but others, realizing that this is a temporary condition, are making extensive exhibits, some of which are described below.

In the line of electrical apparatus the most general exhibit is that of the General Electric Company, of which company the foreign department has fitted out an extensive booth in the Exposition. The apparatus shown is largely for central-station service or general supplies, there being no street railway material proper in the exhibit.

The Standard Underground Cable Company, of Pittsburgh, has a number of show-cases, one of which contains samples of its products especially manufactured for street railway work. Among these are its cables, cable terminals, Conner junction boxes, etc.

boxes, cut-outs, etc., for controllers and motors, to be used in place of porcelain and vulcabeston, and claims for it not only the highest insulating properties and great durability, combined with low cost, but also that copper will not deposit upon the surfaces, and that it cannot be injured by fire, frost or sudden changes of voltage or temperature. The company is having considerable success in introducing this material upon various street railway systems. In addition to showing reconstructed granite in these various forms, the company exhibited a line of glass-lined electrical conduits and chemical ware, which attracted much attention.

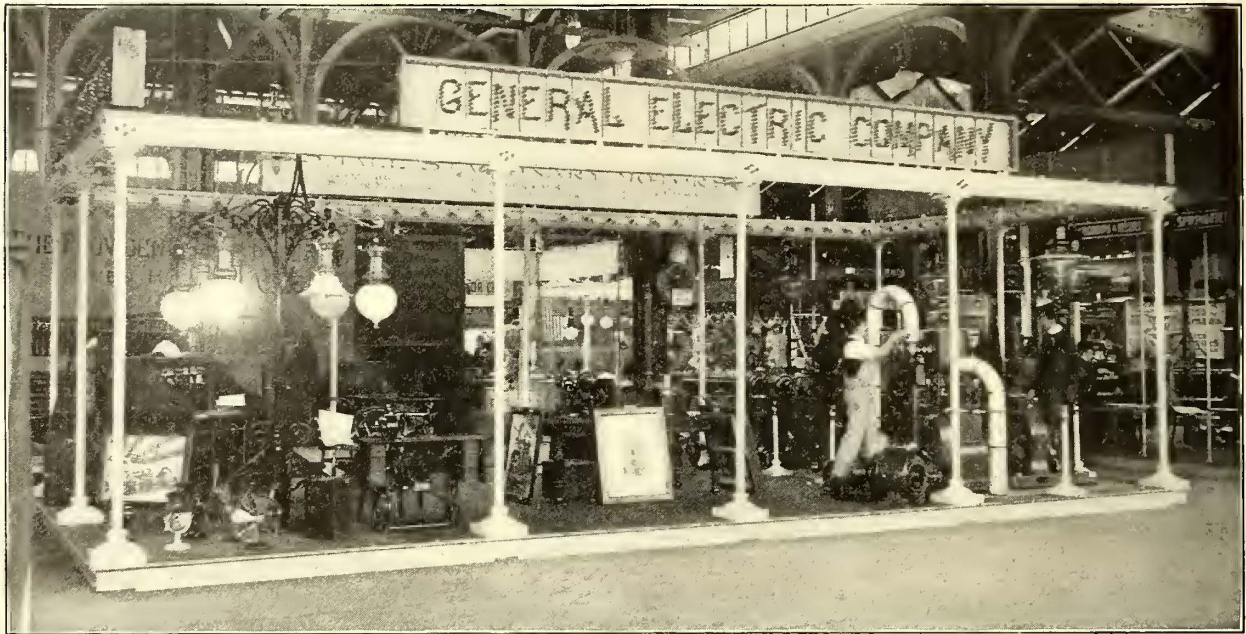


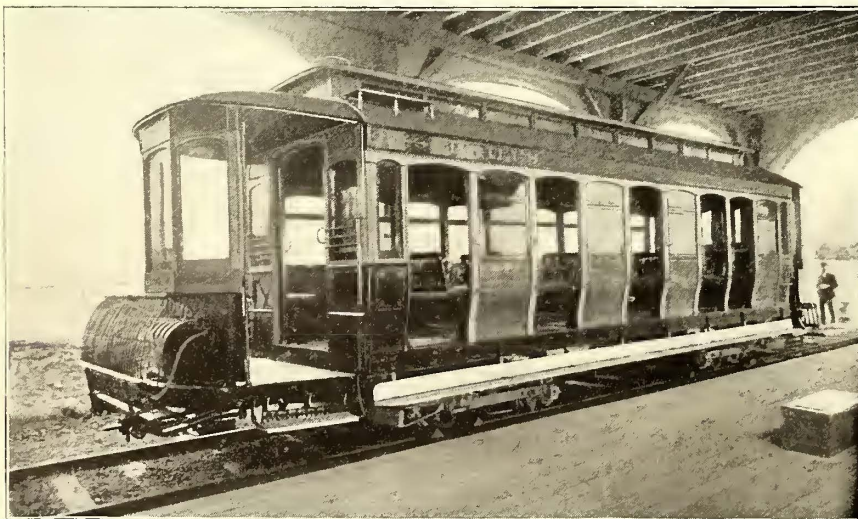
EXHIBIT OF GENERAL ELECTRIC CO. AT PHILADELPHIA

Another exhibit of wires and cables is that of the John A. Roebeling's Sons' Company, whose booth at the Export Exposition is fitted out with the same apparatus and in the same general style as was its exhibit at the New York Electrical Show, this apparatus having become a sort of permanent exhibit, which is sent from exhibition to exhibition. One new feature of the collection is the samples of work done at the company's new rubber mills, which were recently started in Trenton, these mills already consuming 1000 lbs. of Para rubber per day. As usual, the company's rail bonds are well represented.

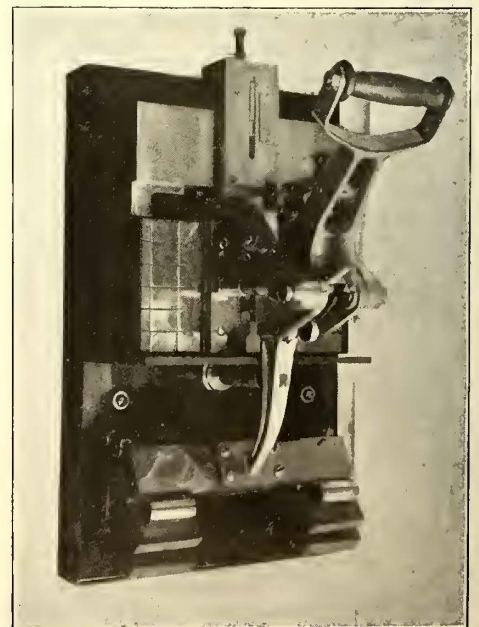
The Reconstructed Granite Company, of New York, has an

A panel of the company's exhibit of reconstructed granite is illustrated in this connection.

The Cutter Company, of Philadelphia, has a large display board, on which is mounted one circuit breaker of each different type manufactured by the company, including even some freak combinations. The most interesting breaker of the collection is a mammoth one of the new laminated-wedge type, specially designed



THE NEW BRILL CONVERTIBLE CAR



CUTTER 4000 AMPERE BREAKER

attractive exhibit of all its various lines of manufacture. In the *STREET RAILWAY JOURNAL* for May, some particulars were given of this remarkable material, especially with reference to its use for third-rail insulators. Since then the company has largely extended its manufactures, so as to cover a great variety of uses for electric railways, such as rheostat blocks, arc deflectors, fuse

for street railway service. This particular one is the largest yet made by the company, and is rated at 4000 amps., its range of operation being from 2000 amps. to 5000 amps. This breaker has a main contact with finely laminated leaves wedged between oblique contact blocks by a toggle joint operated by the handle. The force required to close this breaker is much less than that

necessary for the older types of knife and jaw breakers of much smaller capacities. Incidentally, too, the weight of the breaker is greatly reduced by the more compact arrangement and the greater number of points of contact over a given area of contact surface. The carrying capacity of the breaker is so much improved by the new principle involved that it runs cooler than do the older types, in spite of the reduced area for radiation of heat. The main contact of this breaker is shunted by a secondary copper contact, designed to form a better short circuit around the main contact than would ordinary carbon contacts, and this secondary copper contact is in turn protected by a tertiary carbon contact of ample size for the enormous current the breaker is desired to carry.

In the line of materials and supplies, the Ajax Metal Company, of Philadelphia, has a booth made entirely of bars of babbitt metal and containing samples of the trolley wheels and harps, journal brasses, steel car fittings, etc., turned out by this company. A similar exhibit is that of Merchant & Company, of Philadelphia, containing, as it does, samples of the firm's extensive line of solder, babbitt and other alloys. In addition, the booth is covered with a roof fitted with the firm's Star ventilator, over which there is arranged an artificial rainfall. The interior of the ventilator is illuminated with incandescent lamps, designed to show that no water comes through. Another exhibit of materials valuable in street railway work, although not mechanical in character, is that of the Joseph Dixon Crucible Company, which, as usual, makes an extensive showing of its graphite products. As this material does not adapt itself to very extensive exhibit decoration, the space occupied is elaborately fitted out with handsome furniture, palms, etc. Prominent in the exhibit is one lump of Ceylon graphite exactly as mined, weighing 270 lbs. This is said to be the largest single piece of graphite in this country.

Of track materials and accessories there are many interesting lines shown. The Continuous Rail Joint Company, of Newark, has on exhibition its product consisting of an extended angle or tie-plate carried down below the foot flange of the rail, forming a

of street railway switches, frogs and crossings with manganese steel points. Much of the work shown in this company's exhibit is cast-welded, the various parts of a diagonal cross-over being shown cast-welded together. The firm also shows sections of the various types of rails which it handles, as well as models of derauling and unbroken main-line switches for street railway work.

The Philadelphia Railway Track Equipment Company makes its exhibit, which has become a familiar one to visitors to railway conventions. The exhibit shows the special points of the com-

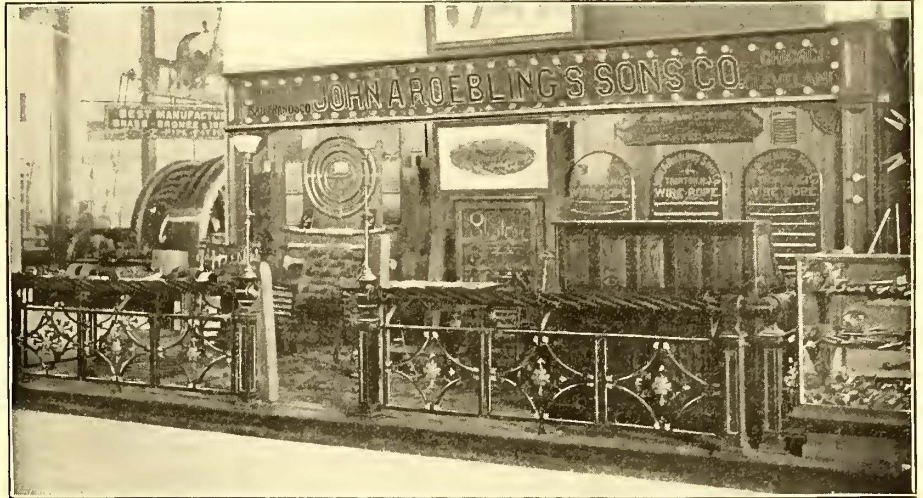


EXHIBIT OF THE ROEBLING CO.

pany's system, the series of under and over-lapping half sections, the rail-head being rolled separate from the foot flange, with staggered joints and tie-bars, which lock the whole together.

Of cars and trucks, the most extensive exhibit is that of the J. G. Brill Company, in the Transportation Building. The most conspicuous feature of this exhibit is Brill's convertible car. In the form shown at the Exposition, this car differs somewhat from its predecessors in having movable panels at its sides covered with an oxidized copper sheet, the panels being finished inside with wood veneer. The rest of the exhibit consists of Brill's sprinkler and trucks of four different styles, the Perfect, the Universal, the Eureka Maximum Traction Pivotal and No. 21-E. The convertible car is fitted with a Providence fender. The Consolidated

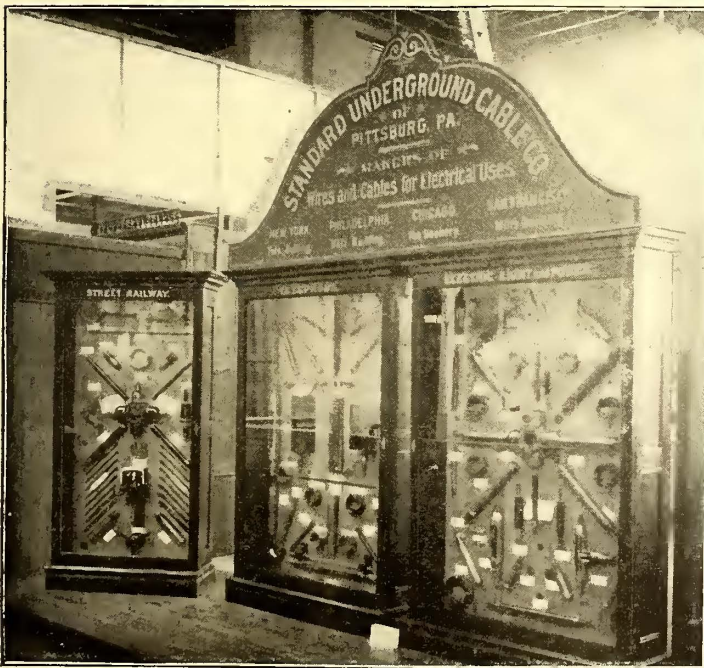


EXHIBIT OF THE STANDARD UNDERGROUND CABLE CO.

base-plate and girder. The samples shown at the Exposition were made by the Illinois Steel Company, and rolled nine times, giving them a high tenacity, which is forcibly illustrated by pieces twisted and bent when cold to fantastic distortions. The Diamond State Steel Company also makes an exhibit of its rails, tie-plates, angles, foot-plates and other special street railway steel work. Another exhibit in that line is made by the firm of Wm. Wharton, Jr., & Company, of Philadelphia, who show their specialties in the line



EXHIBIT OF THE RECONSTRUCTED GRANITE CO.

Car Fender Company has also an exhibit in the main building, consisting of its handsomely-finished full-sized brass model of fender of the 1900 style. Another duplex car is also shown in the Transportation Building, made by the Duplex Car Company, a description of which is hardly necessary in these pages.

Of car wheels, there are two interesting exhibits, one that of the New York Car Wheel Works, of Buffalo, and the other the Whitney Car Wheel Works, of Philadelphia.

STREET RAILWAY MEN AT THE CONVENTION

Representatives of Member Companies

Alton, Ill.—George D. Rosenthal, electrical engineer, Alton Railway, Gas & Electric Company.

Anderson, Ind.—Charles L. Henry, general manager; Charles Berry, superintendent; Albert S. Richey, electrical engineer; W. C. Simpson, director, and Frank H. Schlater, chief bookkeeper, Union Traction Company.

Atlanta, Ga.—E. Woodruff, president; J. R. Gordon, engineer, Atlanta Consolidated Street Railway Company. E. Woodruff, president, and J. P. Smedden, engineer, Atlanta Railway Company.

Augusta, Ga.—C. O. Simpson, secretary, Augusta Railway & Electric Company.

Aurora, Ill.—D. A. Belden, general manager, and C. C. Quackenbush, superintendent, Aurora Street Railway Company.

Atchison, Kan.—J. A. Bendure, general manager, Atchison Railway, Light & Power Company.

Bay City, Mich.—E. S. Dimmock, general manager, and W. R. Morrison, assistant general manager, Bay Cities Consolidated Railway Company.

Binghamton, N. Y.—G. Tracy Rogers, president, Binghamton Street Railroad Company.

Birmingham, Ala.—J. B. McClary, general manager, Birmingham Railway & Electric Company.

Boston, Mass.—Charles S. Sergeant, second vice-president; H. L. Wilson, auditor; J. H. Studley, Jr., and John Balch, assistant engineer, Boston Elevated Railway Company.

Bridgeport, Conn.—Andrew Radel, president, and James Butler, superintendent, Bridgeport Traction Company.

Buffalo, N. Y.—R. E. Danforth, superintendent, Buffalo Railway Company. George Chambers, superintendent, Buffalo Traction Company.

Brooklyn, N. Y.—J. H. Vander Veer, superintendent of shops; J. S. Breckenridge, chief engineer; F. H. Shepard, elevated equipment, and Giles S. Allison, sales agent, Brooklyn Rapid Transit Company.

Camden, N. J.—William S. Scull, president, and W. E. Harrington, general manager, Camden & Suburban Railway Company.

Charleston, S. C.—Nicholas S. Hill, Jr., general manager; P. J. Balaguer, auditor, and G. B. Allen, director, Charleston Consolidated Railway, Gas & Electric Company.

Chester, Pa.—Henry C. Moore, vice-president, and R. H. Beach, director, Chester Traction Company.

Colorado Springs, Col.—A. L. Lawton, general manager; F. C. Lawton, superintendent, Colorado Springs Rapid Transit Railway Company.

Chicago, Ill.—E. R. Gilbert, general manager; A. E. Davies, superintendent, Chicago Electric Traction Company. John McNulta, receiver; John Farson, president; H. M. Sloan, general manager; Edward H. Harrison, auditor; George H. Binkley, engineer; W. A. Harding, master mechanic and electrician, Calumet Electric Street Railway Company. Charles T. Yerkes, president; John M. Roach, general manager; F. E. Smith, auditor; John Millar, master mechanic, Chicago Consolidated Traction Company. D. G. Hamilton, president; Robert McCulloch, general manager; T. C. Pennington, treasurer; F. R. Greene, secretary; G. O. Nagle, superintendent; George W. Knox, electrical engineer; A. C. Heidelberg, assistant superintendent; C. N. Duffy, auditor, Chicago City Railway Company. William Walmsley, superintendent; Benjamin Dawson, electrician, South Chicago City Railway Company. George A. Yuille, second vice-president; J. C. Moore, secretary; M. B. Orde, assistant treasurer; James R. Chapman, electrical engineer, Chicago Union Traction Company.

Cleveland, Ohio—Charles W. Wason, president, Cleveland, Painesville & Eastern Railroad Company. John Ehrhardt, assistant secretary; Albert E. Duty, assistant secretary, and C. B. Easty, master mechanic, Cleveland City Railway Company. R. M. Douglass, general superintendent; F. S. Barton, assistant secretary and treasurer; W. G. McDole, auditor; Charles W. Wason, purchasing agent; B. Maher, assistant secretary, and L. M. Wolf, assistant purchasing agent, Cleveland Electric Railway Company.

Cincinnati, Ohio—G. B. Kerper, general manager; Henry Burkhold, private secretary, Cincinnati Street Railway Company.

Columbus, Ohio—P. V. Burington, auditor; J. W. McCord, Columbus Street Railway Company.

Council Bluffs, Ia.—W. S. Dimmock, general superintendent, Omaha & Council Bluffs Railway & Bridge Company.

Davenport, Ia.—F. C. Denkmann, vice-president; James F. Lardner, secretary; John F. Huntoon, general superintendent, and John D. Fish, electrician, Tri City Railway Company.

Dayton, Ohio—George B. Kerper, general manager, and Nelson Rutzahn, superintendent, People's Railway Company.

Des Moines, Ia.—George B. Hippee, general manager, and J. S. Goodrell, chief engineer, Des Moines City Railway Company.

Duluth, Minn.—Herbert Warren, general manager, Duluth Street Railway Company.

Detroit, Mich.—S. Hendrie, manager; F. A. Baker, director, Detroit & Pontiac Street Railway Company.

Denver, Col.—C. K. Durbin, general superintendent, Denver City Tramway Company.

Evansville, Ind.—H. D. Moran, vice-president and general manager, Evansville Street Railway Company.

Elgin, Ill.—William Grote, president; James B. Lane, vice-president; Charles Wuestenfield, Elgin City, Carpenterville & Aurora Railway Company.

Findlay, Ohio—George B. Kerper, president; W. G. Nusbaum, engineer, and William Twining, electrician, Findlay Street Railway Company.

Gloucester, Mass.—E. C. Foster, president, Gloucester Street Railway Company.

Grand Rapids, Mich.—G. S. Johnson, president; Benjamin S. Hanchett, Jr., assistant secretary and treasurer, Consolidated Street Railway Company.

Galveston, Tex.—F. W. Fratt, superintendent and engineer, Galveston City Railroad Company.

Hartford, Conn.—E. S. Goodrich, president; Elmer M. White, cashier, Hartford Street Railway Company.

Harrisburg, Pa.—F. B. Musser, superintendent; Mason D. Pratt, engineer, Harrisburg Traction Company.

Hazleton, Pa.—E. S. Doud, secretary and treasurer; C. A. B. Houck, electrician, Lehigh Traction Company.

Houston, Tex.—H. F. McGregor, vice-president and general manager; R. M. Johnston, stockholder, Houston Electric Street Railway Company.

Hamilton, Ont.—C. K. Green, director; J. B. Griffith, manager, Hamilton Street Railway Company.

Hamilton, Ohio—Will Christy, president; F. J. J. Sloat, general manager; C. E. Hooven, secretary; J. C. Hooven, director, Cincinnati & Hamilton Electric Street Railway Company.

Indianapolis, Ind.—Charles Remelius, superintendent motive power; John Grant, assistant general manager; H. B. Bales, auditor, Indianapolis Street Railway Company.

Jersey City, N. J.—E. D. Hibbs, auditor, North Jersey Street Railway Company.

Johnstown, Pa.—H. C. Evans, director, Johnstown Passenger Railway Company.

Joliet, Ill.—F. E. Fisher, superintendent; W. H. Huen, auditor; W. J. Kelsch, electrician, Joliet Street Railroad Company.

Kansas City, Mo.—Walton H. Holmes, president; J. A. Harder, auditor; William A. Sallerton, superintendent; Edward Butts, chief engineer; T. Blake, engineer; W. H. Miller, George Wing, Metropolitan Street Railway Company.

Lynn, Mass.—E. C. Foster, vice-president and general manager, Lynn & Boston Railroad Company.

London, Ont.—C. E. A. Carr, general manager and secretary; J. F. Hill, auditor, London Street Railway Company.

Lexington, Ky.—E. C. Hathaway, general manager; E. A. Longuere, engineer, Lexington Railway Company.

Louisville, Ky.—T. J. Minary, president; S. G. Boyle, secretary; J. T. Funk, C. L. Christopher, superintendents track construction, Louisville Railway Company.

Merrimac, Mass.—James T. Wattles, Haverhill & Amesbury Street Railway Company.

Meriden, Conn.—N. H. Heft, president; William Tooker, engineer, Meriden Electric Railroad Company.

Memphis, Tenn.—F. G. Jones, vice-president and general manager; C. H. Ruddock, director; W. B. Mallory, director, Memphis Street Railway Company.

Milwaukee, Wis.—John I. Beggs, general manager; H. C. Mackay, auditor; F. Sargent, consulting engineer; T. E. Mitten, general superintendent railway department; Chester P. Wilson, engineer; George Kemmerlein, superintendent of transportation;

W. H. Greenslade, assistant superintendent of transportation; S. G. Mitten, superintendent of overhead construction; E. Wolds, superintendent of maintenance of rolling stock; C. H. Lemon, surgeon; T. Simmons, roadmaster; T. G. Hoffman, clerk, Milwaukee Electric Railway & Light Company.

Minneapolis, Minn.—J. F. Calderwood, auditor; P. S. Mackay, assistant auditor; F. D. Valentine, chief clerk; A. M. Baldwin, purchasing agent, Twin City Rapid Transit Railway Company.

Mexico, Mex.—Arthur S. Partridge, engineer, Compania de Ferro-Carriles del Distrito Federal de Mexico.

Montreal, Can.—Duncan McDonald, superintendent; H. A. Brown, electrician; W. A. Ross, comptroller, Montreal Street Railway Company.

New Bedford, Mass.—E. E. Potter, general superintendent; Elton S. Wilde, treasurer, Union Street Railway Company.

New York, N. Y.—H. H. Vreeland, president; A. C. Tully, purchasing agent; J. F. Kane, chief of construction, Metropolitan Street Railway Company.

New Brunswick, N. J.—E. H. Radel, secretary and treasurer; John Blair MacAfee, Brunswick Traction Company.

Nashville, Tenn.—E. G. Conette, general manager; N. P. Yeatman, secretary and treasurer, Nashville Street Railway Company.

New Orleans, La.—J. K. Newman, president; George H. Davis, manager; A. O. Kittredge, consulting accountant, New Orleans & Carrollton Railroad Company. A. H. Ford, secretary and treasurer; C. D. Wyman, general manager; T. H. Tutwiler, engineer, New Orleans City Railroad Company.

Omaha, Neb.—W. A. Smith, general manager; D. H. Goodrich, secretary, Omaha Street Railway Company.

Oakland, Cal.—E. A. Heron, president, Oakland Transit Company.

Portland, Me.—William R. Wood, president; William A. Wheeler, director; A. Whitney, director, Portland Railroad Company. Merle R. Griffith, electrician; F. C. Boyd, director, Portland & Yarmouth Electric Railway Company.

Port Chester, N. Y.—N. H. Heft, engineer; Marion Swing, assistant engineer, Port Chester Street Railway Company.

Philadelphia, Pa.—Henry C. Moore, vice-president; J. J. Mahoney, electrical engineer, Roxborough, Chestnut Hill & Norristown Railway Company.

Pittsburgh, Pa.—S. E. Moore, auditor; C. S. Mitchell, assistant auditor, United Traction Company.

Port Huron, Mich.—A. Dixon, president; H. A. Dixon, superintendent, City Electric Railway Company.

Peoria, Ill.—L. E. Myers, secretary and general manager, Peoria & Pekin Terminal Railway Company.

Quincy, Mass.—John R. Graham, president and general manager, Quincy & Boston Railway Company.

Quincy, Ill.—H. E. Chubbuck, electrical engineer; L. A. Scovil, superintendent, Quincy Horse Railway & Carrying Company.

Pasadena, Cal.—W. H. Smith, Los Angeles & Pasadena Electric Railway Company.

Pueblo, Col.—John F. Vail, general manager, Pueblo Traction & Electric Company.

Rockland, Me.—George E. Macomber, president; Thomas Hawken, superintendent; William N. Todd, Rockland, Thomaston & Camden Street Railway Company.

Rochester, N. Y.—J. H. Stedman, manager of transfers, Rochester Railway Company.

Reading, Pa.—Samuel E. Rigg, superintendent; Henry C. Moore, director, United Traction Company.

Richmond, Va.—Berkeley Williams, purchasing agent, Richmond Traction Company.

Syracuse, N. Y.—Ira A. MacCormack, vice-president and managing director, Syracuse Rapid Transit Railway Company.

Scranton, Pa.—C. E. Flynn, general manager, Carbondale Traction Company.

Springfield, Ill.—C. K. Minary, manager; T. H. Minary, electrician, Springfield Consolidated Railway Company.

Springfield, Ohio—Fred. Colburn, president; S. L. Nelson, general manager; L. O. Williams, superintendent, Springfield Railway Company.

St. Louis, Mo.—F. S. Drake, master mechanic, Cass Avenue & Fair Grounds Railway Company; J. J. Coleman, general manager, Citizens, Missouri, Southern, St. Louis and Union Depot Railroad Companies. J. J. Coleman, general manager; Samuel Barnes, electrical engineer, Lindell Railway Company. T. M. Jenkins, general manager; G. J. Smith, master mechanic, St. Louis & Suburban Railway Company.

Saginaw, Mich.—L. M. Richardson, superintendent, Saginaw Valley Traction Company.

St. Joseph, Mich.—W. Worth Bean, president; H. C. Mason, superintendent; W. Worth Bean, Jr., assistant superintendent, St. Joseph & Benton Harbor Electric Railway & Light Company.

Salt Lake City, Utah—W. P. Read, general superintendent; O.

P. Arnold, assistant superintendent, Salt Lake City Railroad Company.

Sioux City, Ia.—Fred. H. Fitch, general manager; C. M. Feist, master mechanic; Louis W. Price, cashier, Sioux City Traction Company.

Schenectady, N. Y.—S. D. Greene, vice-president; W. Gibson Carey, Schenectady Street Railway Company.

St. Joseph, Mo.—J. B. Shirley, auditor; J. H. Van Brunt, superintendent, St. Joseph Railway, Light, Heat & Power Company.

Taunton, Mass.—John McClannel, assistant superintendent of transportation, Taunton Street Railway Company.

Trenton, N. J.—Henry C. Moore, president; Charles Y. Flanders, director, Trenton Street Railway Company.

Toledo, Ohio—Albion E. Lang, president; Thomas H. McLean, vice-president and general manager; Charles L. Wright, auditor; E. J. Bechtel, superintendent construction; G. Munz, superintendent shops, Toledo Traction Company. W. B. Brockway, secretary and auditor; C. A. Denman, general manager, Toledo, Bowling Green & Fremont Railway Company.

Topeka, Kan.—Albert M. Patten, superintendent, Topeka Railway Company.

Toronto, Can.—E. H. Keating, manager; Ewan Mackenzie, assistant superintendent; P. McCullough, electrician, Toronto Railway Company.

Venice, Ill.—Fred. E. Allen, president; E. J. Spencer, secretary, Venice, Madison & Granite City Railway Company.

Wilkesbarre, Pa.—Thomas A. Wright, general superintendent; James Fagan, electrical engineer, Wilkesbarre & Wyoming Valley Traction Company.

Wilmington, Del.—Henry C. Moore, vice-president; W. E. Boughton, director, Wilmington City Railway Company.

Wheeling, W. Va.—W. A. Shirley, secretary and treasurer, Wheeling Railway Company.

Webb City, Mo.—E. J. Pratt, superintendent motive power; C. E. Baker, superintendent transportation, South-West Missouri Electric Railway Company.

York, Pa.—W. H. Lanus, president, York Street Railway Company.

Youngstown, Ohio—A. A. Anderson, general manager and treasurer; Harry Dixon, assistant treasurer; James F. Uhl, Mahoning Valley Railway Company.

Others in Attendance

Neff, Stewart L., superintendent, Union Loop, Chicago.

Waterman, John H., director, Little Rock Traction & Electric Company, Little Rock, Ark.

McDonald, F., Waterloo & Cedar Rapids Traction Company, Waterloo, Ia.

Crankshaw, J. B., electrical engineer and manager, Cincinnati, Lawrenceburg & Aurora Street Railway Company, Cincinnati, Ohio.

Johnson, J. M., electrician and master mechanic, LaCrosse City Railway, LaCrosse, Wis.

Valier, Porter, superintendent, LaCrosse City Railway Company.

Cameron, J. L., president, Salt Lake City Rapid Transit Company.

Flint, J. A., secretary, treasurer and manager, San Diego Electric Railway Company, San Diego, Cal.

Asire, M. E., secretary and treasurer M. C. & P. I. Railway Company, Marquette, Mich.

DeCoursey, H., train master, Leavenworth Electric Railroad Company, Leavenworth, Kan.

Coomb, E. E., manager, Leavenworth Electric Railroad Company, Leavenworth, Kan.

Nary, W. T., superintendent, Hoosac Valley Street Railway Company, North Adams, Mass.

Torbert, H. G., assistant manager, Suburban Street Railway Company, Dubuque, Ia.

Blackwood, D. P., passenger agent, Washington, Arlington & Falls Church Railway Company, Washington, D. C.

Gunn, E. B., superintendent, LaFayette Street Railway Company, LaFayette, Ind.

Discrens, F. L., superintendent, Cedar Rapids & M. City Railway, Cedar Rapids, Ia.

Daniell, Edward, secretary, treasurer and superintendent, Menominee Electric Light, Railway & Power Company, Menominee, Mich.

Doyle, J. L., master mechanic, Metropolitan Elevated Railroad Company, Chicago.

Budd, B. I., purchasing agent, Metropolitan West Side Elevated Railway Company, Chicago.

McCoy, Frank, superintendent, Monongahela Street Railway Company, Pittsburgh, Pa.

- Ellis, T. M., general manager, Rockford Railway, Light & Power Company, Rockford, Ill.
- Williams, William H., electrician, St. Louis & East St. Louis Railway Company, St. Louis, Mo.
- Cummins, W., superintendent, Indiana Railway Company, South Bend, Ind.
- Halliday, E. W., president, Cairo Electric Railway Company, Cairo, Ill.
- Ginn, F. E., superintendent, Lancaster Traction Company, Lancaster, Ohio.
- Hertig, C. M., president, Benton Power & Traction Company, St. Cloud, Minn.
- Ralph, I. D. H., president and general manager, Owosso & Corunna Electric Company, Owosso, Mich.
- Misaki, Sicz, chief engineer and superintendent, Hauskin Electric Railway Company, Kobe, Japan.
- McFarland, J. W., superintendent, Chattanooga Electric Railway Company, Chattanooga, Tenn.
- Baylies, R. N., president, Rockford Railway, Light & Power Company, Chicago.
- Irwin, William G., president, Indianapolis, Greenwood & Franklin Railway, Indianapolis, Ind.
- Wright, J. E., secretary, Detroit & Northwestern Railway, Detroit, Mich.
- Boyd, F. C., director, Ohio Central Traction Company, Galion, Ohio.
- Anthony, William, Ohio Central Traction Company, Galion, Ohio.
- Downs, Edwin E., vice-president and general manager, Citizens' Traction Company, Oshkosh, Wis.
- Cass, L. S., president and general manager, Waterloo & Cedar Falls Rapid Transit Company, Waterloo, Ia.
- Thompson, Fred W., superintendent, Muskegon Street Railway Company, Muskegon, Mich.
- Detwiler, G. K., secretary, Toledo & Maumee Valley Railway Company, Toledo, Ohio.
- Hart, George A., president and general manager, Manistee, F. C. & E. Railway, Manistee, Mich.
- Winters, Valentine, president, Dayton & Western Traction Company, Dayton, Ohio.
- Miller, E. F., supervisor of motormen, South Side Elevated Railroad Company, Chicago.
- Clegg, Harry Pease, secretary and general manager, Oakwood Street Railway Company, Dayton, Ohio.
- Gustafson, C., superintendent, Oakland, San Leandro & Hayward Electric Railway, Consolidated, Elmhurst, Cal.
- Jewett, Edwin, chief engineer, South Chicago City Railway, Chicago.
- Sacmann, Franklin I., treasurer, Sheboygan Light, Power & Railway Company, Sheboygan, Wis.
- Green, C. K., manager, Hamilton Radial Electric Railway, Hamilton, Ont.
- Colvin, J., superintendent, Washington, Alexandria & Mt Vernon Railway Company, Washington, D. C.
- Carney, N. L., president, Electric Street Railway, Clarksville, Tenn.
- Scmenza, Guido, Milan Edison Company, Milan, Italy. (Italian representative STREET RAILWAY JOURNAL).
- Zimmerman, Frank M., superintendent, Collins Park & Belt Railway, Atlanta, Ga.
- Grover, T. F., vice-president and general manager, Fond du Lac Street Railway & Light Company, Fond du Lac, Wis.
- Wilkins, James H., chief electrician and master mechanic, St. Louis & Belleville Railroad Company, Belleville, Ill.
- Frederick, C. R., engineering department, Northwestern Elevated, Chicago, Ill.
- Seacord, Judd, superintendent, Galesburg Electric Motor & Power Company, Galesburg, Ill.
- Brown, William J., general manager, Home Electric Company, Dubuque, Ia.
- Parsel, Jr., J. S., superintendent, Fairfield Traction Company, Lancaster, Ohio.
- Kent, James, superintendent, Washington Electric Company, Washington, Pa.
- Paul, G. J. A., superintendent, Henderson Street Railway Company, Henderson, Ky.
- Clark, Edward C., assistant secretary, Cedar Rapids & Marion City Railway, Cedar Rapids, Ia.
- Holbrook, Royal H., chief engineer, Cedar Rapids & Marion City Railway, Cedar Rapids, Ia.
- Carpenter, Reid, treasurer, Citizens' Electric Railway, Mansfield, Ohio.
- Greene, E. M., superintendent, Signal Mountain Railway Company, Chattanooga, Tenn.
- Payne, H. B., electrician, Ottawa Railway, Light & Power Company, Ottawa, Ill.
- Miller, Irving W., superintendent, Olean Street Railway Company, Olean, N. Y.
- Given, Frank S., assistant general manager, Pennsylvania Traction Company, Lancaster, Pa.
- Vieley, Elmer, master mechanic, Cedar Rapids & Marion City Railway, Cedar Rapids, Ia.
- Cummins, M., superintendent, Indiana Railway Company, Elkhart, Ind.
- Perdue, Whittier, superintendent of construction, Chicago Electric Traction Company, Chicago.
- Hazelrigg, S. F., general manager, Atlantic Coast Elevated Railroad Company, Asbury Park, N. J.
- Allen, Andrew J., general foreman of motive power, South Side Elevated Railroad, Chicago.
- Burke, J. P., vice-president and manager, San Jose & Santa Clara Railroad Company, San Jose, Cal.
- Cobb, C. H., vice-president and general manager, Kankakee Electric Railway Company, Kankakee, Ill.
- Dyer, Jr., R. A., superintendent, Auburn City Railway Company, Auburn, N. Y.
- Weed, H. I., attorney, Citizens' Traction Company, Oshkosh, Wis.
- Gillingham, Jr., W. J., signal engineer, Illinois Central Railroad Company, Chicago.
- Berry, Kav., electrician, Henderson Street Railway Company, Henderson, Ky.
- Reed, William L., secretary, Omaha, Council Bluffs & Suburban Railway Company, Council Bluffs, Ia.
- Townsend, George, president, Omaha, Council Bluffs & Suburban Railway Company, Council Bluffs.
- Poor, F. A., foreman signals, Illinois Central Railroad Company, Chicago.
- Barvion, A. M., general manager, Home Electric Light & Power Company, Elkhart, Ind.
- Hart, H. D., director, St. Charles Street Railroad Company, New Orleans, La.
- Kilmer, F. D., Santa Fe Railway Company, Oak Park, Ill.
- Hourigan, John, auditor, Albany Railway Company, Albany, N. Y.
- Harry, C. L., manager, Kokomo City Street Railway Company, Kokomo, Ind.
- Evarts, Charles O., treasurer, Kansas City & Leavenworth Railway Company, Leavenworth, Kan.
- Kimberley, D. H., president, Kansas City & Leavenworth Railway Company, Leavenworth, Kan.
- Henry, F. R., secretary and treasurer, Missouri Railroad Company, St. Louis, Mo.

Press Representatives at the Convention

- Baumgartner, E. H., "Railway Age," Chicago.
- Beattie, T. S., "Municipal Railway and Record," New York.
- Bennett, J. B., STREET RAILWAY JOURNAL, New York.
- Church, J. V. S., "Electrical World and Engineer," Chicago.
- Clarke, Charles S., "Western Electrician," Chicago.
- Collins, Leslie, "Western Electrician," Chicago.
- Colvert, F. E., "Electrical Review," Chicago.
- Crossman, T. E., "Official Stenographer," New York.
- Drury, F. H., "Chicago Street Railway Men's Journal," Chicago.
- Fairchild, C. B., "Street Railway Review," Chicago.
- Fairchild, Jr., C. B., "Street Railway Review," Chicago.
- Foote, Allen R., The Other Side Publishing Company, Chicago.
- Forbrich, Charles W., "Western Electrician," Chicago.
- Forbrich, W. F., "Western Electrician," Chicago.
- Goddard, Stephen H., "Electrical Review," New York.
- Higgins, Edward E., STREET RAILWAY JOURNAL, New York.
- Kenfield, F. S., "Street Railway Review," Chicago.
- Kenfield, H. J., "Street Railway Review," Chicago.
- Martin, T. C., "Electrical World and Engineer," New York.
- McMahan, C. S., STREET RAILWAY JOURNAL, Chicago.
- Metcalfe, George R., "Street Railway Review," Chicago.
- Reynolds, John N., "Railroad Gazette," Chicago.
- Royse, Daniel, "Street Railway Review," Chicago.
- Scmenza, Guido, STREET RAILWAY JOURNAL, Milan, Italy.
- Smith, W. R. C., "American Electrician," Chicago.
- Wakeman, J. H., "Electrical World and Engineer," New York.
- Whitney, Clarence W., "Western Electrician," Chicago.
- Wilcox, A. M., "Tramway and Railway World," London.
- Wilson, Hugh M., "Railway Age," Chicago.
- Windsor, H. H., "Street Railway Review," Chicago.

EXHIBITS AT THE CONVENTION

THE BUDA FOUNDRY & MANUFACTURING COMPANY, of Chicago, showed some of the well known Paulus drills and a special rapid running small drill for putting in rail bonds. The company's foreign business, in the hands of Laing, Wharton & Down, of London, has increased to large proportions, one foreign city alone having ordered within the past few months 500 drills. The exhibit was in charge of John McKinnon.

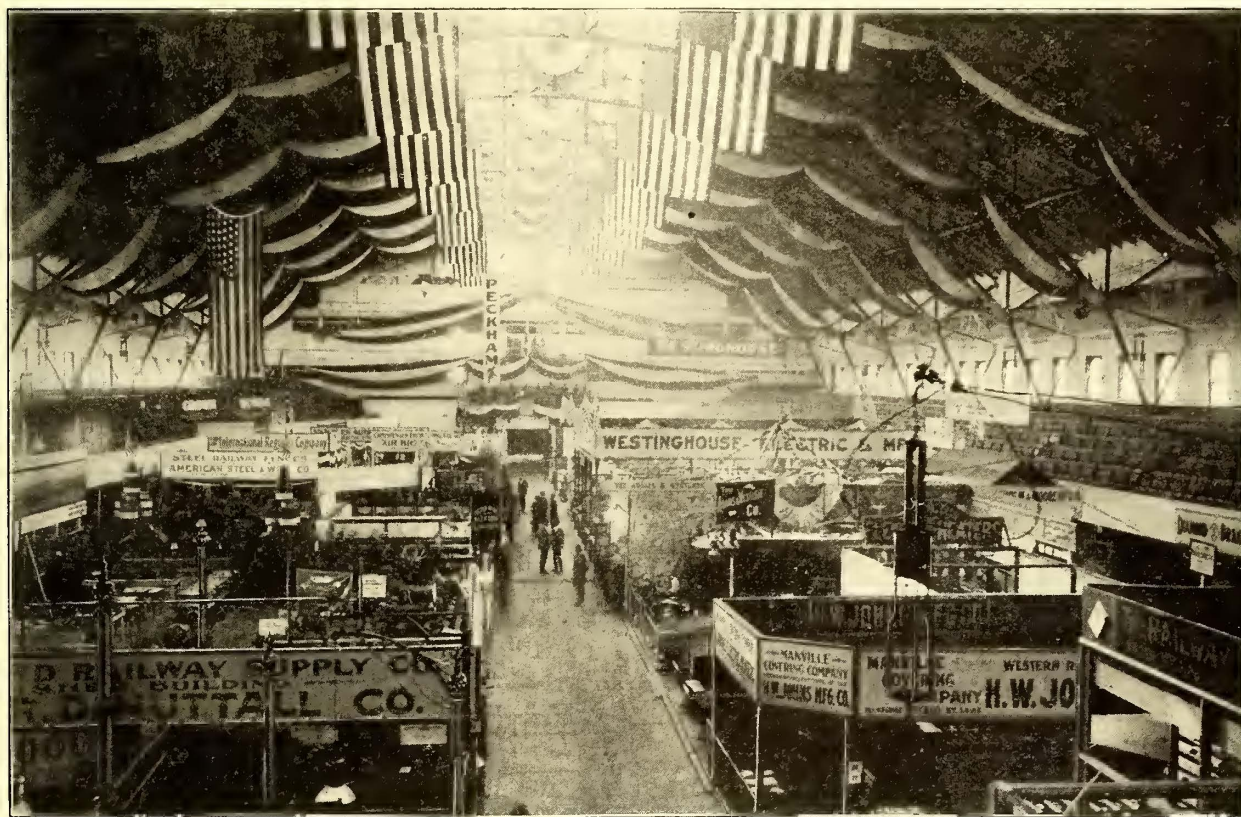
THE GREEN ENGINEERING COMPANY, of Chicago, was represented by P. Albert Poppenhusen. This company has recently secured several of the largest orders ever placed for traveling grates. The company represents the Edgemoor Iron Company, Goubert Manufacturing Company, Monarch Manufacturing Company and Broomell, Schmidt & Company.

THE CHISHOLM & MOORE MANUFACTURING COMPANY, of Cleveland, was represented by Col. W. E. Ludlow, manager of its American rail joint department, who has for the last twenty years been studying the needs of the track department of railways. The company states that with the completion of its malleable plant it is prepared to make about 10,000 joints per

plant. One of the newest things it has brought out is a rail-bracing tie-plate, which is proving popular. It also exhibited samples from its twenty-one sizes of differential hoists, in capacities from ½-ton to 20 tons and operated by compressed air, electricity, steam or hand power. Its souvenir was a track gage of Pennsylvania Railroad standard, which will be sent to anyone requesting same. The gage shows that with Fahrenheit thermometer readings of 80 degs. or over, the rail ends should butt tightly together; from 60 degs. to 80 degs., they should be 1/16 in. apart; from 40 degs. to 60 degs., 1/8 in. apart; from 20 degs. to 40 degs., 3/16 in. apart, and from zero to 20 degs., 1/4 in. apart.

A. L. IDE & SONS, of Springfield, Ill., were represented by their genial Chicago agent, Enos Bookwalter.

THE PAIGE IRON WORKS, of Chicago, exhibited blue prints and photographs of their special track work, crossings, curves, switches, stands, etc. The company's output is distributed all over the city of Chicago and can be found on the Calumet, the Chicago City, North & West Chicago, South Chicago City, and the Chicago Electric Traction Company's lines. The company's



GENERAL VIEW OF EXHIBITION HALL

month, and therefore makes the following proposition to those who will want to commence laying track early next spring. It will close contracts for what joints will be wanted in the spring, and give the benefit of prices in force at time contract is made, purchaser to pay for same within thirty days of date of shipment, and shipments to be made at such time as purchaser may designate, but not later than May 1, 1900. A section of rail, 3 ft. in length, showing drilling, must be furnished within thirty days of date of contract. The company will at once make a joint and fit to rail and return for acceptance, and will guarantee that all others shall be same as sample. The joints on exhibition were samples of those furnished to different cities as follows: Chester, Pa.; Cincinnati, three sizes; Wilmington, Del.; Louisville, Ky.; Mobile, Kansas City and Detroit. There was also shown one of the latest types of joint on an 80-lb. T-rail, which, in order to test the material, had been driven on with forty blows of a 20-lb. sledge. Among the company's latest orders are 10,000 joints for the Chicago Union Traction Company, and 7500 for the Calumet Electric Railway in Chicago. The company is open for new ideas in track material and is prepared to manufacture same in its immense new

shops are running to their fullest capacity, supplying orders not only for the roads mentioned but for others in almost every State in the Union. The exhibit was in charge of E. S. Nethercut, chief engineer. Other representatives present were J. M. Spackman, secretary; George Lowe, superintendent; T. H. Lovejoy, assistant superintendent.

C. F. ORR & COMPANY, of Chicago, exhibited some handsome uniforms for street railway conductors and motormen. C. F. Orr, owner of the business, reports that his trade with street railway companies all over the country is increasing at a rapid rate. He has recently booked orders from several Southern roads.

THE ATLAS RAILWAY SUPPLY COMPANY, of Chicago, had one of the handsomest booths at the exposition. A dainty maid served bouillon and crackers and each lady visitor was presented an American beauty rose. Each gentleman caller went away with a carnation in his coat lapel. The company exhibited the Atlas rail joint, of which 275,000 are in use; also, "Cartime Surfacier," which is not a paint in the ordinary sense of the word, as it is a combination of materials which is not affected by ammonia.

carbonic, sulphurous or other gases, salt water, smoke or acids. It will not crack, peel off nor blister, and will last three times as long as white lead or mineral paint. It expands and contracts with the heat and cold on iron or tin roofs and will not scale off or become loose. These compositions have been in use on many of the leading railroads for the past nine years.

K. M'LENNAN & COMPANY, of Chicago, sole manufacturers of Gale's commutator compound, were represented by W. J. Isaacs, the manager of the company. This company's exhibit consisted of Gale's commutator compound. One of the features of the booth was a large bulletin board, on which were attached several hundred extracts from testimonials, and at the side of the board two original testimonials were displayed. Judging from the number of samples of compound which this company gave out at its exhibit, its compound is a necessity to the users of dynamos and motors. A neat souvenir was distributed in the way of a "Mauser" cartridge knife, which was much sought.

THE MANVILLE COVERING COMPANY, of Chicago, Western representatives of the H. W. Johns Manufacturing Company, had an attractive exhibit, showing a very complete line of molded mica overhead insulation, electric car heaters, vulcabeston



HE ADQUARTERS OF THE STREET RAILWAY JOURNAL

parts for street car motors and controllers. A special feature of this exhibit was the "Noark" fuse, it does not arc, but is an ideal protective against overload or short circuit, and a safe, accurate and correct motor protection. H. A. Reeves, who is manager of the electrical department of the Manville Covering Company, has had charge of the same department of the H. W. Johns Manufacturing Company since 1891, during which time he has succeeded in handling some large contracts for the latter concern. Six representatives of the H. W. Johns Manufacturing Company were also in attendance.

THE DIXON CRUCIBLE COMPANY, of Jersey City, N. J., was represented by Sam Mayer and Dudley Johnson, the company's Chicago representatives, and A. L. Harris, E. A. St. John and William Allen. The souvenirs of this company were large Uncle Sam pencils—also a thick pencil which, when once placed in the buttonhole, could not be detached without a deal of study, also souvenirs of plumbago medals made of the same graphite as used in Dixon's world renowned pencils. The Dixon booth soon became the headquarters of many of the old-timers, who thought they knew a good thing when they saw it. Large orders were booked for Dixon's graphited wood grease for use on electric railway car gears, and which was claimed to be something new and

something better than ever before offered railway companies. Its advantages were said to be that it prevents noisy gears, keeps the gears and bearings constantly lubricated, prevents all drippings from gear cases and lasts longer and is more economical than any other lubricant.

THE LESCHEN-MACOMBER-WHYTE COMPANY, of Chicago, was represented by F. B. Macomber, George S. Whyte and E. E. Robirds. The exhibit consisted of galvanized steel strand, galvanized curtain cord, galvanized telephone wire, rubber insulated wires and cables, weather-proof feeder wires, magnet wire, "Century" tape, "Beacon" bearing metal, overhead line material, and the Standard head light. A very neat paper cutter was distributed as a souvenir. While the principal business of the Leschen-Macomber-Whyte Company is wire rope, its trade in the street railway direction is rapidly increasing and is now reaching large proportions.

THE MEAKER MANUFACTURING COMPANY, of North Chicago, was represented at the Chicago convention by J. W. and G. L. Meaker. The exhibit consisted of the Meaker registers, every detail of which is so thoroughly familiar to street railway men that any attempt at description would be superfluous. The company's handsome new catalogue which was given out, explained the register to the few who were so far behind the times as to be ignorant concerning it.

THE CHAPMAN VALVE MANUFACTURING COMPANY, of Indian Orchard, Mass., had a booth in charge of E. W. Buss, Western manager, where was displayed a line of valves for steam, water, gas, oil and ammonia, ranging in pressure from 50 lbs. to 250 lbs.

J. R. M'CARDELL & COMPANY, of Trenton, N. J., showed their tower wagon, of which over 400 are in use, although the company's first patents were issued in 1895. This wagon is in service in every country where there are electric railways, and over forty have been shipped to Europe during the present year. The wagon can be operated easily by one man, and can be changed to any position in one-quarter of the time required by collapsible wagons. It embodies certain principles of construction that render it impossible that it ever should become loose-jointed or dangerous. The wagon is built on honor with an eye solely to its utility and durability.

THE CUTTER ELECTRICAL & MANUFACTURING COMPANY, New York, in connection with McGill, Pomeroy & Company, the company's Western agents, showed its new type of circuit breaker. Old standard types were not exhibited since they are too well known to street railway men to need it. V. C. Gilpin, in charge, stated that he will be pleased to set up this new type of circuit breaker anywhere and without charge until thoroughly tested. It has been designed to meet the severest conditions incident upon the transmission of power, and combines with ease of operation and high current carrying efficiency, promptness and certainty of action. The main switch contact is made by a "laminated wedge," involving a new feature in switch construction and producing a switch which combines high carrying capacity with small size. During the opening of the main switch it is amply protected by a shunt switch, whose circuit is not only of low resistance, but non-inductive as well, thus altogether obviating the possibility of arcing at the main contacts. The final break is made on carbon.

THE MURPHY FURNACE COMPANY, Detroit, Mich., had its interests cared for by W. G. Amos, Chicago agent, who is well known to Western steam users.

EUGENE MUNSELL & COMPANY and THE MICA INSULATOR COMPANY, of New York, Chicago and London, occupied space No. 11, 200 sq. ft. The booth was very tastefully gotten up, dark rich blue material paneled in gilt, being used as the background, giving a very rich effect. The companies' space, being fitted up with easy chairs and a handsome rug, somewhat resembled a richly furnished parlor. The Mica Insulator Company's exhibit consisted of "micanite" plate, flexible plate, cloth, paper, M. I. C. compound, "empire" cloth and paper, "micanite" tubes and troughs, and various forms of insulation, of which this company makes a specialty. Eugene Munsell & Company's exhibit consisted of "mica" in the sheet, and a variety of sizes. Both the India and amber qualities were shown, also mica as it comes from the mines, and mica segments. Directly over the desk, suspended from the sign, was a large rare specimen of India mica, measuring 14 ins. x 36 ins., probably one of the largest sheets ever mined. This is such a rare specimen that there are probably less than 3 lbs. or 4 lbs. of mica of these dimensions in

the United States. The souvenir distributed was a very neat card-case, and it was highly appreciated by the delegates in attendance. The exhibit was in charge of Charles E. Coleman, Western manager, assisted by Howard M. Frantz.

WILLIAM WHARTON, JR., & COMPANY, Inc., of Philadelphia, Pa., exhibited their standard manganese steel special track work, among which was the Nichols protected heel tongue. The Wharton unbroken main line switch, although well known, was examined by many. There were shown several novelties in track work, among which was the Nichols protected heel tongue switch, which prevents entirely the throwing of the tongue between wheels and the kicking of the tongue. A steam and street railway crossing, in which the steam rail was made entirely of

THE AMERICAN MASON SAFETY TREAD COMPANY, of Boston, was represented by Herman Pfeffer, its Chicago agent, and Fletcher Randall, Cleveland agent, who showed the Mason unwearable non-slipping treads for street cars. These treads are adapted for both open and closed cars. They may also be applied to wood, iron, marble or granite stairs, to hydrant and manhole covers, coal hole covers and for similar uses. The tread is now in use on the Cleveland Electric Railway, the steps of the Boston Subway, the Brooklyn Bridge, the Chicago Elevated Railway and in many other important places.

ADAM COOK'S SONS, of New York, made an exhibit through their Western agents, Winne & Kellogg, of Chicago. The display included a variety of lubricating oils of the "Albany"



EXHIBIT OF THE IRONSIDES CO.

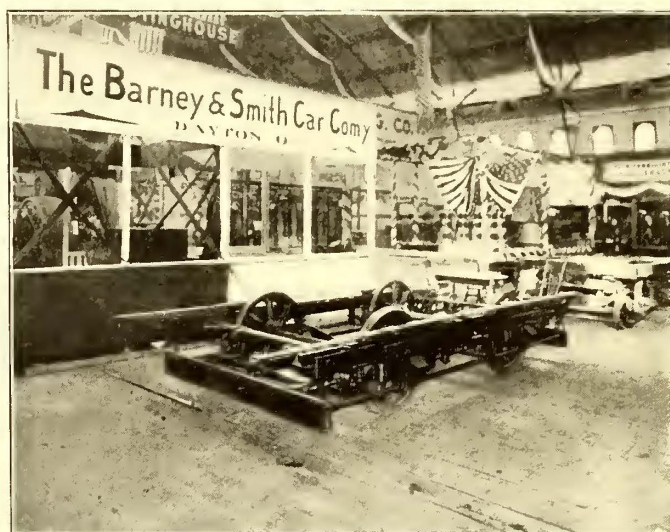


EXHIBIT OF THE BARNEY & SMITH CAR CO.



EXHIBIT OF THE INTERNATIONAL REGISTER CO.



EXHIBIT OF HEYWOOD BROS. & WAKEFIELD CO.

manganese steel, combining the running rail, guard rail, filler and third-rail, all in one piece, proved of interest to those who had had trouble with other steam railroad crossings in their tracks. A steam and street railroad crossing frog with manganese steel center for paved streets was shown and highly commended by track engineers. An example of its particular adaptation was shown by a large plan of a very intricate track layout in front of the new South Boston station in the city of Boston, in which a great mass of special work is crossed by a steam track. This layout, by the way, will be one of the, if not the most, important layout in Boston. Samples of T-rail, frogs and switches, cast entirely out of manganese steel, showed what strides had been made in handling this remarkable metal, which combines extreme hardness with great toughness. A double spring frog, long radius switch, complicated curving pieces and photographs of work made by the Wharton Company were further objects of the exhibit. The representatives present were F. P. Howe, first vice-president; Victor Angerer, second vice-president, Philadelphia; A. S. Partridge, St. Louis representative, and J. C. Robinson, of Harrington, Robinson & Company, agents in Boston.

brand, and greases, and compression and spindle grease cups of various sizes and for various purposes.

OWING to large increase of its business, the Springfield Manufacturing Company, of Bridgeport, Conn., manufacturer of car wheel and tool grinders, was unable to prepare for exhibit either a car wheel grinder or tool grinder. This company manufactures, in addition to the car wheel grinder exhibited at Buffalo and Boston, a machine using an 18 ins. x 1½ ins. emery wheel, also two different styles of single end grinders specially adapted for the smaller systems. The company was represented by its general manager, George W. Jackman.

THE FALK COMPANY, of Milwaukee, Wis., showed numerous large and very handsome photographs, some of which represented track, overhead and power-house construction of the Oshkosh & Neenah (Wis.) road, owned by the Citizens Traction Company, of Oshkosh, Wis. All of this work was built by the Falk Company under the superintendence of W. F. Carr, chief West Chicago Street Railway. Other pictures represented the engineer of the Falk Company, and recently chief engineer of the

construction of the Metropolitan Street Railway at Kansas City, Mo., illustrating particularly track construction and showing track laid in concrete beam without ties, which was described by Mr. Butts, chief engineer of the Metropolitan Street Railway Company, of Kansas City, in his paper read before the association. Other pictures showed some of the novel features of cast welding on the Third Avenue line, New York City, where the cars are run continuously, and special clamps were devised in this case so that the work could be carried on without interruption to traffic. Another of the series of large pictures was of gears and pinions manufactured by the Falk Company. This picture showed one of their large shipments to Cairo Tramways Company, Cairo, Egypt, which practically illustrated the wide extent of the business of the Falk Company. The company was represented by Gen. Otto H. Falk, Herman W. Falk, President, E. A. Wurster, Secretary and Treasurer, Clement C. Smith, Vice-President, Charles L. Jones, Assistant Secretary, Jacob Wendell and R. L. McDuffie, Eastern representatives of the company.

THE DEARBORN DRUG & CHEMICAL WORKS, with general offices and laboratories in Chicago, had a very elaborate booth decorated in red and green, with trimmings of red and green, and an abundance of flags. This company of chemists, organized some fourteen years ago, has built up a very extensive business in the treatment of boiler feed waters as per analysis, going into the subject most thoroughly and scientifically. In fact,

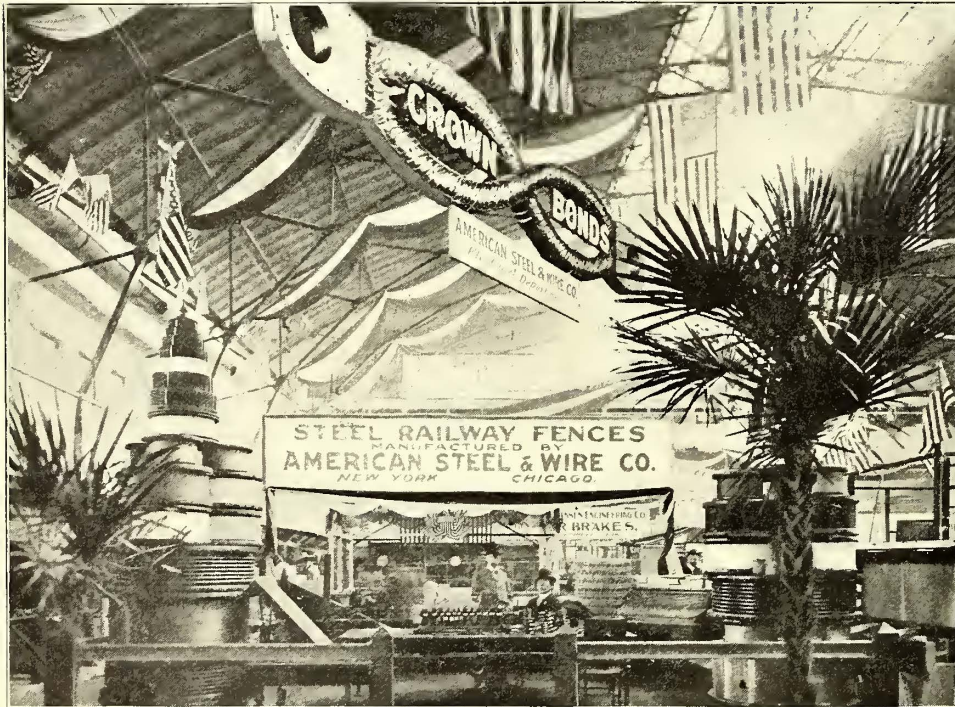


EXHIBIT OF AMERICAN STEEL & WIRE CO.

it has developed the boiler compound business so that it is recognized to-day by the most practical engineers as a subject on which considerable economy can be obtained in the operation of the steam plant. All such analyses of waters are made free of charge and reported to the steam user with information as to the treatment required to prevent scale formation, and to overcome internal corrosive action, pitting, etc. These preparations are blended and prepared to meet the requirements of each case. These methods cannot help but appeal to the operator. These people are also in the refining and lubricating business, and their laboratory equipment for the refining and proper blending of lubricating oils, and the retesting of same, is probably the most thorough of any in existence. In the marketing of oils, this company, in the first place, gets the proper oil for the conditions of the steam plant, the first requisite being the highest quality and afterwards the price per gallon. Many of the largest steam plants in the United States are buying their oils of the Dearborn Company through its laboratory inspection, and the saving made in quantity required to give thorough lubrication has been something remarkable. When the proper oils are once introduced, every shipment is absolutely uniform on account of the double check testing system they employ. The company exhibited a very complete line of lubricating oils and greases, that are used especially by the street railway companies now running high pressure plants. Also to be seen in this booth were a great many interesting samples of scale

formation, caused by different waters, and many samples of pipe, boiler tubes and braces, showing the different effects of pitting, caused by many waters charged heavily with sodium and potassium salts. Other specimens were shown illustrating the effect of some of the "cure all" boiler compounds, which are usually made from caustic soda, and while they reduce some scale formation, the deleterious after effect on the steam plant (such as pitting and corrosion) is a great deal worse than the apparent good effect obtained from removing some scale. This company has maintained for years that vegetable extracts only should be employed as feed water treatment; that they do the work perfectly in the boiler and act as a preservative to the entire system. The company gave as souvenirs a very handsome pocket spirit-level, and delighted the hearts of the ladies by presenting to each a bottle of very fine perfume, a product of its own laboratories. There were in attendance at the exhibit of this company Robert F. Carr, vice-president and general manager; Charles M. Eddy, secretary and treasurer; William B. McVicker, Eastern manager; T. J. McMaster, G. W. Spear and A. Ruffner, of the Chicago office. The company now has branch offices in Detroit, St. Louis, St. Paul, Denver, San Francisco and Los Angeles.

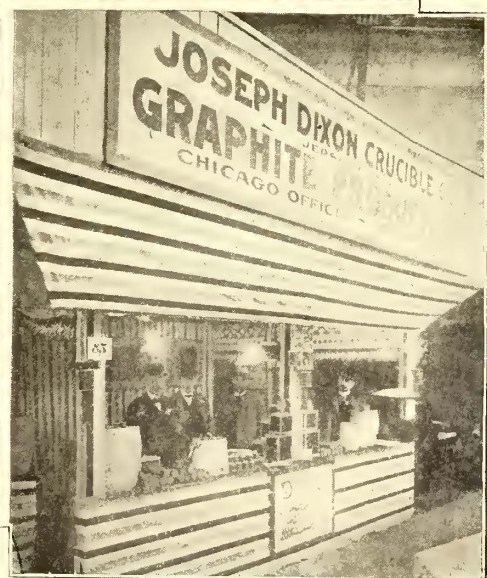
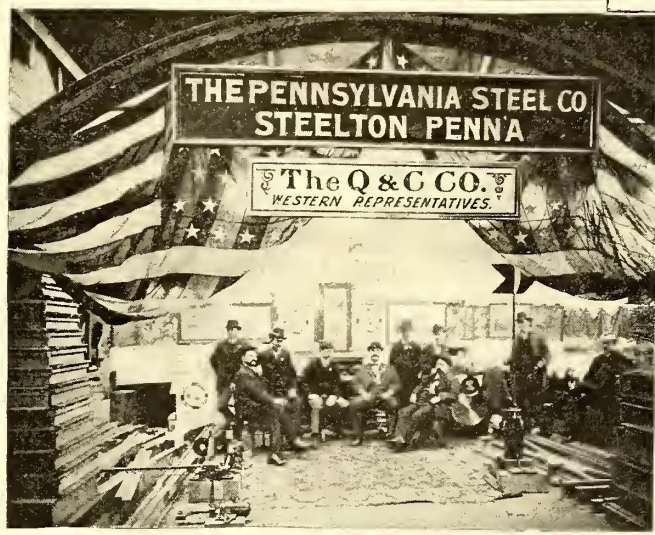
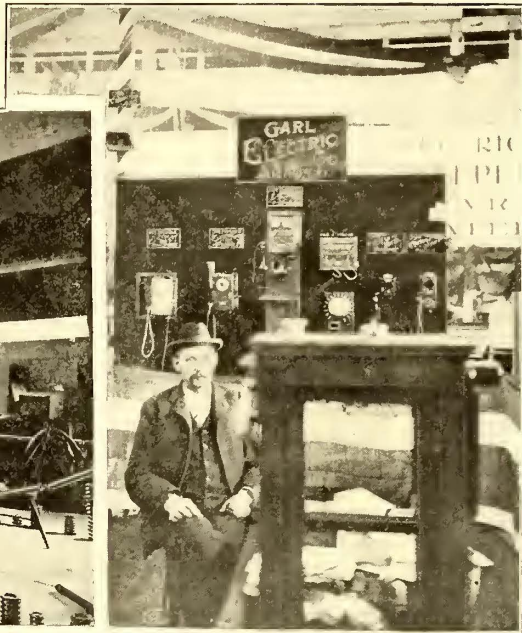
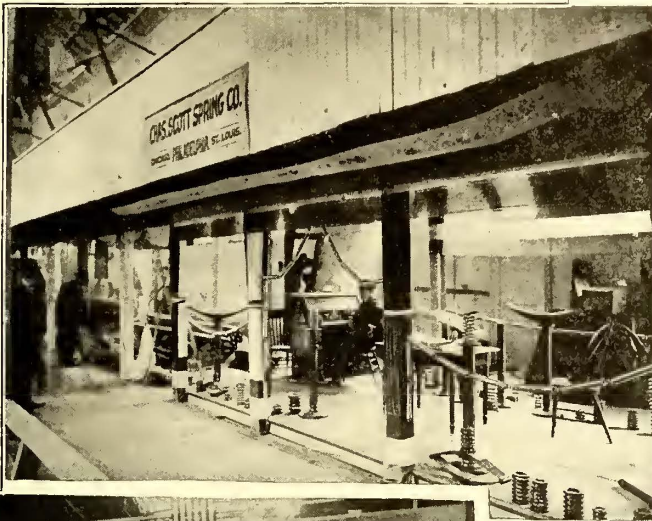
THE BARNEY & SMITH CAR COMPANY, of Dayton, Ohio, showed three trucks. Its maximum traction, double suburban and single truck. These trucks are too well known to the trade to require any description or explanation. A. M. Kittredge, superintendent; H. M. Esterbrook and H. Tesseyman were in attendance.

THE CENTRAL ELECTRIC COMPANY, of Chicago, had a very handsome booth decorated in yellow and black, and with a number of steel trolley poles spanning the doorway. M. M. Wood was in charge. There was exhibited a display board made up of overhead material, car fixtures, etc., elegantly polished. These were mostly of the well known Wood type, manufactured by the Central Union Brass Company. A brass cannon, a yoke of brass oxen, and a brass street car attracted no small attention. The company's souvenir was a neat brass paper cutter. The following gentlemen were also present: George A. McKinlock, president; Charles Brown, secretary, and C. W. Cobb.

THE GARTON-DANIELS ELECTRIC COMPANY, of Keokuk, Ia., was represented by J. V. E. Titus. Its booth contained a panel mounted with Garton station type arresters of different styles of finish, and connected with a 500-volt circuit. By the aid of a static machine the operation of the arresters was shown in a very satisfactory manner. They interrupt a short circuit so quickly that the ammeter shows little or no deflection. On a table was displayed a full line of pole, station and

car arresters, as well as samples of 500-amp. and 800-amp. kicking coils, of which this company makes a specialty. Two samples were also shown of the Automotoneer, an invention of George W. Knox, electrical engineer of the Chicago City Railway Company. This device prevents too rapid starting of electric cars and attracted much attention. A more complete description will be given in these columns later.

THE EXHIBIT of the American Steel & Wire Company was a composite of all the different products of the company applicable to street railway interests. High above the booth swung a mammoth "Crown" rail bond, which was illuminated with more than a hundred incandescent bulbs, and at night was one of the most brilliant features of the exhibit. The words "crown bonds" were brought out with numerous electric lights. Crown bonds, indeed, in innumerable shapes and sizes, crown bonds, straight and twisted at every known curve and angle, were the "piece de resistance" of the American Steel & Wire Company's exhibit. These bonds, however, were supplemented on every side of the exhibit with devices calculated to interest every department of street railway maintenance and operation; trolley wires, round and odd-shaped, feeder wires and cables, steel armored cables, lead encased cables, submarine cables, magnet wires, every form of insulated wire, wire ropes, rheostat cables, car truck springs, etc. These again, were re-enforced by voluminous representation of



A GROUP OF PROMINENT EXHIBITORS

guy wires and span wires, both plain and twisted, also with huge model of the "high grade W. & M." double galvanized telephone and telegraph wires in "extra BB," "B B" and steel grates. Another feature was the exhibit of woven wire right-of-way fence. A panel of the company's celebrated "American" style of fencing was shown erected on the posts with stretcher attached and in operation. This company makes a specialty of railway fence building and has now contracts covering the erection of several thousand miles of right-of-way fencing in different parts of the country. It stands ready to demonstrate its ability to furnish all labor and material and turn over to the railway companies a better fence, and for less money, than the railway companies could secure in any other manner. Souvenirs in the form of solid leather memorandum and pocket-books were judiciously distributed. E. J. Pietzcker was in charge of the exhibit for the electrical department and George P. Rider was in charge of the fence exhibit.

H. P. CAMERON, Syracuse, N. Y., showed G. E.-800 commutators, and samples of his different styles for all kinds of street railway service. These commutators are made from the best drop forged Billings & Spencer segments, insulated with amber mica and turned to standard size. Perfect fit is guaranteed in every instance. He keeps a large stock made up and can ship any number promptly. Some large orders have recently been received.

THE MILLER KNOBLOCK COMPANY, of South Bend, Ind., was represented by its manager, A. W. Morrell. Its exhibit was a very fine line of assembled commutators for all standard

Major discovered it in 1876 and put it on the market; it has had an increasing sale ever since. The other is an economical arrangement for water-coolers. It is a receptacle that can be used in any water-cooler. With it in the cooler, the ice melts only half as fast and keeps the water at the temperature of cold spring water. It is now used by a number of prominent firms who approve of it and recommend it highly. Their testimonials state that the receptacle does everything Mr. Major represents it to do. The superintendent of one of the largest of Edison's electric plants in New York City stated to Mr. Major that since the receptacle has been used, not one man in the engine or boiler room has suffered from the effects of ice water. It also accomplishes a great saving in ice.

THE W. T. VAN DORN COMPANY, of Chicago, showed eleven patterns of couplers for cable, electric and elevated roads. Full-sized couplings for all these classes were shown in detail. Also two sizes of Mr. Van Dorn's well known ball joint. Two small cars fitted with Van Dorn's No. 5 complete with ball joint, made up the remainder of the exhibit. Visitors at this booth without exception pronounced the Van Dorn coupler perfect.

THE STAR BRASS WORKS, of Kalamazoo, Mich., had a neat booth in charge of Walter C. McKinlock. This company's trolley wheel, which has been on the market not quite two years, is running on thousands of cars. Some of the points of superiority claimed for it are as follows: It will run in sleet longer than any other, is self-oiling and therefore saves bushings, will run

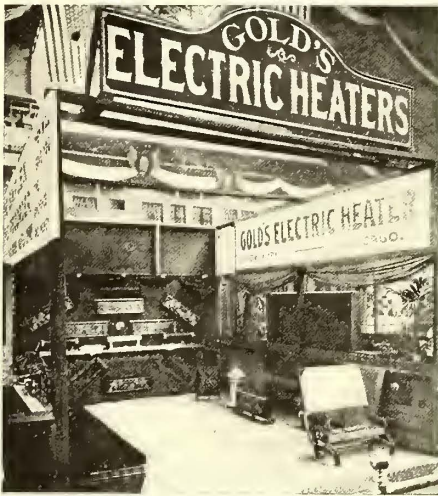


EXHIBIT OF GOLD'S ELECTRIC HEATERS

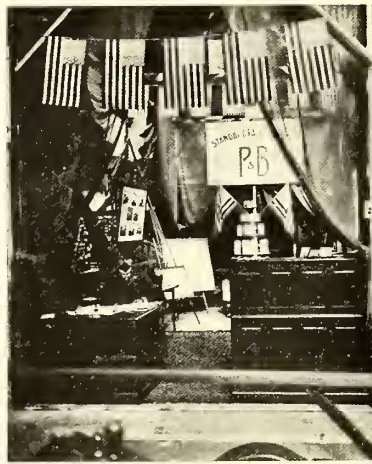


EXHIBIT OF THE STANDARD PAINT CO.



EXHIBIT OF THE SAFETY INSULATED WIRE & CABLE CO.

street railway motors. Its recently improved process for assembling commutators puts it well to the front on this class of work. A constantly increasing business has made it necessary to double the capacity of the company's shops. This exhibit elicited universal praise from street railway men. The company was also represented by A. M. Knoblock.

McGILL, POMEROY & COMPANY, of Chicago, were present in the persons of Mr. McGill, J. W. Porter and E. R. Mason. They showed samples of trolley poles, harps, wheels, rawhide pinions, and in connection with the Ohio Brass Company, a complete line of electric street railway supplies—"from the wire to the ties." In addition to their own line of supplies, they represent the following: The Ohio Brass Company, Mansfield, Ohio; the Forest City Electric Company, Cleveland, Ohio; the Cutter Company, Philadelphia, Pa.; the Orient Electric Company, Youngstown, Ohio.

THE CREAGHEAD ENGINEERING COMPANY, of Cincinnati, made its usual large exhibit of flexible brackets, overhead line material, iron and wood pole fittings, rail bonds, etc. One particularly attractive feature of this exhibit was an extra heavy double bracket for center pole construction, which was recently supplied for the rebuilding of the overhead work on the New Orleans & Carrollton Railway at New Orleans, La. A number of large photographs showing the company's material in use on roads in different parts of the world, completed this attractive exhibit, which was in charge of its superintendent, G. R. Scrugham. A steel pocket rule was given as a souvenir.

A. MAJOR, of New York, exhibited two useful and valuable articles. One of these is Major's cement, which is known throughout the country and extensively sold by druggists. Mr.

smoother and last longer, is a good conductor and is not complicated, will not injure the overhead equipment, is made in the standard sizes, 4 ins. and 6 ins., and will fit any standard harp.

THE GARL ELECTRIC COMPANY, of Akron, Ohio, represented by M. Garl, had on exhibition its street railway phones, which have been described in the JOURNAL in the past. The company has just bought out a new portable pocket phone which the motorman may carry in his pocket. The transmitter and receiver are all fastened together in one piece, the receiver forming a cap over the transmitter. When needed, the cap is removed and the phone plugged in at the stations along the line. The phone complete weighs only a pound. The company also showed house phones, and an ingenious fire and burglar alarm, which explodes a blank cartridge when disturbed by either fire or burglars. The cartridge serves the purpose not only of attracting the owner's attention, but of frightening the burglar as well.

THE AMERICAN VITRIFIED CONDUIT COMPANY, of New York, was disappointed by not receiving the material intended for its exhibit in time for making the extensive display, as originally planned. The company showed a few samples of its self-centering single and multiple ducts in its standard types of conduits for street railway and lighting service. The company was represented by B. S. Barnard.

CLIFT WISE, of Chicago, known to convention goers for the past fifteen years as one of Chicago's street railway contractors, was on hand as usual.

THE NORTH AMERICAN RAILWAY CONSTRUCTION COMPANY, of Chicago, had its interests cared for by A. S. Littlefield, president; D. J. Evans, secretary, and E. M. Fry, general superintendent. This company has had an immense amount of

work on its hands this summer, among its contracts being 25 miles in Indianapolis, the track work for the Northwestern Elevated in Chicago, and extensions of the Metropolitan Street Railway, of Kansas City, and the Chicago & Milwaukee Electric Railway.

THE STANDARD RAILWAY SUPPLY COMPANY, Chicago, was present in the person of its president and general manager, Garson Myers. This company represents the Christensen Engineering Company, R. D. Nuttall Company, Albert & J. M. Anderson Mfg. Co., Du Puy & Company, and others.

PIERCE & RICHARDSON, of Chicago, the well known Western contractors, were represented by the three gentlemen who comprise this firm: Richard H. Pierce, Robert E. Richardson and Samuel G. Neiler. This company acts strictly as consulting engineer, not being interested in nor handling any manufactured products. Among the company's clients are Armour & Company, Salt Lake (Utah) & Mercer Railroad, and the Chicago City Railway.

THE COMPRESSED AIR MOTOR COMPANY, of Chicago, had a small booth from which it issued its handsome new catalogue. Those of the company present were Henry D. Cooke, president; William E. Selleck, general manager; Robert Hardie, engineer; C. V. Kasson, head of sales department. This Company's compressed air system for operating street railway cars has often been discussed in the columns of the STREET RAILWAY JOURNAL. Air cars have been running in Chicago since May 30, 1899, and have performed continuous and uniformly satisfactory service. One interesting peculiarity about this operation is that on the first trip each night the run is made with air stored over from the previous run, and it is not unusual to attach one trailer, and sometimes two trailers.

THE SWARTS METAL REFINING COMPANY, of Chicago, is a name well and favorably known to street railway people throughout the entire country. This company has built up an immense business in the handling of worn-out trolley wire, scrap windings, brass castings, etc., etc. The company also furnishes a superior metal for motor bearings, which is coming into general

NAUGLE, HOLCOMB & COMPANY, of Chicago, the contractors who built the Suburban Railroad in Chicago, and who are at present constructing 250 miles of the Tennessee Central Railway, much of which is through the roughest part of the Tennessee Mountains, were represented at the convention by E. E. Naugle. This company is the largest producer of ties and poles in the West, and has an enviable reputation for experience and reliability.

THE SPIRAL JOURNAL BEARING COMPANY, of St. Louis, exhibited with the Morris Electric Company its new motor bearing, which consists of an iron shell lined with two dissimilar metals, brass and anti-friction, so placed that the journal has a continuous bearing on both metals. From this combination it is claimed that a greater mileage is obtainable than from either a



EXHIBIT OF W.M. WHARTON, JR. & CO.

solid bronze or babbitted bearing. The company guarantees to replace without charge all spiral bearings removed from service on account of heating or breaking before wearing out. L. P. Delano, president, represented the company.

THE CYLINDORAMA RAILWAY COMPANY showed a new attraction for parks, which consists of a revolving steel cylinder 200 ft. long x 50 ft. in diameter, which contains forty convolutions of tracks, running around the inside of the shell. The cars, of which forty can be operated continuously, are held at the

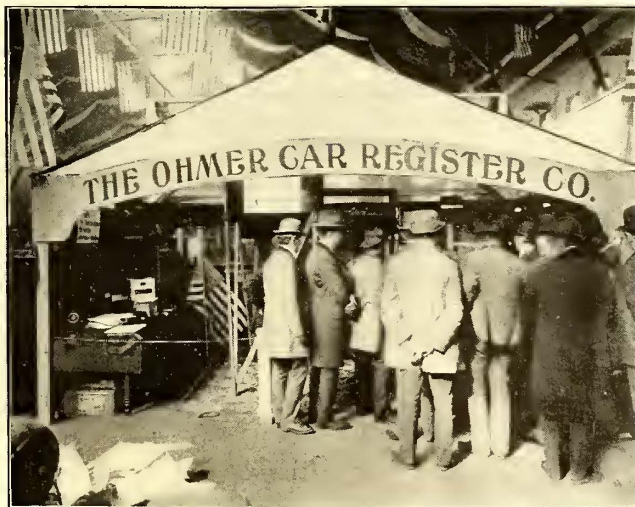


EXHIBIT OF OHMER REGISTERS

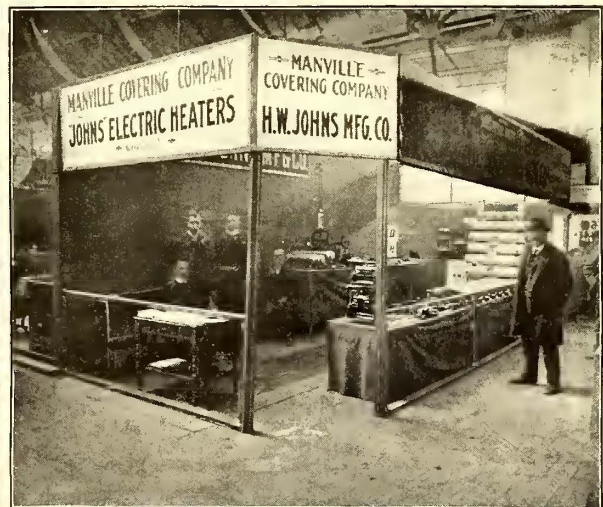


EXHIBIT OF JOHNS' ELECTRIC HEATERS

use on the best roads. The company was represented by its president, S. Swarts.

SARGENT & LUNDY, of Chicago, known as engineers for many of the largest steam plant installations in the West, were present in the persons of Frederick Sargent and A. D. Lundy, neither of whom needs any introduction to street railway men of the present day. This company is retained as consulting engineer for a large number of the railways now being constructed in the West.

THE HEINE SAFETY BOILER COMPANY, of St. Louis, was present in the person of its genial Chicago representative, James H. Harris, who has represented this firm in Chicago for nearly twelve years, during which time he has been one of the best known among steam supply men.

bottom of the cylinder by the action of gravity, but appear to the passenger to be running at great speed, due to the revolution of the cylinder. The cylinder is fitted with scenery, tunnels, bridges, etc. It is believed that this new park attraction cannot fail to meet with very great success. Samuel Barnes, secretary and general manager, and Harry J. Armstrong were in charge.

THE WESTERN ELECTRICAL SUPPLY COMPANY, which has rapidly built up the largest business in the Southwest in the handling of street railway supplies, was represented by the manager of its street railway department, Charles Scudder, Jr.

THE CENTRAL UNION BRASS COMPANY, of St. Louis, was represented by its manager, T. C. White. This company is bringing out an extensive line of overhead material and making

a special drive for street railway business. Mr. White reports that his factory is very busy and that the company's new material is meeting with much favor from street railway companies.

A. C. BECKEN, of Chicago, exhibited a case of Paillard non-magnetic watches, which, it is claimed, are absolutely uninfluenced by magnetic action. These watches are handsome and durable and accurate time-keepers.

THE SIEGRIST LUBRICATOR COMPANY, of St. Louis, had its booth enlivened by one of the best "coon" orchestras in town, whose good music and singing attracted and entertained a continuous crowd. The company's booth was a handsome one, decorated in purple. There were exhibited automatic oil cups and automatic sight feed lubricators, also a double automatic lubricator which has the advantage of two passages for the feeding oil, removing in a large measure the danger of stoppage on account of an obstruction in the oil passages; also the company's standard

bought all the old companies in the business, now controls all the curtain fixtures made. Those of the firm present were W. H. Forsyth, G. H. Forsyth, F. C. Kenly and A. L. Whipple.

THE HANNA SOLID OIL COMPANY, of Chicago, although a new company in the field, is becoming well known through its manager, J. W. Hanna, who was often seen at the Convention Hall.

HEYWOOD BROS. & WAKEFIELD COMPANY, of Wakefield, Mass., made a very good exhibit of car seats of the Wheeler, Bushnell and Henry patterns. The special feature of the display was the "walk-over" seat, which was shown in leather, rattan and plush finish. The claims made for this seat are its simple mechanism and its neat appearance. The seat department of the exhibit was in charge of Bertram Berry, of New York, and James Hitchcock, of Chicago. The company also showed a new time recorder for use in car shops or factories of any kind where

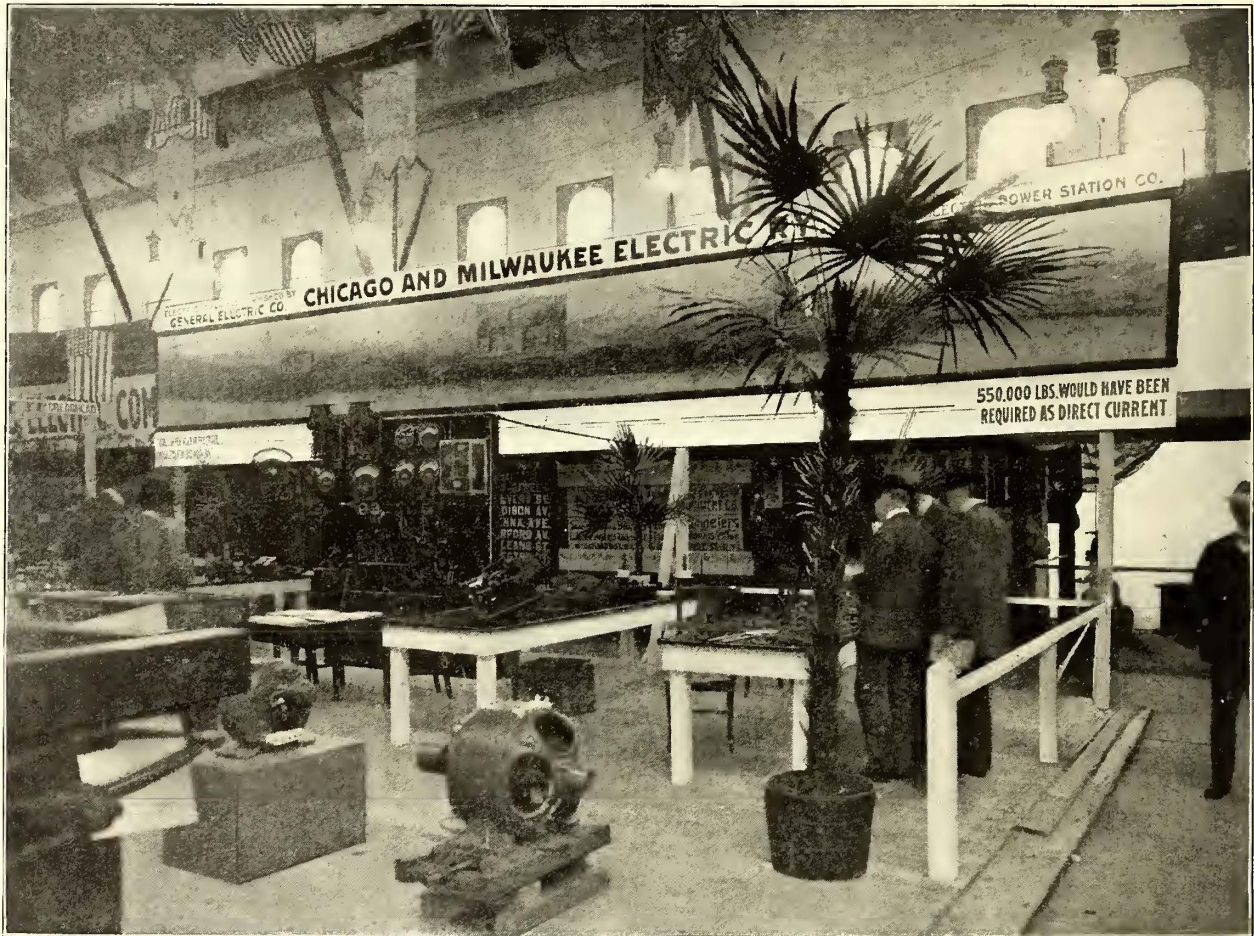


EXHIBIT OF THE GENERAL ELECTRIC CO.

automatic oiling table. The company's manager, J. N. Edelin, was present with a constant supply of good cheer for his friends.

THE ALLEN & MORRISON BRAKE SHOE & MANUFACTURING COMPANY, of Chicago, showed its composite brake shoe, which was brought out some two years ago, and which is already well known to the trade. This shoe is in service on a great many lines and giving excellent satisfaction. A. M. Allen, J. H. Miller, F. R. Spear and F. D. Freeman, of the company, were present.

THE AMERICAN BRAKE SHOE COMPANY, of Chicago, illustrated the construction of its "Diamond S" brake shoe with sectional broken and complete shoes. The "Diamond S" is in service on a large proportion of the cars, both steam and electric, throughout this country. Representatives of the company were F. W. Sargent, W. D. Sargent, George H. Sargent, A. T. Herr, H. H. Haskell, J. W. Gardner, Arthur Gemunder, G. C. Isbester. The Sargent Company, of Chicago, displayed in this booth a number of steel castings. This company has for years furnished for street railways everything in the line of steel castings.

THE CURTAIN SUPPLY COMPANY, of Chicago, displayed all kinds of curtain fixtures, in a full-sized car model. The company will soon issue its new catalogue. This company, which

a large number of workmen are employed. Those interested were supplied with a handsome catalogue and samples of the records made by the recorder. This part of the exhibit was in charge of R. E. Kimball, of Chicago.

THE DIAMOND STATE STEEL COMPANY, of Wilmington, Del., made an interesting exhibit of some of its track specialties, among which may be mentioned the Churchill girder and T-rail joints, the Diamond spike, the Diamond crescent spike, the Diamond tie-plate and the automatic rail joint spring. The Churchill girder rail joint was shown in full and also in cut sections, exhibiting the perfect union of parts and the wedged under-bearing, preventing any movement of the rail ends and thereby eliminating wear. Blocks of wood illustrating the cutting of wood fiber by the Diamond spike, as compared with the ordinary pressed and even rolled point spikes, presented a striking contrast which attracted considerable attention. The automatic rail joint spring, which has already proven its effectiveness in steam railway practice, is claimed to add largely to the strength of channel as well as T-rail joints, and are invaluable in crossings where bolts tend to loosen and break. The Diamond tie-plate is a modification of the well known Servis type with longitudinal under flanges and projecting fluted web to shield the flange ways from water dripping from the rail. The company was represented by

W. S. Boughton, treasurer, formerly with Lorain Steel Company, and Benjamin Reece, engineer.

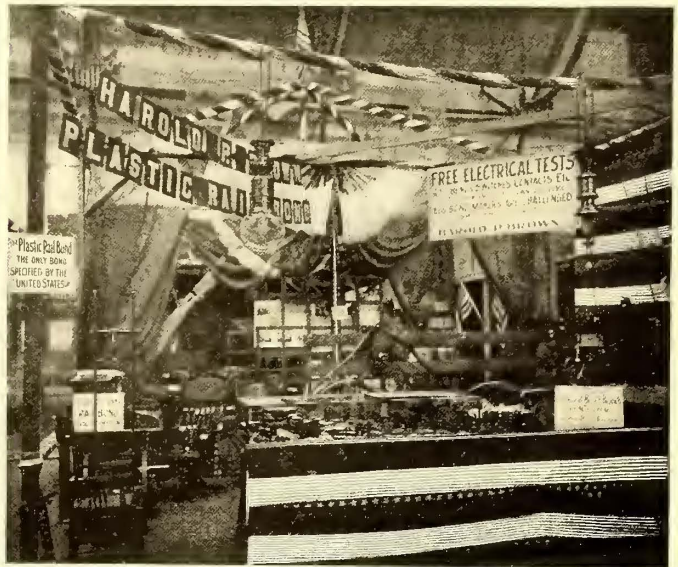
THE INTERNATIONAL REGISTER COMPANY, of Chicago, made a very handsome exhibit of its well known machines. The company was represented by A. H. Woodward, president; W. H. Brown, secretary; A. H. Place, W. J. Volkins, vice-presidents; A. H. Englund, of Philadelphia, and Charles N. Wood, of Boston. The features of the exhibit were the standard single register, with aluminum face, designed for one class of fares, and the double register for any two kinds of fares, such as tickets and cash, transfers and cash, five-cent and ten-cent fares or any other two classes as may be required. Any of these registers may be fitted with any style of pulls, cord or rod, and for any type of open or closed car. The double registers are fitted with two bells of different tones. Some of the registers shown were made with the aluminum face, others with black face. The exhibit included a full line of register fittings for both rod and cord, such as handles, pulleys, brackets, rods, etc. There was a great demand for the company's small portal scale souvenir, which was one of the most practical souvenirs at the convention.

THE OHIO BRASS COMPANY, of Mansfield, Ohio, made a very handsome exhibit, which was well arranged and was very comprehensive. The company was ably represented by three men from the Mansfield office, and one from the New York office. These were C. K. King, secretary; A. L. Wilkinson and G. A. Mead, of Mansfield, and R. A. Byrns, of New York. The ar-

THE GENERAL ELECTRIC COMPANY was in full force with a large delegation from its various offices and factories. The delegates who attended were S. D. Greene, S. Trawick, George Rosenthal, E. D. Mullin, T. P. Bailey, R. H. Beach, F. W. Willcox, F. E. Case, F. H. Strieby, A. H. Armstrong, W. F. Hayes, B. E. Sunny, F. Barbour, W. J. Ferris, E. D. Priest, J. J. Mahoney, F. M. Kimball, R. A. Swain, George J. Cadwell, J. W. Johnson, W. B. Potter, F. N. Boyer, J. G. Barry, J. W. Buell, J. H. Livsey, H. R. Bishop, Jr.; George Breed, R. E. Moore, W. G. Carey, T. Ferris, Ward S. Arnold. The exhibit comprised two GE-55's mounted on a truck, which are to be used as an equipment for the Northwestern Elevated Railway. These motors are of 150-h.p. capacity. In addition, there were two GE-100's, equipped with the B-13 controller and electric brakes. The motors and brakes were mounted on a St. Louis Car Company's truck. One of the special features of the exhibit was the new GE-65 of 250 h.p. capacity. This motor was built expressly for the Paris & Orleans Railway, Paris, France. The exhibit of street car motors comprised a GE-52 and also a 57. A line of stationary motors was also shown, the new C. E. type being displayed. There was also an air compressor which the General Electric Company is building for elevator work. A line of standard switchboards also attracted much attention as showing the latest type for feeder panel boards. This part of the exhibit included two standard generator panels and an additional panel whereon was mounted a form G-2 station wattmeter. A large line of supplies of overhead material, circuit breakers, lightning arresters. as-



EXHIBIT OF THE FALK CO.



HAROLD P. BROWN'S EXHIBIT

angement of the display was well calculated to show off the material to good effect. Surrounding the space were placed both wood and iron poles, equipped with two styles of iron brackets. The brackets included the company's well known flexible brackets and these were fitted with hangers of the various types required in actual service. One pole was equipped with a flexible bracket on which the suspension yoke was fitted for supporting two parallel trolley wires. A full line of clamps and ears for figure 8 wire were shown, including a greater variety than ever before exhibited by the company. The insulating material used in the entire exhibit was of the Ohio Brass Company's well known standard type known as "Dirigo." Mention should be made of the very fine sample board which formed the background of the exhibit, made up of a well arranged display of small line material in a great variety of styles. A full line of feed-wire fittings was also shown. The entire central part of the company's space was taken up by a pyramid of steps, on which all small parts were displayed in great profusion. Besides this elaborate exhibit of line material the company also showed a variety of other supplies, such as headlights, ratchet brake handles, bell-metal motor bearings, track brushes and brush holders, the Monarch track scraper, gongs, bonding caps of steel and copper, etc., etc.

THE WATSON-STILLMAN COMPANY, of New York, had a practical exhibit which included a motor lift for pit work with a capacity of 3000 lbs.; hydraulic rail punches, suited for punching a hole 1 in. in diameter in 1-in. iron; swivel jacks of 7 tons and 10 tons capacity; hydraulic T-rail bender, and a hydraulic girder rail bender.

sembled commutators, armature coils and porcelain insulators similar to those used on the third-rail system were also displayed.

THE NEW HAVEN CAR REGISTER COMPANY, of New Haven, Conn., showed, in addition to its well known regular line of "New Haven" single, double and triple registers, its new round single and double registers, which the representatives of the company present claimed are the most complete, and in every respect, the finest round registers ever made. These machines are constructed in a very thorough manner, and are said to contain all the recognized desirable features, and in addition special and valuable points which none of the other makes possess. The completeness of the double register, which consists of two single registers in one case, is recognized at a glance, and the many unique features, such as showing the number of the trip, as well as the direction, the number of each class of fare rung up on the trip up to 1000 in large numerals, which can be plainly read from end of longest car, the total number of each class of fares up to 100,000, and indicating the class of fare last rung up in prominent letters, were appreciated by all practical railway men. Each machine is also provided with red safety shields and with automatic locking and controlling devices, preventing one side of register from being rung up while the other side is being operated. A locking device is also provided so that conductors can lock the register upon temporarily leaving car, preventing the ringing of any fares during their absence. This register is also adapted for use on two connecting roads, one side for each road, each conductor securely locking his side of register when leaving car. It can also be arranged as two separate registers, each side operating and being reset to zero independent of the other side. All these

different arrangements make this machine peculiarly adapted to meet the various conditions of registering fares on electric railways. The round single registers are provided with very prominent numerals and the safety shield is lettered "not registered." This shield covers the figures as soon as the conductor begins

much attention at the convention. The different parts of the New Haven registers were also shown mounted on boards, together with the "New Haven" simplex and duplex counting machines, used in commercial business for any kind of counting records. The representatives of the company at the convention were



VIEWS TAKEN NEAR THE CENTER OF THE HALL

ringing up the fares, and remains in view until after the fare is rung up and registered. This machine has been adopted by the Third Avenue Railroad, of New York, on its new equipment. Both of these registers, in addition to being very complete, strong and durable, presented a very fine appearance with finely finished antique copper cases and ornamental aluminum dials and attracted

J. S. Bradley, president; F. C. Boyd, W. M. Anthony and H. E. Beach.

THE EUREKA ELECTRIC COMPANY, of Chicago, had a compact and comprehensive exhibit of its telephones, and called special attention to its excellent telephonic apparatus for railway

work, emergency purposes, etc. It was a shrewd idea to make such a display and it attracted much attention on the part of the managers and superintendents of roads. The exhibit was in care of I. J. Kusel, president; H. J. Kusel, vice-president, and Arthur

THE PITTSBURGH REDUCTION COMPANY had one of the smallest exhibits in the place, but it was decidedly one of the most novel and interesting. It consisted essentially of a large glazed frame holding an assortment of its aluminum wires and



SOME VIEWS TAKEN IN DIFFERENT SECTIONS OF THE HALL

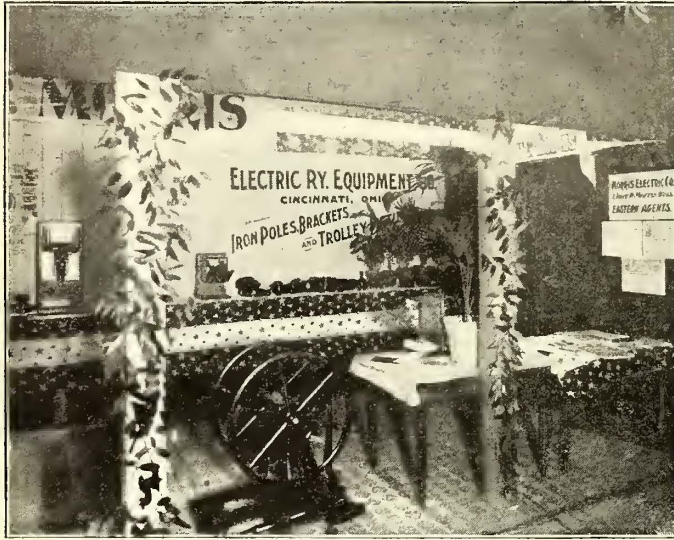
Stein, secretary and treasurer. They are to be congratulated on the display made and the effect created.

W. R. BRIXEY, manufacturer of Day's kerite wires and cables, was represented by G. F. Porter, New York manager, who had samples of this product with him. This company has recently taken some of the big orders in the street railway line.

cables, which of late have made so distinct a place for themselves in electrical transmission and allied work. A few samples of other aluminum goods were also shown by J. A. Rutherford, representative.

THE FRANK RIDLON COMPANY, of Boston, was represented by Chas. N. Wood, who exhibited a Wilson trolley-pole catcher, which he showed in operation with a Nuttall pole. The

compact little round box containing the roll-up machine is easily attachable to the dashboard and the cord is held at the point where the conductor sets it, so that his mind and hands have greater freedom to attend to his more legitimate business of looking after the passengers and collecting fares that would otherwise be missed. The attachment is inexpensive, simple, and does not



get out of order. It not only prevents trolley-pole accidents, but it keeps out of sight all the cord that is otherwise a nuisance by dangling idly. Testimonials that it kept the pole in position were shown from those using the device, testifying to its value on trolley cars, particularly in places where the high speed of running was likely to throw the trolley off.

THE TAUNTON LOCOMOTIVE MANUFACTURING COMPANY, of Taunton, Mass., was represented by W. R. Billings, treasurer; J. C. Sproat, J. H. Wright, agent, Lancaster, Ohio, and Messrs. Wendell & MacDuffie, both of these New Yorkers being also on hand. The exhibit was made wholly in the open air, and comprised a double-truck share snow plow, a nose plow and a snow sweeper, the last being the company's initial attempt in this direction. The double-truck plow has a long leveler that can be swung out widely from the cars, and which can level down the snow for carting away, sleighing, etc. Some seventy of the plows have been sold this year. The sweeper shown was sold to the Cleveland, Painesville & Eastern road. It has several notable features. The weight is about 11 tons, and the main sill is 11 ins. x 4½ ins. The heaviness of the sill gives strength, but with this go adjustability and the keeping of the sill level, even after years of service. Friction clutches are used on the broom motor shaft, and the brooms have malleable iron heads with extra heavy rattan in the brushes. There are extra heavy accessories and arrangements for the draw-bar, and specially heavy and long leveling wings on each side which can be quickly opened and shut. A first-class digger is supplied. The machine presented a most solid and massive appearance.

ALEXANDER H. LEWIS, Cincinnati agent for the Cahall boiler and the Kilgour safety brake, was in evidence for the first two or three days.

THE GOLD CAR HEATING COMPANY, of New York, had an effective and attractive display of its well known electric heaters, tastefully grouped and showing details. The exhibit included complete lines of this company's street car heaters and the types for house, office and apartment heating. The company was well represented, its forces on the ground including E. E. Gold, president; John E. Ward, general manager; Egbert H. Gold, Western representative; F. Weston, New York, and J. Watson and T. Downing, Western salesmen. A large business was done at the booth, which was visited by the delegates in great numbers, and the company was elated as to the victory recently achieved by it in

the courts, and in regard to which a special circular was issued. The company, which has quite a reputation in the souvenir line, gave out liberally a choice leather pocket note-book, with many features of desirability.

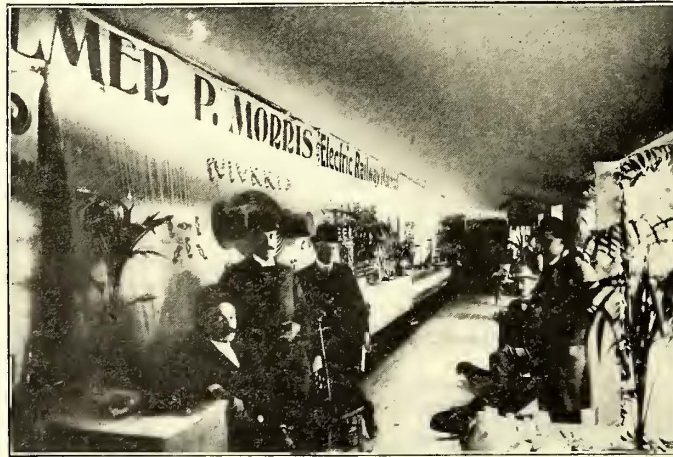
THE CONSOLIDATED CAR HEATING COMPANY, of Albany, N. Y., had an attractive exhibit on the main aisle under the care of R. S. Scales, Western representative; W. P. Cosper, general agent at St. Louis, and J. H. Dubarry, Jr., of New York City. The heaters were shown separately, in detail, and in operation, under longitudinal and cross seats. Special attention was directed to the new three-point switch with a dial, which indicates visually the steps in throwing on the heaters and heating the car. Along the back of the booth or space the gratings of the heaters were used to mask some colored incandescent lamps under mica, giving a very pretty effect.

C. S. KNOWLES, Boston, a well known supply dealer, was ably represented by Percy Hodges, who is in charge of the street railway department.

THE STANDARD AIR BRAKE COMPANY, of New York City, was represented by J. R. Ellicott, general manager; E. H. Beacham, and G. E. Baker, of New York. The exhibit was very complete, illustrating thoroughly the application of mechanical brakes in the street railway service. It included three types of service, one with the motor driven compressor, one the gear driven and the third showing the eccentric driven. The independent motor driven compressor, which was fitted with a Storey motor, was admirably demonstrated, and the various parts were all available for examination, including compressor, automatic controller, cylinder, reservoir, operating valve, platform staff, etc.

The automatic was set at 60 lbs., cutting in at 45 lbs. The other type cuts out at 90 lbs., and cuts in at 80 lbs. The interest shown by large throngs proved that while air brakes are still unfamiliar to many people in street railway work, the resort to them is rapidly becoming general and is encouraged by public opinion. Handsome catalogues were distributed and instruction books to those who could benefit by them.

J. G. WHITE & COMPANY, electrical engineers, etc., of New York, distributed a handsome brochure in which the statis-



SNAP SHOTS OF THE MORRIS EXHIBIT

tics of the growth of electrical industries in the United States are presented very concisely. The total capitalized value is put at over \$3,000,000,000, half of which is to be credited to electric railways alone, all due to the development of electric traction in the last ten years.

THE CHARLES SCOTT SPRING COMPANY, of Philadelphia, was represented by D. L. Roche, of that city; Scott R. Hayes, of Cleveland, and J. T. Harahan, Chicago. This com-

pany's compact exhibit included specimens of the various branches of its work, particularly a full line of springs for trolley trucks and trolley stands, as well as valve springs. At a central table stood a large nicked spring, of the kind made to go under steam passenger coaches. Around the exhibit smaller springs were mounted on wooden pedestals for better inspection. The company distributed among its friends a valuable card case pocket-book in leather.

THE TAYLOR ELECTRIC TRUCK COMPANY, of Troy, N. Y., exhibited one of its heavy 8-ft. wheel base single trucks, designed for heavy vestibule single-truck cars, one of its Empire State radial trucks, one of its swing bolster double trucks for regular double-truck passenger car service, and a recently designed extra heavy swing bolster double truck, for long, heavy, high-speed suburban cars. The exhibit was in charge of John Taylor, manager of the company, and the Taylor trucks were thoroughly examined in detail and highly spoken of by many delegates. Of the extra heavy swing bolster style, sixteen have been ordered for Ottawa, Canada, while six long car sets have been sold to the Quebec, Montmorency & Charlevoix Street Railway.

THE R. D. NUTTALL COMPANY, of Allegheny, Pa., had a large space and was represented by F. A. Estep, president, associated with them in its occupancy being the Standard Railway Supply Company, Garson Myers, president, and C. N. Wood, of Boston, with whom was C. W. Held. The Nuttall exhibit included a variety of the trolley poles, springs, gears, pinions, etc., of the company's familiar make. The motor gear cutting plant owned by this company gives it unusual facilities in that line and the product

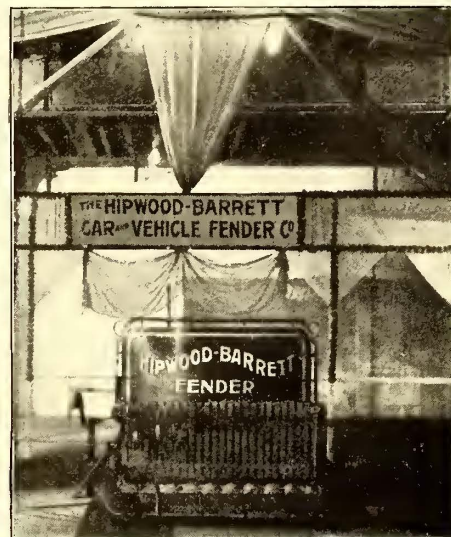
newability of working parts, which greatly simplify the work of the motorman. The single controller of this type for two motors up to 35 h.p. each was attached to one of the trucks and in operation. The double controller shown will take care of four motors up to 35 h.p. each, and is practically two motors rolled into one. The controllers were a subject of much interest on account of their originality and were in constant operation by the company's experts.

THE JACKSON & SHARP COMPANY, the well known car builders of Wilmington, Del., was represented by J. Monteith Jackson.

THE HIPWOOD-BARRETT CAR AND VEHICLE FENDER COMPANY made an exhibit which probably attracted as much attention as any in the hall, partly because of the intrinsic merit of the fender, and partly because it was accompanied by one of the most ingenious and effective devices for showing the working of a piece of apparatus ever seen at a convention. This was the "mutascope," by means of whose 1200 photographs, taken at the rate of forty per second, a car equipped with the Hipwood-Barrett fender is actually seen approaching the spectator at the rate of 15 miles an hour, while in the course of its travel it picks up two 65-lb. child dummies, one standing erect on the track, the other prostrate with one arm extended in the direction of the approaching car—conveys them a few feet further till the car can be stopped—and then is shown the operation of closing up the fender and running it out of the way under the car. The Hipwood-Barrett fender is constructed on the principle of providing yielding striking surfaces, by which the blow to the "strikee" is greatly less-



EXHIBIT OF THE STANDARD AIR BRAKE CO.



THE HIPWOOD-BARRETT FENDER

has thus won the reputation deserved by every piece shown in the exhibit.

F. B. BROWNELL, of the Brownell Car Company, St. Louis, was in attendance through the convention.

THE EXHIBIT of the Lorain Steel Company, of Lorain, Ohio, spread out over almost one entire end of Tattersall's, and needed the space taken for this varied display, which in many respects was one of the most comprehensive in the whole hall, as it ranged from car controllers and motors to the details of track construction. The exhibit was in charge of P. M. Boyd, of Lorain, secretary; S. P. S. Ellis, Pittsburgh; F. A. Merrick, Johnstown; W. W. Kingston, Atlanta; R. T. Lane, Johnstown; A. S. Littlefield, Chicago; O. C. Evans, Cincinnati, and H. C. Evans, of New York. The exhibit included, in the truck department, the company's new double truck, "style F," and its new single truck, "style C," the double taking two 50-h.p. "steel" motors, and the single two 35-h.p. "steel" motors, constituting a very substantial, but flexible mechanism. In the rail and crossings department were shown the company's guaranteed 9-in. switch pieces, with hardened plates, Lorain standard crossings and a remarkable 9-in. girder crossing with the continuous arms made in two pieces, so that there is only one pair of joints in it. Note must also be made here of the beautiful examples shown of electric welds, taken from real practice on 6-in. 66-lb. rail, recently, at Buffalo. The company also showed two of its new controllers, for which many points of excellence and uniqueness are made, and which are strikingly compact, simple as to wiring, easy of access, and re-

ened, and he is landed safely upon the fender. It is stated that the 65-lb. dummies shown by the mutascope, which are made of ordinary canvas, filled with sand, have been struck and captured by the fender 104 times to date without at any time tearing or ripping the canvas. As souvenirs of the convention, the company presented to its friends several circulars descriptive of the fender, together with a beautifully gotten up little souvenir showing pictures of all the challengers and defenders of the America's cup since the latter was first won in 1851. The European patents of this company have recently been sold to Frederic Romünder, of Cologne. The company was represented by A. B. Dalby, president; George Hipwood (inventor of the fender), treasurer; George Weiler, Western manager, and Henry S. Jenkins.

THE OHMER REGISTER COMPANY exhibited, as its principal feature, a complete working installation of a ten-fare Ohmer register with auxiliary apparatus, and this was examined with the greatest care by some of the principal street railway managers and auditors attending the convention, several spending an hour or more in watching the operation of this peculiar and valuable invention. The register has been brought to still greater perfection during the past year, and is now a very simple and highly efficient machine. Its principal mechanism is of malleable iron, and springs have been almost completely done away with, the action of the conductor's cord being to raise the iron parts to the point where the record is taken, these parts returning to their original position by means of their own weight. The counters are also simple and well made, and by an ingenious mechan-

ism, a record may be taken at the end of every single or round trip, or at any time, in such a way as to form a perfect check upon the conductor. This feature, joined with that of the multiple register plan of construction for registering different classifications of fares, transfers, etc., makes it possible to greatly simplify the work of the auditor's department, and at the same time that of the detective force, in ways which have already been quite fully explained in the STREET RAILWAY JOURNAL. Moreover, the method of ringing up fares by the conductor provides a "visible receipt" similar to that given by the cash registers now in common use in stores, and the system devised by the company for recording the different



EXHIBIT OF K. M'LENNAN & CO.

kinds of cash fares, transfers, etc., makes it possible to not only detect dishonesty in the case of any single conductor, but to find out who is his confederate, if any, together with the method employed by them for "beating the company." The Ohmer register will find a wide field, especially in interurban work in America and upon foreign tramways, where several different rates are charged, and one feature which gives it additional value abroad is that it can be used on double deck cars with almost the same advantage as with single deckers. The company was represented at the convention by John F. Ohmer, president and general manager; J. H. Stedman, secretary; H. Tyler, superintendent of manufacture; William F. Breidenbach, Western manager, and E. M. McDonald, and A. N. Loper, traveling agents. Mr. Stedman, the company's secretary, has recently become financially interested, and through his wide acquaintance and popularity will, undoubtedly, add great strength to the company.

THE CONTINUOUS RAIL JOINT COMPANY OF AMERICA made an exhibit consisting of several T and girder rail sections fitted with their joints, and showing well the admirable character of the work which this company does. Ordinarily, it is not an easy thing to make three fits with a fish-plate, one to the bottom of the rail, a second to the top of the base, and a third to the under side of the head, but the Continuous Joint is so carefully rolled as to make these fits absolutely perfect, and when this is done there is no question as to the strength or value of the joint, which is very popular among steam railroads, and might readily find wide use in street railways. The company was represented by J. F. Braine, general manager; William F. Ellis, New England agent; H. M. Montgomery, Western agent, and F. C. Schmitz, New York agent.

THE CONSOLIDATED CAR FENDER COMPANY exhibited not only its well known fender, which is undoubtedly the most widely used of any in the United States, but also showed a new step lifter for open cars, by means of which the motorman can easily raise or lower the step from the platform at the end of the trip, and also, when necessary, in passing through crowded streets, and the Campbell snow broom, which is a great improvement over the brooms ordinarily in use. The broom head is made in sections of malleable iron, and the rattan is passed through holes specially prepared for its reception and firmly held in place. It is claimed for this broom head that it will outlast an immense number of those ordinarily in use. The company distributed at the convention a number of bright and taking souvenirs, one of which, especially, was in great demand among the supply men as well as

the delegates, and created much amusement. Another contained a Chinese coin given in the hope that "As a pocket piece it may serve as a charm against accidents and misfortune, and be a continual reminder of (the Providence) Fen-Der, a great magician and astronomer of ancient China." Other souvenirs were a small leather covered mirror and a mirror of a different pattern. The company was represented by Col. A. C. Woodworth, general manager, and George Hollingsworth, superintendent.

THE COLUMBIA MACHINE WORKS, of Brooklyn, N. Y., made an exhibit of a few of its street railway specialties, and was represented by W. R. Kerschner.

F. E. DONOHUE, Western agent, and E. H. Hammond, of the Chicago office, represented the American Electrical Works at Providence.

THE PENNSYLVANIA STEEL COMPANY, of Steelton, Pa., had its interests in the care of M. D. Pratt and C. S. Clark, the former being the company's street railway engineer and the latter its Boston manager. The entrance to the exhibit was framed by a huge arch of the company's No. 250 9-in. rail, weighing 128 lbs. to the yard, and the piece thus shaped into a perfect semi-circle of 12 ft. radius weighing about 2000 lbs. Among the samples exhibited were pyramids of rail sections, one column being T-rail and the other girder, through the range of from 12 lbs. to the yard up to 128 lbs. There were also samples of the company's regular Adamantine cast steel special work in frogs, switches and switch stands, and of the Adamantine worked up this way on T-rail frogs and switches using 60-lb. rail. A most interesting feature, both by its suggestiveness and by its relation to export trade, was that of the steel ties to be bedded in cement and intended specially for use on tropical roads, where the conditions are adverse to longevity in wood. With the tie were shown also the drop forged steel brackets used in the work. This style of construction will go on the Sao Paulo (Brazil) road, and is in requisition also for Australia.

THE M'GUIRE MANUFACTURING COMPANY, of Chicago, had, as usual, a very fine, comprehensive and complete exhibit, both within Tattersall's and outside, and was represented by a large staff, at the head of which were W. A. McGuire, president; W. J. Cooke, vice-president; W. P. McGuire, and E. E. Cook, superintendent. The exhibit in the hall covered a large space and comprised two No. 39 trucks, one elevated truck, one solid steel Columbian truck, six ratchet brake handles and six new



EXHIBIT OF EUGENE MUNSELL & CO. AND MICA INSULATOR CO.

Columbian car heaters. A great deal of interest was taken by experts and the public in the "A1" suspension truck shown, bearing a sign to the effect that it was one of 120 ordered for the Havana Electric Railway, and which is also of the type of which the New South Wales Government has bought 230. Of the No. 39 and the solid steel, the company also reported that it was exporting a number to Germany. An interesting feature of this exhibit, and one which attracted great attention, was a pair of side bars of the truck which had been twisted to form a spiral, then bent double. This showed the great ductility of the cast steel used and ability to withstand fracture. Outside the hall, the company had a 14-ton

electric snow sweeper, of which fifty-seven have already been sold this year, fourteen of them going to one road in St. Louis. In addition to the material included within its exhibit proper, the McGuire Company had auxiliary exhibits, so to speak, in the spaces of the General Electric Company and the Westinghouse Company, where railway motors carried on its trucks were in actual operation.

THE BADT-GOLTZ ENGINEERING COMPANY, of Chicago, comprising F. B. Badt and William Goltz, was conspicuously represented by the former, who was not only in constant attendance at the exhibition, but entertained friends in off hours at the Union League Club. Mr. Badt was quite busy with the delegates in regard to Weston instruments, Leonard rheostats and signs, Helios lamps and Edison-Brown plastic bonds. He had as a souvenir a handy pocket calendar for 1899-1900.

THE SIEMENS & HALSKE ELECTRIC COMPANY, of Chicago, was glad to welcome numerous visitors at its fine factory during the convention, but did not make an exhibit. The company was represented on the floor of the house by W. G. De Celle, W. H. Abbott, C. E. Wilson, W. R. Mason, of St. Louis, and Alex. Churchward, its electrical engineer.

THE JOHN A. ROEBLING'S SONS COMPANY, of Trenton, was very much in evidence all the time, not so much by exhibit and sample or souvenir, as by the indefatigable efforts of its large staff, which comprised M. R. Cockey, G. W. Swan, H. Jen-

switchboards, panel boards, etc., and the "Syracuse China" drop sockets of Pass & Seymour, the well known porcelain manufacturers. Crouse-Hinds switches range from 10 amps. to 5000 amps.

THE STANDARD PAINT COMPANY, of New York, and most other big cities in the world, had a pretty booth in which were grouped artistically cans and packages of the famous P. & B. compounds and other specialties so familiar in various departments of railway insulation. These were set off by framed diplomas of merit, etc. The company was represented by F. S. De Ronde, general manager at New York; J. C. Shainwald, manager at Chicago; O. K. Heppes, of the Chicago office, and F. S. Howard, traveling agent. In addition to the distribution of literature, samples, etc., the company presented its friends a handsome and costly leather pocketbook, which, it is needless to say, was eagerly sought after. It is whispered that there were some in white leather for the ladies.

THE SPEER CARBON COMPANY, of St. Marys, Pa., was represented by John S. Speer and A. Kaul, Jr., and made a promising debut at a street railway convention, although it was by no means Mr. Speer's first appearance at such scenes. The company had a display of its railway carbon specialties in the Morris space and exhibited electric light carbons in addition to carbon brushes. The company distributed considerable numbers of a new and handsome catalogue price list of fifty-two pages, devoted to dynamo and motor brushes for all classes of work, and of all the



EXHIBIT OF THE CENTRAL ELECTRIC CO.



EXHIBIT OF ATLAS RAIL JOINTS

kins, A. B. Conover, A. M. Whaley, H. E. Fisher, W. G. Tingley and W. P. Bowman, each paying attention to the roads represented from his respective territory.

ROSSITER, MacGOVERN & COMPANY, of New York, were represented by Frank MacGovern and John A. Steuart, the Western representative. Mr. MacGovern was an assiduous attendant at the exercises of the convention and gave close attention to matters coming within the field which he has made specially his own. The changes in apparatus and his recent venture in the acquisition of the Excelsior Electric Company's manufacturing plant have brought Mr. MacGovern into touch with so many railway men that he had no time for social distractions except in their company.

THE SAFETY INSULATED WIRE & CABLE COMPANY, of New York, was represented by Lieutenant E. J. Spencer, of St. Louis, who had a well appointed booth. With him were associated M. B. Austin and A. B. Brown, of Austin & Brown, the Chicago agents. A very good display was made of some twenty special wires and cables, running up to the largest sizes. For example, there were shown sections of the cables made for the Chicago elevated roads, equalizer cables employed in Chicago railway power-houses, and the 6000-volt three-conductor three-phase cables of the Metropolitan Company. The Niagara power cable was also shown, and a number of special sections of cables relating to the war and in use by the United States signal corps.

JOHN W. BROOKS, of the Monadnock Block, as special agent in the territory, issued circulars as to the Syracuse headlights for cars, the Crouse-Hinds Electric Company's switches,

standard makes on the market. The data in this useful catalogue are most minute as to sizes and the type of brush required, price, etc. Besides this, Messrs. Speer and Kaul gave away with liberal hand leather cigar cases and purses.

HAROLD P. BROWN, of New York, with the co-operation of Lieutenant F. B. Badt, of Chicago, made, on the main aisle, an effective exhibit of his solid copper bond, emphasizing this evolution of the appliance in sharp contrast with the other extreme as embodied in the flexible types. This interesting Brown bond consists essentially of a piece of rolled electrolytic copper, 3 ins. long, about $1\frac{1}{2}$ ins. wide and $\frac{1}{8}$ in. thick, although these dimensions may be varied. At each end is a cup-shaped projection, and inside the concavity is a piece of sheet steel supporting a pair of steel springs. The steel is used to keep the springs from wearing the copper. The pieces are all held together by a small iron strap until the bond is applied, when the sharp web on the inside of the spring cuts it away and enters the angle plate, thus aiding the conductivity of the bond, which is amalgamated to prevent rusting, and which has its contact surfaces covered with plastic alloy. Naturally, this ingenious novelty attracted much attention. A case contained examples of other types to show freaks and peculiarities of wear; while the Brown bond was shown on sections of rail, in place. In order to give an accurate idea of its value, Mr. Brown had a compact plant operating in his space, comprising a Zucker-Levett American Giant double armature generator giving 3000 amps. at 10 volts, driven by an Edison 20-kw. motor, with Ward-Leonard rheostats, and two very fine Weston instruments, one reading up to 2000 amps. and the other reading fractions of a volt down to .00001. The effect of the bond in estab-

lishing perfect electrical continuity of track was demonstrated to all comers in this way. The current was first put in series through a joint of 80-lb. T rail, with no bond and a joint of 70-lb. T rail, with a Brown solid copper bond on each side and angle plates loosely set up. The unbonded 80-lb. joint, with 2000 amps., showed a drop of 0.423 volts. Mr. Brown then amalgamated the top of the rails at the inner ends, and laid upon these amalgamated spots one of his No. 0000 bonds. The drop with 2000 amps. was then .018 volts. The drop of 1 in. of solid rail with same current was .00223 volts, showing bond was equal to about $8\frac{3}{4}$ ins. of rail in resistance. The drop on the 70-lb. rail joint with 2000 amps. was .01946 volts. With an extra bond laid on top of rail the drop with same current was .00762 volts; the drop of 1 in. of this rail, with same current, was .00286, showing the bond was equal in resistance to about 7 ins. of rail. This joint was set up with a small monkey-wrench. In actual work, Mr. Brown said, much better results would have been attained. Tests were also made in the same way with other makes of bonds. One showed .425 volts' drop, with 1000 amps. and .75 volts, with 2000 amps. The other showed respectively .22 volts and .37 volts' drop. Both heated to redness in the time required to make tests.

THE MORRIS ELECTRIC COMPANY, of New York City, was represented by Elmer P. Morris, treasurer; G. C. Ewing and Mr. Delano. The exhibit was extensive and remarkably varied, covering the whole range of electric railway supplies. It was grouped along a considerable stretch of the left aisle and was tastefully arranged and decorated with plants, foliage and bunting. At one end was an annex known as the ball grounds and fair

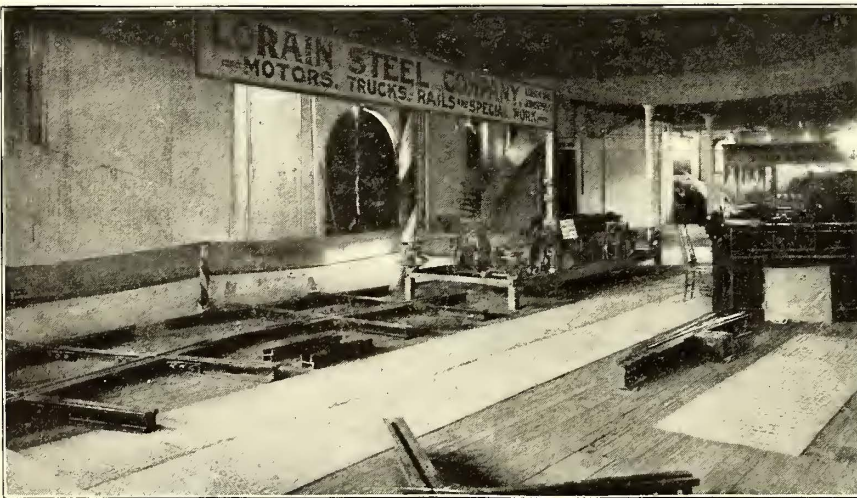


EXHIBIT OF THE LORAIN STEEL CO.

grounds, according to the selection of the visitor, the entrance to this abode of hospitality illustrating over its portal the operation of the Hunter illuminated sign. Conspicuous among the exhibits was the Morris rail bond, to which attention was directed by a large sign and by a model 4 ft. long. The rear wall of the exhibit on which these were placed, showed also an assortment of the car straps of J. E. Rhoades & Sons, the Anderson line material, and the Garton lightning arresters. There was also displayed a very interesting collection of complete and dissected bearings for various sizes of journals made by the Spiral Journal Bearing Company, of St. Louis. At the front of the booth were shown by well selected samples, the poles, brackets and line material of the Electric Railway Equipment Company, 25-amp., 50-amp. and 60-amp. circuit breakers of the General Equipment Company; the street track drill made by the Michigan Manufacturing Company; one, two and four duct Mason terra cotta conduits made by the Potomac Terra Cotta Company; Dale Manufacturing Company's shades and socketless clusters; the sand boxes of Louis Fink, of Boston, and the Bock triple-glaze insulators of Thomas & Company, of East Liverpool, Ohio. The samples of Speer carbons shown are referred to in another item. Other features of the exhibit were the track cleaner of Van Dorn & Dutton, and the neat work in detail and complete of H. P. Cameron's assembled commutators. The Munder incandescent lamp was shown and a clever point was made by large pictures of the Brooklyn Bridge with its huge "Welcome Dewey" sign built up from 8000 Munder lamps.

THE CRANE COMPANY, of Chicago, although making nearly everything used in power plants, found that the limited space at its disposal prevented an exhibit of a complete line and

only such articles were shown as it was thought would prove interesting to users of high pressure steam. The exhibit comprised an assortment of extra heavy gate valves for 250 lbs. steam pressure, showing the No. 8-E with inside bronze screw, the No. 10-E with outside steel screw and yoke and the No. 11-E with outside steel screw, yoke and by-pass. High pressure globe and angle valves, Nos. 20-E and 21-E, pop safety valves, automatic relief valves, flanged fittings, large pipe, flanged to show style of workmanship, brass valves and pipe threading tools. Sections of the wedges and hard metal seats of the gate valves were also shown to illustrate the method of construction. The exhibit was in charge of J. A. Minwegen.

J. P. SJOBERG & COMPANY, manufacturers of street car woodwork, New York, were represented by J. P. Sjoberg and W. J. Walker.

THE SPRAGUE ELEVATOR COMPANY, of New York, through C. A. Benton, called attention to the ingenious system worked out by F. J. Sprague for handling trolley cars in car houses by electric elevators, so that better storage can be obtained in a tall building with facilities for easy release for service. The proposed scheme of operation was designed for the following conditions, viz.: that the elevator should be operated with load only, which load need not necessarily be the maximum one, but should consist of, at least, an empty trolley car on the platform. These conditions are specified for economical operating reasons only, otherwise the net hoisting duty imposed upon the machine would be too great to allow the economical operation. The elevator sys-



EXHIBIT OF GARTON LIGHTNING ARRESTERS

tem is in equilibrium when the platform is carrying its maximum load, and under these conditions the highest economical rate of operation is attained, for the reason that the only power consumed is that which is necessary to overcome the friction in the various parts of the system. By employing the system as above described, it is evident that with proper changes in the weight of the drum and car counterweight, any conditions of average load can be successfully met with this type of machine. The capacity of the hoisting machine itself, as shown in blue print and as designed and built for the Central London Railway, is 10,000 lbs. net on the hoisting drum at a speed of 200 ft. a minute. By the multiple sheave arrangement proposed, the machine is amply able to meet the duty required at a speed of 100 ft. per minute. The control used in connection with this machine is entirely electrical and includes all the safeguards in the way of automatic upper and lower limits of car travel, slack cable device and speed regulator. These devices, in connection with the form of controlling switch used on the car itself, render the system safe under all conditions. In addition to Mr. Benton, the Sprague interests were represented by Mr. Shepard on behalf of the multiple-unit system, and Mr. Kittle, of Chicago, in behalf of its generators and motors.

THE IRONSIDES COMPANY, of Columbus, Ohio, had a very attractively arranged exhibit, representing a collection of barrels marked with the names of its respective specialties. The sign "Lubrication Without Oil" attracted attention. The specialties of this company comprised materials for preservation and protection of wire ropes and fibre ropes, the lubrication of gearing, paints for metallic surfaces, etc. For the electric cars the company is placing special stress on its lubricant for motor gearing, and to demonstrate the merits of this material, had on exhibition a pair of stand-

ard motor gears which had been treated with this lubricant gear shield. Large number of orders were reported as having been placed during the convention. This material has not only been shipped to all sections of this country, but orders have been taken from many distant parts of the world.

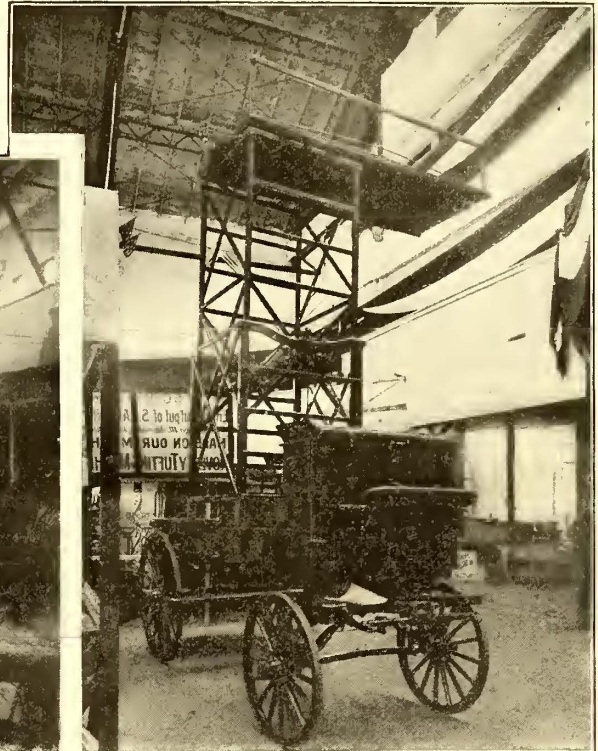
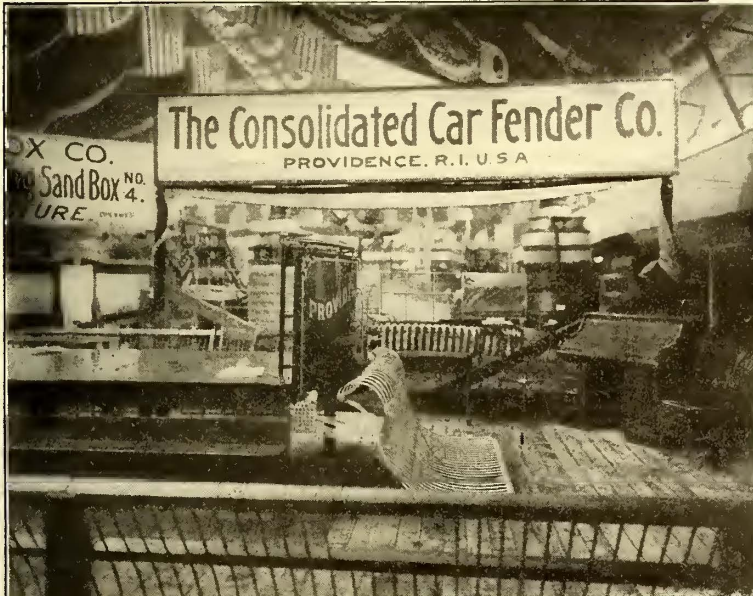
THE CHICAGO MICA COMPANY, of Chicago, had a neat pink and green booth in the gallery in charge of W. F. Hatch, secretary, and W. A. Snider. This is a new company in the mica business, but reports that it has already established a good trade. Its special mica composition is known as "Micabonds."

W. R. MASON, St. Louis, representative of the Siemens-Halske Company, of America, and who never misses a convention, was on hand in the interests of his company.

THE W. H. SILLS MICA COMPANY, of Chicago, had a wall space where it showed, on a board, a handsome collection of its products. C. B. Wisner, president, gave away an interesting card

ferred to it as the best spring construction upon the market. H. T. Bigelow, Western representative of the company, had charge of the exhibit.

THE W. R. GARTON COMPANY, of Chicago, represented many well known manufactures. The new circuit breakers of the General Equipment Company, of Camden, N. J., served to attract general and very satisfactory attention, while the Eureka flexible copper rail-bond, the latest type, was displayed in a most becoming manner. The bond is made by the Eureka Tempered Copper Works, of North East, Pa. A line of its well known knife switches, copper and gauze brushes and segments, was also shown.



EXHIBITS OF CONSOLIDATED FENDERS, M'CARDELL WAGONS, MEAKER REGISTERS AND SIEGRIST LUBRICATING SYSTEM

which showed graphically the years in which financial panics have and will occur again. It, therefore, warns the holder when to make and not to make investments.

THE UNITED STATES ROCKING GRATE BAR COMPANY, of Chicago, had one of its rocking grate bars on exhibition and gave away a "Lecture on Combustion," by his Satanic Majesty. John J. Moroney and J. F. Thompson were in charge.

MAYER & ENGLUND, of Philadelphia, were represented by A. H. Englund.

THE HALE & KILBURN MANUFACTURING COMPANY, of Philadelphia, displayed in its exhibit several styles of the popular "walkover" seats. The No. 80-3/4 seat, made with movable foot rail, attracted much attention, every one heartily approving this new feature. The grip handle, which is applied to several seats in their exhibit, also received favorable comment. Some reversible seats were also exhibited as well as sample of spring edge longitudinal seating. The Hale & Kilburn patent steel top spring work was praised by every one, and many re-

The W. R. Garton Company also arranged an operative display of the Multiplex reflectors, arc and incandescent, a line of which is just being introduced by the Multiplex Reflector Company, of Cleveland, Ohio. This reflector is a decided departure in this line and was well received. The Partridge Carbon Company, of Sandusky, had an exhibit of its plumbago, as well as treated, special and regular carbon motor brushes. The Billings & Spencer Company, of Hartford, Conn., had a handsome display of its drop forged commutators bars. One of these bars weighed almost 50 lbs. The Keystone Electrical Instrument Company, of Philadelphia, had on display a magnificent board showing its various switchboard instruments, including ammeters, voltmeters for railway and arc light circuits; ground detectors, portable instruments, etc. A. O. Schoonmaker, of New York, exhibited some mammoth sheets of India and amber mica, and his mica discs were to be seen everywhere. The enclosed arc lamps of the Lea Manufacturing Company, of Elwood, Ind., made a decidedly favorable appearance. This company makes a full line of both d. c. and a. c. machinery. Johnson & Morton, of Ithaca, N. Y., had a series of photographs of their products on display. Samples of the Pitts-

burgh Steel Hollowware Company's pressed steel gongs were also shown, and had it not been for convention rulings, certainly would have made themselves heard. The Graphite Lubricating Company, of Bound Brook, had a pretty display board of its genuine graphite and bronze trolley wheel bushings. Enamacal and Armalac, the Massachusetts Chemical Company's specialties, along with samples of its various tapes and compounds were shown to advantage. Besides Mr. Garton and Mr. Lee, members of the W. R. Garton Company, Messrs. A. L. Short, of the Eureka

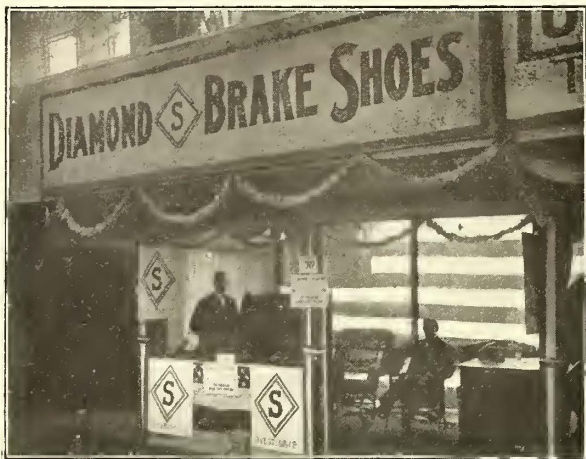


EXHIBIT OF DIAMOND BRAKE SHOES

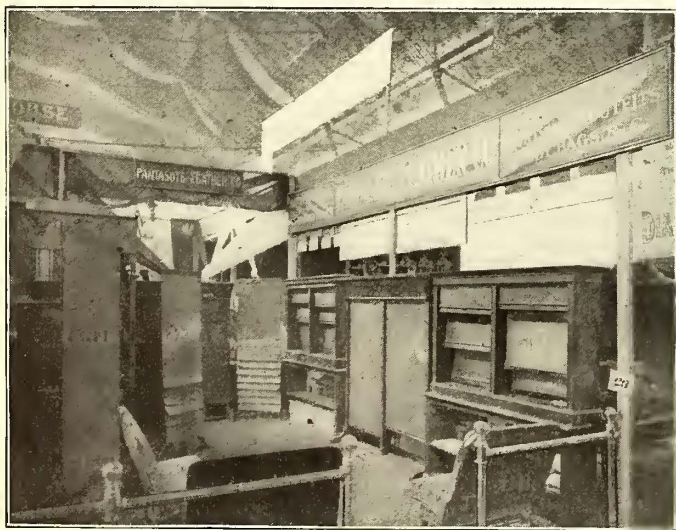
Tempered Copper Company, and James Partridge, of the Partridge Carbon Company, were present to assist in the exhibit.

BERRY BROS., manufacturers of railway varnishes, Detroit, Mich., were represented by L. M. Combs, of St. Louis, who says he will never miss another street railway convention if in his power to be there.

J. B. PERRY, of Toronto, Ont., was in attendance in the interests of the McCollum Compound Friction Car Brake Company, of Toronto.

F. A. LAPHAM, of the Cleveland Frog & Crossing Company, Cleveland, was a constant attendant.

PATTERSON & GREENOUGH, of New York, were represented by Frank L. Crocker, their Chicago representative. This firm is selling agent for the Waterloo Woolen Manufacturing



THE PANTASOTE EXHIBIT

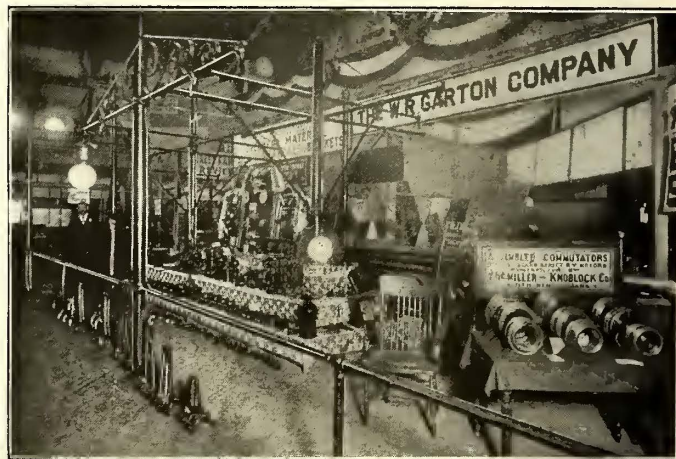
Company, of Waterloo, N. Y., and made a nice exhibit of uniform cloths, etc.

THE STIRLING BOILER was represented by B. M. Barr, of the New York office, and J. P. Snedden, chief engineer, of the Chicago office.

H. T. MERCUR, general agent of the Corning Brake Shoe, Corning, N. Y., was an active representative of this well known company.

THE ELECTRIC RAILWAY EQUIPMENT COMPANY, Cincinnati, Ohio, the well known manufacturer of street railway overhead line material and steel and iron tubular poles and brackets, had in charge of W. J. McCallum a display which was one of the most elaborate at the convention. A characteristic iron railing surrounded the space and a generous array of pole and bracket construction served to give the visitors at the convention an idea of the excellency of this line of the company's work. Across one side of the exhibit was arranged a number of 30-ft. steel tubular poles, showing various sections, diameters and lengths. Through the center of the space was arranged an oblong pedestal, supported at one end by a center pole, showing an arrangement for double track construction, and at the other by a pole upon which were mounted several of the companies numerous brackets. Upon this pedestal were shown in excellent shape the various items that go to make up one of the most complete lines of overhead material made in the world. A thorough demonstration of the company's type of figure 8 material, in all its forms, as well as that of the West End type, was most successfully given. Malleable iron pole fittings, cross arms, clamps, etc., were presented galore. Ornamental bases and trimmings for poles were also shown; in fact, all the poles erected were trimmed throughout in the latest approved fashion. One of the principal features in this display was the demonstration of the Equipment Company's method of tubular pole construction, which is meeting with so much favor to-day.

THE HUBBARD BRAKE COMPANY, of Chester, Pa., was represented by George E. Pratt, the vice-president of the com-



VIEW ON ONE OF THE AISLES

pany. The company made no exhibit, but Mr. Pratt distributed pamphlets that briefly explained the working of the company's new solenoid electric brake and secured several trial orders during his stay at the convention.

THE BINGHAMTON OIL REFINING COMPANY, of Binghamton, N. Y., was represented by A. S. Dexter, manager of the Chicago office.

A. C. VOSBURG represented the New Process Rawhide Company, at Syracuse, N. Y. Mr. Vosburg reports that the company's new plant is running to its fullest capacity and that the demand for its rawhide pinions has extended to every part of the world where gearing is used.

THE HARRINGTON RAIL BONDING COMPANY, of New York, was represented by S. H. Harrington, the general manager of the company.

THE G. C. KUHLMAN COMPANY, street car builders at Cleveland, Ohio, was represented by G. C. Kuhlman.

THE R. BLISS MANUFACTURING COMPANY, of Pawtucket, R. I., had on exhibition full-size working models of its well known Wood platform gates, of which from 45,000 to 50,000 are now in use on the street, steam and elevated railways of the United States. A working model was also shown of a new folding gate for double-door and vestibule cars. This gate, when closed, is folded back against the car body, fitting very well into the narrow panel found on double-door cars. Another novelty shown was the Crone pneumatic gate for use on air power cars or cars using air for brakes. This has been in use for two years and gives good results. The exhibit was in charge of N. H. Colwell, the general manager of the company.

JAMES L. HOWARD & COMPANY, Hartford, Conn., were represented by F. K. Dorrance, of the Western Union Building, Chicago. Models were shown of the Agard vestibule sliding door. This door is used successfully on the cars of the Hartford Street Railway and other Eastern roads, and is considered a very decided improvement over hinged doors.

F. H. NEWCOMB, of New York, manufacturer of uniform caps, made an interesting exhibit, showing samples of uniform caps as supplied to various companies throughout the United States.

THE CROUSE-HINDS ELECTRIC COMPANY, of Syracuse, manufacturer of the Syracuse changeable electric headlight, was disappointed in not getting its goods to the convention in time to make an exhibit. The company was represented, however, by its Chicago representative, John W. Brooks. The company reports that it has never been so busy since its organization. The "Syracuse Changeable" has become the standard headlight on a large number of roads throughout the United States, and is generally regarded as not only the highest type of headlight manufactured, but the most economical one to purchase, as one light answers for either end of car or for either a summer or winter car.

THE HUNTER ILLUMINATED CAR SIGN COMPANY was represented by Lytle J. Hunter, the president of the company, and made an exhibit in connection with the Morris Electric Company, the Eastern agent for the company. The company showed

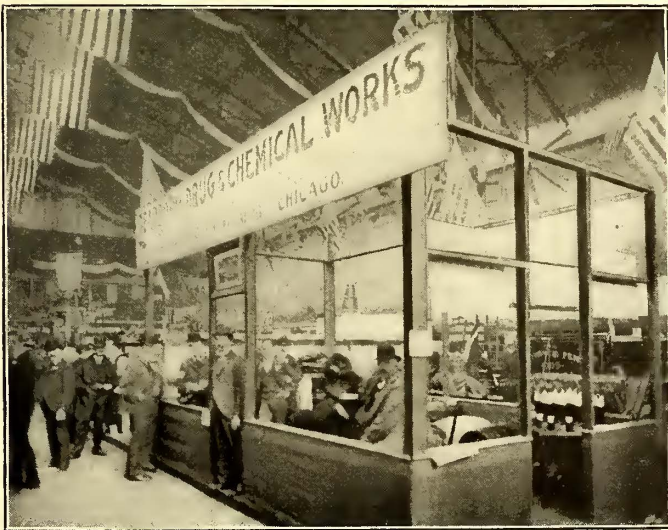


EXHIBIT OF THE DEARBORN DRUG AND CHEMICAL WORKS

an illuminated car sign with over thirty changes and arranged to be easily operated by the motorman.

EDWARD ROBINSON, New York, sole proprietor and manufacturer of the Wells light, was an early arrival at the convention. The Wells light is known to practically every steam and street railway for use in night construction and repair work.

THE VULCANUS FORGING COMPANY, of Cleveland, Ohio, was represented by Alfred G. Hathaway, who is well known in the street railway field as the builder of the Hathaway transfer table.

P. F. LEACH was present at the convention, representing Leach & Simpson, of Chicago, selling agents for The Bass Foundry & Machine Company, of Fort Wayne, Ind., builders of engines and boilers, and manufacturers of car wheels and railway castings.

THE ADAMS-BAGNALL ELECTRIC COMPANY, of Cleveland, was represented by E. J. Bagnall.

THE JEWETT CAR COMPANY, of Jewett, Ohio, was disappointed at not receiving its shipment for exhibition. A. H. Sisson, manager; C. E. Krebs, secretary, and N. Paulson, superintendent, were in attendance.

THE ST. LOUIS CAR WHEEL COMPANY, of St. Louis, was represented by A. A. Hilton, sales agent for the company.

SALVATOR POTIS, formerly chief engineer of the North and West Chicago Street Railway Companies, was a visitor at the convention.

THE AMERICAN CAR & FOUNDRY COMPANY, whose general offices are now in St. Louis, with manufacturing plants located at various points, both East and West, had a very practical

exhibit of street car wheels. The exhibit was in charge of Scott H. Blewett, of the home office. A feature of the wheel exhibit was the display of finished wheels, with parts broken from their rims in such a way as to show the strength of the metal used in the rims, hubs and spokes, and the depth of the chill. The sample wheels shown included plate wheels for interurban service, plate wheels for ordinary city use, and a new style of key seat designed to save the strength of the axle. The display was made under the joint auspices of the Missouri Car & Foundry Company, the Wells



NEW M'GUIRE SWEEPERS

& French Company and the Terre Haute Car & Manufacturing Company, as the output of all of these concerns is now controlled by the American Car & Foundry Company.

THE AMERICAN RAILWAY SUPPLY COMPANY, of New York, maker of badges, had on exhibition a very handsome sample board of conductors' and motormen's badges in bronze, nickel and aluminum finish.

THE STANDARD UNDERGROUND CABLE COMPANY, of Pittsburgh, was represented by its Western sales manager, J. R. Wiley. The full line of samples usually shown at ex-



TAUNTON NOSE AND SHARE PLOWS

hibitions of this kind is now at the Export Exposition in Philadelphia, and on this account Mr. Wiley simply distributed the company's literature and "took orders." The Standard Company's manufacturing capacity is now so heavily taxed that it is building a new factory at San Francisco, and another in the East.

THE PROTECTED RAIL BOND COMPANY was very ably represented by J. M. Atkinson, Chicago, representing the Western territory, and A. H. Englund, of Mayer & Englund, Philadelphia, Eastern representative.

THE GARL ELECTRIC COMPANY, of Akron, Ohio, had an attractive booth, in which were shown the telephones manufactured by this company for railway work. In the branch of car

dispatching by telephonic communication, the company has made a specialty and its system is employed on a large number of roads. Mr. Garl was present in person and explained the method of operation to the visiting delegates.

THE PANTASOTE COMPANY, of New York, was represented by John M. High, the general agent, and H. M. Grier, the Western agent of the company. The display of car curtains for both open and closed cars, as well as curtains and upholstery material, was very handsome. Some especially striking effects are obtained by the use of curtain material with silk finish. Pantasote curtains were shown on a sample car made by the St. Louis Car Company for the Chicago City Railway Company. Pantasote as applied to other products, such as sportsman's outfits, caddy bags, etc., also formed a part of the exhibit.

THE MILWAUKEE RAIL JOINT & WELDING COMPANY, of Milwaukee, had an exhibit at Tattersall's consisting of a variety of rail sections showing the actual condition and appearance of the cast joints employed in its system. The exhibit was carefully examined by many delegates who universally commended the system, especially the feature by which the joints can be cast

pany. Edgar Peckham, the well known president of the company, was not in attendance. In addition, the company had one of its "Metropolitan Special" trucks in the exhibit of the Westinghouse Company.

E. A. and HIRAM B. CURTIS, of the Chicago Truck Company, were there.

THE BALTIMORE CAR WHEEL COMPANY, of Baltimore, Md., was represented by J. Paul Baker, secretary of the company, and exhibited one of the Lord Baltimore maximum traction trucks. This style of truck met with many favorable comments and gave the impression of strength and durability. Mr. Baker stated that the company had received many orders for this type of truck, including one of good size from Baltimore.

THE EXHIBIT of the Griffin Wheel Company, of Chicago, was one of the most tasteful at the convention. The space was given up to showing samples of different sized wheels made by this company, and sections of wheels, exhibiting the character and depth of chill. The exhibit was in charge of C. K. Knickerbocker, who had many customers among the delegates, all of whom spoke in the highest terms of the service given by the Griffin wheels. An

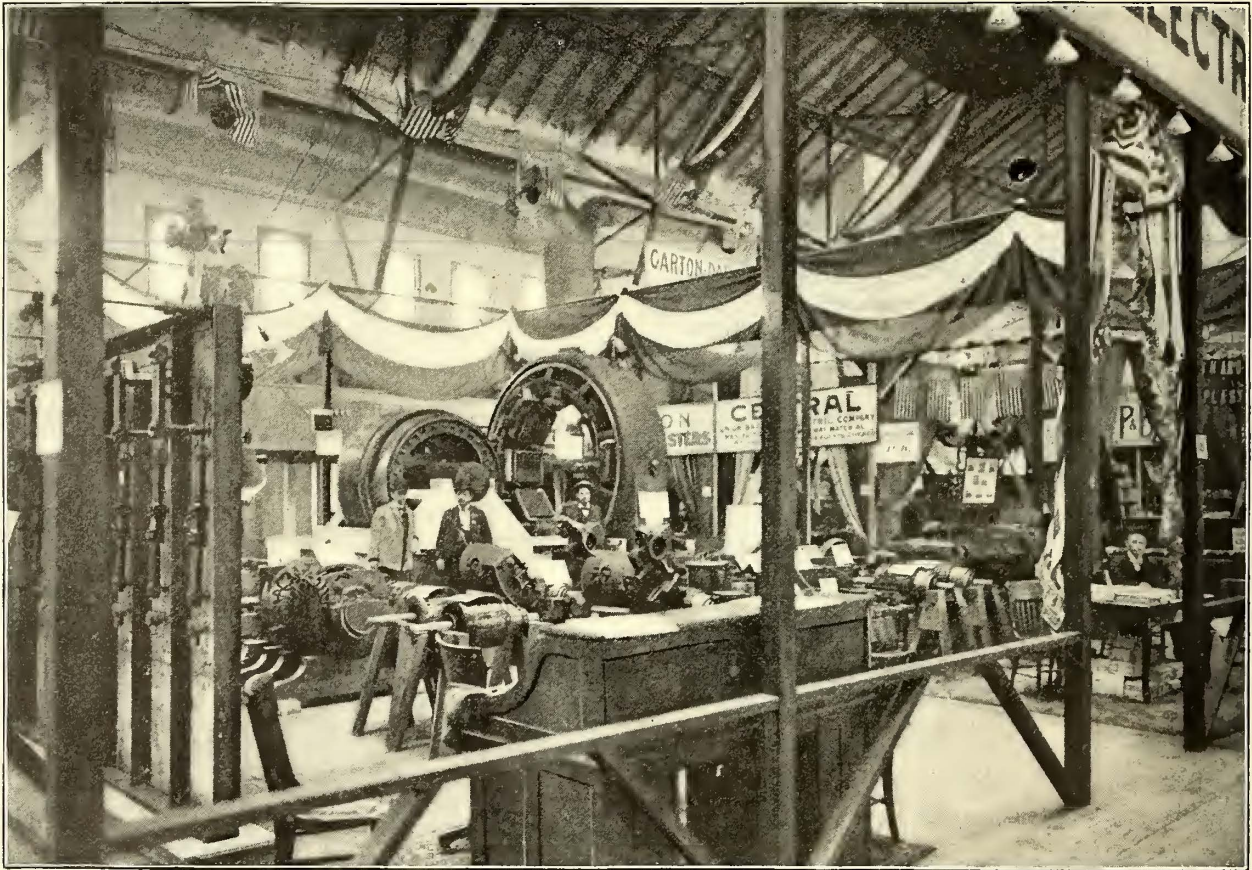


EXHIBIT OF THE WESTINGHOUSE ELECTRIC & MANUFACTURING CO.

without removing ties. In addition to completed joints, the company showed the steel jackets used as molds. E. M. McVicker, manager, and H. L. Prather, of Cleveland, Eastern agent, were present.

J. A. RUTHERFORD was at the convention with an attractive exhibit of samples of wire and cable for street railway purposes, as manufactured by the Pittsburgh Reduction Company, of Pittsburgh, Pa.

A. M. KITTRIDGE, manager of the Barney & Smith Car Company, Dayton, Ohio, made a hurried visit to the convention.

THE PECKHAM MOTOR TRUCK & WHEEL COMPANY, of New York and Kingston, did not consider it necessary to make as elaborate an exhibit as in former years, partly because its trucks have been employed so extensively in Chicago that practically all types can be seen, from the single trucks used under surface cars, to the heaviest double trucks employed on the South Side Elevated cars, and partly because the truck has been so widely adopted elsewhere that it can now be seen in operation in practically every large city in this country and abroad. The company had on exhibition, however, two of its latest type of truck, the 14-B3, described in the last issue. These trucks were equipped with motors, were examined with a great deal of interest by the delegates in attendance and their merits were explained by E. G. Long, J. A. Hanna and W. H. Gray, who represented the com-

pany. The attractive feature of the exhibit was the unique railing surrounding the booth; it was made up largely of small half wheels which gave a most business like appearance to the space.

THE J. G. BRILL COMPANY, of Philadelphia, was represented by W. H. Heulings, Jr., and G. M. Haskell, of the company's New England office. The Brill Company made no regular exhibit, but had a parlor at the Auditorium, where were shown models of the company's trucks, as well as photographs of some of the latest styles of cars built by it. These headquarters were very popular, particularly in the evenings, and visitors were most hospitably welcomed.

THE ST. LOUIS CAR COMPANY, of St. Louis, made no exhibit, but was ably represented by George Kobusch, the president of the company; Charles Y. Flanders, Eastern agent, and Lytle J. Hunter, Cincinnati representative.

THE CLING SURFACE MANUFACTURING COMPANY had an exhibit which attracted much attention from those steam users who are employing belted plants, and while direct connection has made great advance during the past few years, there are still many power stations in which belts are employed, and a number of engineers remarked that their number might have been greater if the Cling Surface had been on the market for a longer period of time. This compound has been indorsed by the highest

authorities in steam engineering, and its merits were clearly demonstrated in a practical way at the Chicago Convention.

G. P. MAGANN AIR BRAKE COMPANY, of Detroit, was represented by W. D. Ray, the company's general manager, and expected to have on exhibition its storage system of air brakes applied to a Peckham truck. Unfortunately the apparatus did not arrive in time to be shown in the hall, but the advantages of the storage system of air brakes were explained by Mr. Ray, who pointed out the fact that no compressing machinery is required on the car and that the car mechanism is reduced to the greatest degree possible. The absence of compressing machinery includes, of course, the elimination of all noise, and possibility of accident to this part of brake mechanism. Although this system has been on the market for less than a year, the orders secured have been numerous and the company is now entering upon the second year of its existence with an enviable record.

THE ELECTRICAL INSTALLATION COMPANY, of Chicago, was well represented at the convention, those of the firm present being J. I. Case, president; F. H. Fitch, vice-president; J. A. Brett, general manager, and A. M. Hewes, secretary and treasurer. This company has made a remarkable record during the six and a half years it has been in business, having closed in that time 112 contracts for street railway and lighting work, which number will be materially increased before the end of 1899, by the addition of several other contracts, upon which the company is now figuring. During the past season, the company has completed work in Kansas City, Vicksburg, Miss.; Chicago, and many other cities. The company is prepared to entertain propositions for any kind of electrical construction in any section of the country.

W. E. DODDS, of the Allis Company, Milwaukee, and J. B. Allan, Chicago representative of the company, were in attendance.

THE POWER TRACK CLEANER COMPANY, of Toronto, Can., exhibited at the convention, a track cleaner and digger, which is for use in both winter and summer. This is a contrivance for cleaning the track, so made that it passes over the uneven joints in the track and clears all obstructions before it. It is within control and easy operation of the motorman and can be placed upon the smallest platform without interfering with the brake or controller. Those roads which have used it have given the most flattering testimonials concerning its work. The company will shortly open up an office in the States, probably in Chicago.

THE KANSAS CITY CAR & FOUNDRY COMPANY, of Kansas City, Mo., showed various types of street car wheels. The company manufactures every type of wheel for car and engine service. The company was represented by F. W. and A. J. Fisher.

THE WESTERN ELECTRIC COMPANY, of Chicago, was represented at the convention by J. C. Cannon, Philip Rust and F. L. Swan. They had headquarters in booth 30, where they entertained friends of the company and distributed printed matter and souvenirs to visitors. The souvenir was a match-box having on one side an illustration of a petite arc lamp, and on the other, an illustration of a 16-in. fan motor. On both edges of the box were "Western Electric Company, Chicago-New York." The box was finished in silver and white celluloid.

JOHN T. McROY, inventor of the McRoy vitrified clay conduits, and who is owner of what is said to be the largest clay converting works in the world, was on the special New York Central Lake Shore train, bound for Chicago, and attended the convention. Mr. McRoy says that the entire output of his work is sold for two years to come.

THE AMERICAN CAR COMPANY, of St. Louis, was represented by William Sutton, president, and E. J. Lawless, of New York.

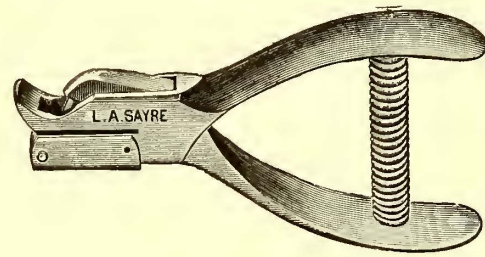
GEORGE E. SHINKLE and A. WHITING WATRISS, Chicago representatives of Charles A. Schieren & Company, were active at Tattersall's, though they did not make an exhibit.

THE HAM SAND BOX COMPANY, of Troy, N. Y., was present, as usual, and the exhibit of its box attracted much attention. The construction of this box is so well understood that no particulars are required here. It need only be said that the fact that the box has no valves and few parts, and is warranted not to rust, leak, waste sand and draw moisture, made the exhibit an interesting one. The box is used extensively in Chicago.

E. J. BAGNALL, of the Adams-Bagnall Company, was in Chicago during two days of the convention, and visited the exhibit at Tattersall's. The Adams-Bagnall Company is just putting upon the market a new arc lamp, which it believes is the first satisfactory lamp of this kind yet put out.

THOMAS AHEARN, of Ottawa, one of the best known engineers and contractors, of Canada, was present at the Chicago convention on Wednesday and Thursday, and will come to New York before returning home.

L. A. SAYRE & COMPANY, makers of punches, Newark, N. J., were represented by Mr. Sayre, who showed their No. 428 punch, which is especially adapted to street railway service and



MINIATURE PUNCH

which is in use on a large number of railways. Mr. Sayre presented to the street railway people present one of the most unique and handsome souvenirs that was shown. It consisted of one of their No. 428 punches in miniature size and a handsome deck of playing cards, both enclosed in a handsome case. An illustration of this punch is shown herewith.

Exhibit of the Christensen Engineering Company

The Christensen Engineering Company's exhibit at the convention consisted of—

First.—A complete air-brake instruction stand showing the operation of the independent motor compressor air brake. This instruction equipment is more particularly described in the Christensen Engineering Company's catalogue B, page 37.

Second.—An installation of a five-car equipment, with automatic air brakes complete and in operation, with air gages showing the pressure in each cylinder on application of the brakes. The triple valves are the Christensen quick-acting type, suitable for steam railway practice. This is the device on which the Court of Appeals for the District of Columbia recently rendered a favorable decision. The engineers' valves in this five-car equipment are of the automatic train pipe feed type, giving excess pressure in the main reservoir.

Third.—An exhibit of a special high-pressure air compressor made for the United States torpedo service. It is designed for 1500 lbs. per square inch, and is capable of compressing up to 2500 lbs. The storage tanks for this compressor are tested to a pressure of 4000 lbs. per square inch, and are made in one piece of steel on the cold-drawn process.

Fourth.—A complete portable air-compressing apparatus for use around car shops and power-houses. It consists of an air compressor of 11 cu. ft. of free air capacity per minute, together with automatic cut-out switch, fuse, piping, etc. It weighs about 800 lbs., and is mounted on a truck, so as to be wheeled about wherever it is desired to use the compressed air.

Fifth.—A portable air-compressing apparatus, built up in substantially the same manner as the one above mentioned with the exception that it is a much larger compressor, being of a capacity of 50 cu. ft. of free air per minute. Its weight complete is about 1600 lbs.

Sixth.—An air hoist of the standard type, made by the Christensen Engineering Company, having an automatically closing valve working in such a way that no air can enter into the hoist from the main reservoir, nor escape from the hoist to the atmosphere without the operator holding the valve open, either for admission or exhaust.

The company brought a new catalogue to the convention, and among the many courtesies bestowed upon the delegates was the presentation by the company to each lady attending the banquet of a beautiful basket of flowers. The company was represented by S. W. Watkins, N. A. Christensen, A. Beveridge, and W. J. Richards, of the home office, and F. C. Randall, general Eastern agent.

Exhibit of the Westinghouse Company

The most costly and elaborate exhibit made at the convention was that of the Westinghouse Electric & Manufacturing Company. The largest piece in the exhibit was a 500-kw. "engine type" railway generator complete—a beautiful machine in design and workmanship. The armature was placed on a platform apart from the fields, so that both could be examined to better advantage. There also appeared in the Westinghouse exhibit a 200-kw. rotary converter, equipped with starting motor, and a rail-

way station switchboard complete for three generators, six feeders and one load panel, together with two No. 68 500-volt railway motors, with auxiliary apparatus, mounted on a Peckham truck, two No. 49 500-volt railway motors, with auxiliary apparatus, mounted on a McGuire truck; one No. 70 railway motor complete, one No. 59 railway motor complete, one No. 56 railway motor complete, and several armatures partially wound, with commutator connected, so that all stages in the building of the armature could be observed, and a complete line of detail apparatus, including fuse boxes, lightning arresters, canopy switches, etc., used in street railway equipment.

The 500-kw. generator was one of three of the same size recently sold to the Monongahela Traction Company, of Pittsburgh, and the switchboard is also sold to the same company. The No. 68 and No. 69 motors are the latest types built by the Westinghouse Company, and in placing them on exhibition the company called attention to a number of new features of great importance. One of these is the increased current-carrying capacity of the field windings, by means of which an equal temperature rise in both field and armature is permitted, instead of, as has heretofore usually been the case, the passage of more current, in proportion, through the fields than through the armature. Another feature is found in the use of field poles, which are bolted to the yoke, instead of being cast in, as has been the practice for the last ten years with the Westinghouse and other companies. These new motors were originally built on an order from the Third Avenue Railroad Company, of New York City, and since then large orders have been placed by the Brooklyn Rapid Transit Company and others.

The company was represented at the convention by the following: William Bauder, J. M. Duncan, C. S. Cook, W. M. Probasco, F. McCoy, J. H. Reid, C. E. Skinner, N. W. Storer, F. S. Smith, of Pittsburgh, Pa.; W. W. Grant, of Ottawa; J. R. Gordon, of Atlanta; H. C. Marsh, of Cincinnati; R. S. Brown, of Boston; C. H. Bragg, of Philadelphia, and C. S. Powell, of Cleveland; W. S. Rugg, Irvin Dryer, C. W. Regester, Frederick Nelson, C. G. Burton, W. R. Pinkard, L. M. Harvey, T. A. Hall, T. P. Gaylord, and Ivor Hennings, of Chicago; T. Julian McGill, of Minneapolis; C. F. Medbury, of Detroit, and A. Hatet, of the Westinghouse Electric Company, of France.

New Type of Electric Brake

A new electric brake, in which the motors are used as generators, has been placed on the market by the Hubbard Brake Company, of Chester, Pa. The brake consists of a large solenoidal magnet, to the plunger of which the brake levers are connected without interfering with the hand brake. The latter is left intact and ready for use. The solenoid is actuated by changing the motor terminals so that they will act as generators while the car is in motion, and these connections are made by a movement of the brake controller. The amount of current taken from the motors is about 25 amps. maximum, and the braking effect is automatically reduced as the speed of the car decreases, so that the greatest braking efficiency is obtained, while the possibility of sliding the wheels is prevented. The latter fact also eliminates trouble from flattening wheels. In case of accident to the motors the line current can be used to set the brake, but ordinarily the motor current is used.

In the system two brake controllers are employed, one on either platform. They are of about one-third the size of the car controllers, of which they are independent, except that if the brakes should be applied while the car controller-handle is on the "on" position, the connection between the motors and the line current is broken.

The general manager of the company is George E. Pratt, well known in street railway circles.

Resistance Tests in Chicago

The Chicago Edison Company has recently been making some interesting tests of resistance under different conditions of working contact. Readings were taken upon a Weston milli-voltmeter reading .0002 volts per degree. The first test was taken across the joint of an Edison tube through extension strips with contacts bolted. The average current was 1800 amps. and the ten readings varied from .00550 to .00544 volts. The average was .005466. The same joint was tested later with contacts amalgamated and treated with the Edison-Brown plastic alloy. The current used was 1740 amps. and the average drop was .003564.

Similar tests were made on a tube in the Edison Company's

subway, near the Chicago River, with ordinary bolted contact and 1800 amps. The drop in voltage, with 1800 amps., averaged .004619. For the same joint, with contact amalgamated and treated with Edison-Brown plastic alloy, the average current being 1730 amps., the drop was .00321. Other tests were made, indicating about the same difference in resistance, due to the use of this device.

Cork as a Frictional Agent

The use of cork for frictional purposes in brake shoes by the Composite Brake Shoe Company, of Boston, is well known, and it has proved so satisfactory for this purpose that the company is extending its application to other industrial uses, notably to discs and friction clutches in machinery. Such discs are now being used on the friction clutches of heavy movable-bed reversible planers for reversing the travel or motion, and where the application of the clutch with cork inserts is made twenty-five or more times per minute. The action is found to be quick, but without gripping effect, due, without doubt, to the elasticity of the cork. Oil is freely used on the clutch without apparent detriment to the functions of the cork inserts.

The application of cork in brake-shoes is not confined to steam and street railway service, but is coming into general use on fire apparatus and heavy wagons and carriages, and is also being experimented with on horseless carriages. Another field which is attracting special attention just now is its application to rubber tires, for which it has manifest advantages.

In the electric railway service in New England this brake-shoe is very largely used, and it is found that the elasticity of the cork overcomes the usual gripping effect and the flattening of wheels, and secures a smoother running of the cars. Wood plugs were formerly used, but cork is more tenacious, and, because of its elasticity and resilient nature, it will not become impregnated with iron particles from the wheels, or gather up sand and grit from the street, an important feature in connection with rubber tires.

Legal Decision

A decision in favor of the defendant has recently been rendered in the suit of the Consolidated Car Heating Company vs. the Palmer & Monson Street Railway Company. The suit was brought for the alleged infringement of patent No. 608,211, on improvements in electric heaters, and was defended by the Gold Car Heating Company, whose heaters were being used by the street railway company. The decision just rendered declares that these Gold heaters are not an infringement of this patent.

The Largest Rope Cable in the World

What is said to be the largest rope cable in the world is in use on the Glasgow district subway, and was manufactured by D. H. & G. Haggie, of the Wearmouth Patent Rope Works, Sunderland. Its weight is about 55 tons. The last cable removed from this cable road was also manufactured by the Messrs. Haggie, after a life of 14½ months. The previous best record was 10½ months. In other words, the rope just removed ran 85,000 miles, while the previous best record was 61,000 miles. The success of this cable is largely due to the improved cable-making machinery specially erected by Messrs. Haggie. The process adopted by them consists in making the strands and closing the rope on one machine, thereby securing the greatest possible efficiency and a perfect mechanically constructed rope.

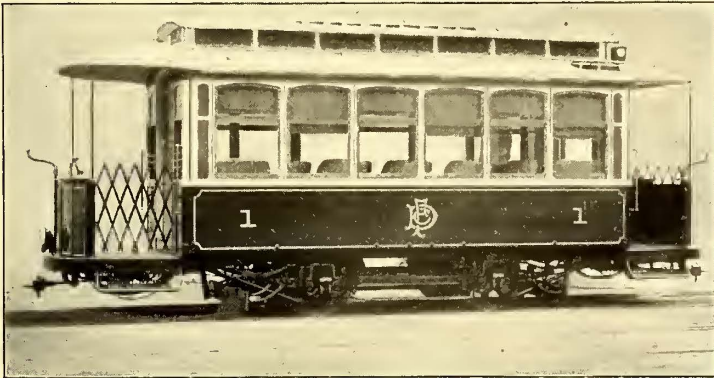
Enclosed Rheostats

The inclosed type of rheostat has become the favorite type for motor starters during the past few years. The resistance material is usually in the form of a reflex ribbon, which is embedded in sand, which sand is the filling material of a shallow box made entirely of iron or having one face of slate. A patent was issued Oct. 24, 1899, to H. Ward Leonard, which thoroughly covers the essential features of this form of rheostat box. The patent contains twenty-eight claims, and a typical claim reads as follows:

Claim 23. "In a resistance box, the combination of a box having two large parallel surfaces and a relatively narrow edge, one of the large surfaces being in the form of a cover, a resistance within the box arranged in steps or sections, terminals to which said steps or sections are connected, and a removable filling of mineral insulating material surrounding said resistance."

Street Car for Mexico

The car shown in the illustrations herewith is one of a large number recently built for the Ferro Carril del Distrito of the City of Mexico. Externally these cars are very handsome, the large monogram and the straight panels setting off the gold of the lettering to admirable advantage. The length over the end panels is 18 ft. and the total width 8 ft. 2 ins. There are two platforms, each 4 ft. in length, making the length over the dashers 26 ft. The cars are mounted on Brill No. 21-E trucks, with 7-ft. wheel base, and equipped with two G. E.-1000 motors. There are eight reversible back seats, covered with woven cane, and four stationary back seats in the corners. Spring roller curtains are fitted to the windows, which are made to drop into the side of the car. The



CAR FOR MEXICO

use of the cross seats was one of the reasons which brought the innovation of a straight-side car for street railway use. By a proper design and putting together of the side frame an exceedingly strong belt was obtained below the windows. The braces were cut into the belts, and posts secured with screws, and the sheathing was put on in the usual way and then glue-blocked afterward. Inside, the height from the floor to the belt rail is 2 ft. 3 ins., and from the bottom of the sill over the trolley-board about 9 ft.

As these cars have to be run in trains, there is a 15-in. opening in the center of each dasher. This has a sliding iron door, which goes in from the top, and when not in use is placed in grooves at



INTERIOR OF MEXICAN CAR

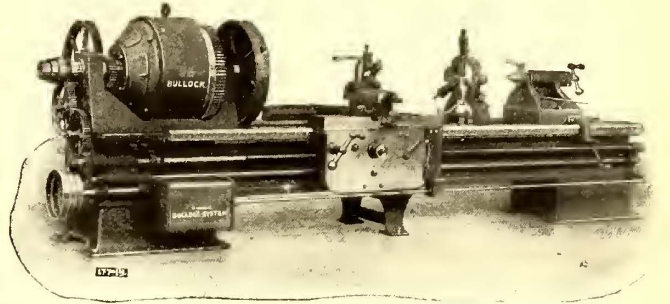
for the passenger, presenting the good features of elegance with light effect. The central chandelier is a combination of oil and electric lamp.

Electrically Driven Lathe

The practice of driving machine tools individually by electric motors, a method which is growing popular in many industrial establishments, seems particularly applicable to electric railway repair shops.

The illustration herewith shows a 28-in. swing-screw cutting engine lathe of this kind, driven by a Bullock, type "N" motor. As will be seen, the motor is placed directly on the spindle in the head stock, taking the place of the cone pulleys. The armature spider is built directly upon the hollow spindle of the lathe.

By means of a new system of variable speed control the motor is given a greater range of speed, without loss of torque, than is

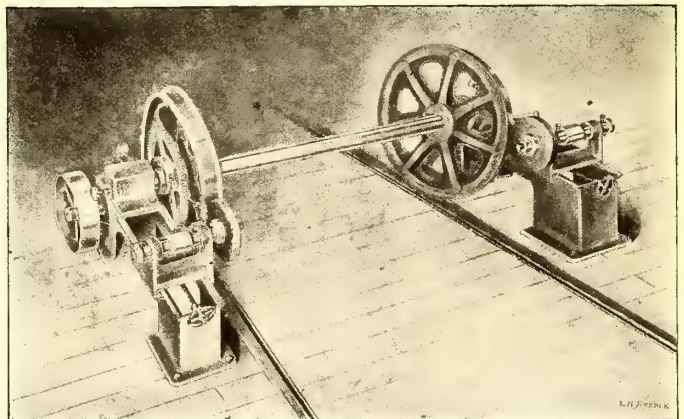


ELECTRICALLY DRIVEN LATHE

ordinarily given by the cone pulley, having sixteen speeds in either direction, including the back gear. The controller is placed upon the leg of the lathe directly under the head stock, and is operated by a spliced shaft running along the bed of the lathe, and a handle which travels with the carriage. The slowest speed is 60 r.p.m., and the highest about 250 r.p.m.

Car Wheel Grinder

Below is shown a new car wheel grinder designed to meet the demand for a substantial grinder at a low price. In this grinder the car wheels are rolled into bearings from the rear end, and the difference in the size of the axles is provided for by an adjustable



CAR WHEEL GRINDER

one side of the opening. Brill angle iron bumpers and Brill gates are fitted to the car. There are also two Brill sand-boxes and two Dedenda gongs. The trim is solid bronze throughout. The signal lamps are in a rather unusual position, being placed diagonally opposite each other on the roof landings. This is at the right-hand corner of the car going forward. It should be added that there are four spectacle glasses for each lamp, presenting four different colors—red, blue, green and yellow. The headlights are electric.

These cars were built on the Brill special system of construction, by which, after being completely finished "in the white," they are taken apart and shipped; one only of the whole number was completely painted in this country. From the view of the interior it will be seen that the car is a pleasant and agreeable one

bushing operated by a screw. The car wheels are revolved at about 10 r.p.m. by a large gear and pinion, the latter being driven by a large pulley, which is belted to a small pulley on the counter-shaft. The large gear is held on the car wheel axle by a screw with adjustable bushings, and is put on before the car wheel is rolled into the machine.

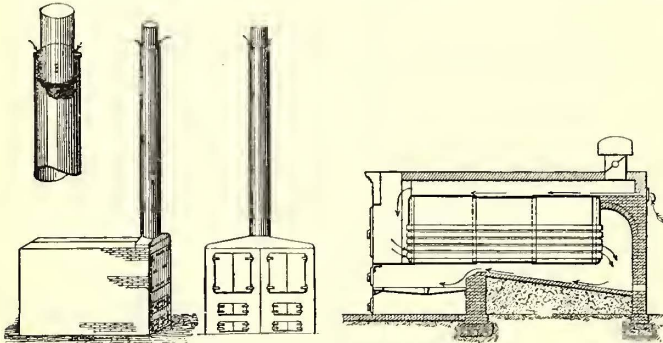
The bearings for the emery wheel are two sleeves, each 7 in. long, with dust-proof collars. A sliding motion is obtained by a keyway cut on the outside of the sleeve bearings. An eccentric on the car wheel gear gives an automatic feed across the face of the car wheel. An emery wheel with a grooved face is used for grinding the car wheel flanges.

The advantages claimed for this grinder are that the adjustable bearings for the axle enable the operator to grind the wheel true

with the axle, even though the axle be worn or sprung, and that the weight of the car wheels can be much more easily supported by adjustable bearings when the strain is downward than on centers where the strain is outward as well as downward. The machines carry two 14 ins. x 1½ in. emery wheels. The grinder is manufactured by the Hampden Corundum Wheel Company of Brightwood, Springfield, Mass.

Schlicht Process of Combustion

Radical changes in methods of generating steam have been comparatively rare recently, as it is generally assumed that this branch of steam engineering has reached a stationary condition, so far as principles are concerned. For this reason the Schlicht process of combustion, which is certainly bold and novel in conception, has attracted much interest, especially from the fact that it has been employed in a number of manufacturing establishments with excellent results. Some of the prominent users of this



NEW PROCESS OF COMBUSTION

process are Fuchs & Lang Company, Brooklyn; Barber Asphalt Paving Company, Long Island City; the Fleischmann Distillery, Blissville, L. I.; Summit Silk Mills, Summit, N. J. The theory of the economy resulting from this process is the introduction of hot air, instead of cold air, into the combustion chamber. The method of this introduction, which constitutes the peculiarity of the system, is through the chimney. The process was thoroughly described by Mr. Schlicht in an address read before the Franklin Institute about a year ago, and in which he stated that when a tube of smaller diameter than the stack or chimney is inserted in the latter, the gases of combustion will escape through this tube,

of this invention, that its critics were convinced and then spoke in the highest terms of the invention.

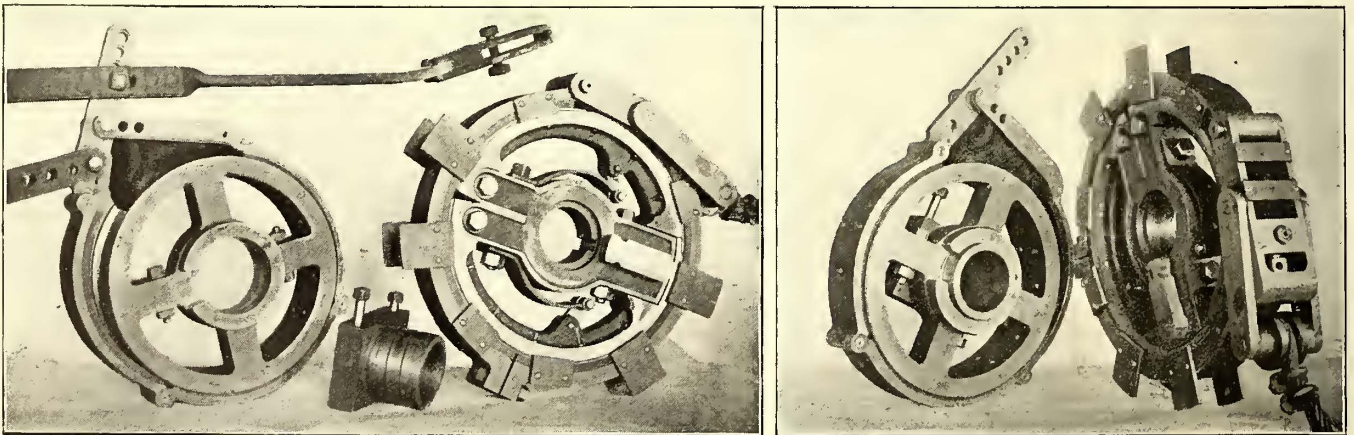
Another interesting feature of the device is that separate chimneys to each furnace are not necessary for its successful use, but that each furnace will automatically take the quantity of air proportional to the combustion occurring therein. For instance, if twice the amount of fuel is being burned in one furnace than in another, both connected with the same stack, approximately twice the amount of air will automatically flow into the combustion chamber of that furnace. When used in furnaces burning soft coal the system materially reduces the amount of smoke injected into the air. The process is being placed on the market by the Schlicht Combustion Process Company, of New York. H. M. Thompson is vice-president and general manager of the company.

New Compound Friction Car Brake

For over a year tests and experiments with a new mechanical friction brake have been conducted on one of the large double truck cars of the Toronto Railway with such success that the company has acquired the right from the owners to equip its entire system with the new invention. Officials of the Buffalo Railway Company and of the Rochester Railway Company, who have visited Toronto to examine the device, have also been so impressed with its possibilities that both companies are planning to give it a trial in high speed service on their respective systems.

The brake is composed of two wheels 18 ins. in diameter, which, when fitted closely side by side on the car axle, occupy only 6 ins. of actual space. One of the wheels is expandable and is keyed firmly to the axle. The other wheel runs loosely on a sleeve on the axle. The wheels are connected together by a loose rocker, or clutch, resting in opposite recesses in each wheel, causing both wheels to run together. A steel band lined with ½ in. of compressed paper encircles the periphery of each wheel, the band on the loose wheel being compressible while that on the keyed wheel is a rigid circle.

To operate the brake, the motorman, with suitable connection rods, gently compresses the band on the loose running wheel, retarding its motion, thereby reversing its pressure on the loose clutch, which in its turn, expands the other wheel within the rigid circular band. To this band the chain from the brake frame lever is attached, and thus the strain is put upon the brake shoes. It will be observed that unlike other friction car brakes, this not only depends on a compound, or double friction, but the wind of the chain is on an 18-in. circumference. A compression of only 1/16 of an inch on the loose wheel friction gives a great leverage



COMPOUND FRICTION BRAKE

while a current of air will flow down outside of the tube within the flue, and thus reach the fire. It is not necessary to have the deflector the same height as the stack or, in fact, at all approaching the height of the stack; its insertion a short distance at the top of the stack is sufficient for the purpose.

The air in this passage down the stack is, of course, heated from the hot gases of combustion, so that when it reaches the fire the oxygen in it will readily ignite with the combustible elements in the fuel. With this method of working, of course, no air is admitted to the grate in the usual way. At first sight it would appear paradoxical to conceive a current of air flowing in the stack in a direction directly opposite to the gases of combustion, and it was upon this ground that the Government Patent Office originally rejected Mr. Schlicht's application, on the ground of inoperativeness. It was not until the inventor had made a demonstration in the basement of the Patent Office of the practicability

on the main keyed wheel friction, makes the operator's work in the cab very easy, and gives him absolute control of his car.

In stopping on grades, there is no back roll of the car, as the wind is so far from the axle, and although the most sudden emergency stop can be made, complete control over the operation of the brake is retained. As to the durability of the apparatus, it is stated that when the parts were examined after four months' steady running, making approximately 13,000 miles, and 196,000 stops, there was no perceptible wear. It will be noticed that the frictional pressure is most severe on the band linings, and these, it is said, were found had not worn down 0.01 in. in the four months.

The brake complete weighs about 175 lbs., and outside of slight regular lubricating, is said to require no personal attention whatever. J. B. Perry, director of the McCollum Company, Bedford Road, Toronto, which is manufacturing this brake, is about to form a company in the United States to place it on the market.

Important Presentation in New York

One of the principal points brought out in the discussion in Chicago upon Mr. Yerkes' paper was on the relations existing between employees and the managements of the transportation systems in different parts of the country. Apropos of this, one of the most striking events, showing the possibility of cordial relations existing between these two departments, occurred in New York last month, and its importance, judged in many ways, is so great, that more than a passing notice should be given it. It shows clearly that enlightened treatment, coupled with a thorough understanding of the needs and wishes of the men composing the operating force, and a willingness to comply with those wishes, when reasonable, is thoroughly appreciated by the men, and able to bring about a feeling in all departments that the welfare of each is being cared for by the other.

What makes the event, which of itself, we think, was unique, the more remarkable was its occurrence within a month after an attempted strike, during which every attempt was made to create within the minds of the employees a feeling of distrust against the management, and their fidelity was assailed by all the demagogic arguments known to labor agitators, who had staked their reputations upon creating dissatisfaction against the company. It is needless to say that these efforts failed utterly, and the feeling of loyalty on the part of the road where the attempt was made was greater than ever before. The importance of this to the company can hardly be overestimated.

The event to which reference is made was the presentation of a loving cup and a set of testimonials to H. H. Vreeland, president of the Metropolitan Street Railway Company, by his employees. The presentation occurred at Carnegie Hall, Oct. 7, at the third annual meeting of the Metropolitan Street Railway Association of which Mr. Vreeland is president, and which is a mutual benefit organization of the employees of the Metropolitan Street Railway Company. The cup and testimonials were secured by a committee of the employees, entirely without the knowledge of the management, to whom the entire affair was a complete surprise. The contribution of each employee was limited in amount to 10 cents, and only those were allowed to contribute who had been with the company since before the attempted strike. In this way the offering became essentially a spontaneous tribute from those who were well acquainted with the personality and characteristics of the person whom they honored.

The cup, which is of silver, is illustrated herewith. The resolutions, which were very handsomely engrossed, bore the following words:

"The employees of the Metropolitan Street Railway Company, of the city of New York, being desirous of showing our high appreciation of your worth as an official, a man and a friend, offer you, Herbert H. Vreeland, president, our best wishes, and extend a vote of thanks for the interest taken in our welfare and the many kindnesses shown us in sickness and in health.

"That you and your family, through the grace of God, may enjoy many days in health and happiness is the prayer of the

"COMMITTEE FOR THE EMPLOYEES.

"October 7, 1899."

It is certain that no railway manager was ever a recipient of such a gift from all his employees as this, and it is one which is to be regarded as the most valuable of heirlooms.

The Metropolitan Street Railway Association, to which reference has been made, has been in existence for three years, during which time its membership has increased from 100 to 2630. Any employee of the Metropolitan Street Railway Company is eligible to membership, and it now includes most of the men employed by the company. Its main object is to give free medical attendance to its members, and \$150 to their families in case of death, at an expense of 50 cents per capita per month. During the past two years the association has also established an excellent library for its members and their families, and if any member wishes a technical or engineering book for his own use or for that of some member of his family, and the work is not already in the library, it will be purchased upon request.

The meeting on Oct. 7 was preceded by an address by the presi-

dent, Mr. Vreeland. Among other things he said: "At a time like this, when there is so much misleading talk concerning the evil effects to workingmen of large combinations of property, it is well for us to study our own case, and inquire what the effect of combination has been upon us. It is, of course, no part of our duty to here discuss the affairs of any other class than our own. We are railroad men, pure and simple, and we must regard movements and tendencies as they affect ourselves and our business.

"In probably no industry in the world has consolidation been more active in the last ten years than in railroads. In fact, railroad history of that period is one continuous record of 'combinations,' 'amalgamations,' 'mergings,' 'leasings,' or whatever term lawyers please to give to one and the same thing. In the nine years since 1890, 946 railroads, aggregating 63,000 miles, have been consolidated.

"None of the eloquent gentlemen whose prerogative it is to interest himself in every one else's business will claim that by reason of this consolidation the number of railroad employees in



CUP PRESENTED TO MR. VREELAND

the United States has been lessened or wages reduced. It is true, these consolidations have saved millions of dollars paid to high-class and ornamental officials, but so far as the operating and working forces are concerned (and with this we are most interested), the effect has been good.

"Within the period named, hours of labor have been lessened and wages increased, and in that time the number of railroad employees has grown, not alone by reason of extended mileage, but because even the so-called labor-saving improvements have called for more human help. I think it is safe to say that in every instance where an improved appliance has displaced one man, the demand for greater safety and improved facilities has created a demand for two.

"Nothing will bring this fact home to your minds more surely than a glance at the past and the present of the railroad systems on which you are employed. Do you find that the introduction of electricity as a motive power, instead of horses, has increased or diminished the working forces on the street railways which constitute the Metropolitan system? That system as now consolidated has a wage list ten times as great as that when its constituent properties were operated separately and by horses.

"Nor is this all, for with every increase in the volume of the list of paid operators, there has been a marked improvement in

the personnel and in the standard of the men. No one who knows the truth would, for instance, think of comparing the employees of this system with the rag-tag and bob-tail that constituted the working force of its constituent parts or companies when they were separately operated by horse power. The effect of consolidation upon us has been to elevate out of the slough of what is contemptuously called 'miscellaneous labor' between five and six thousand men into a distinct class, in which not only muscle but brain is demanded.

"New York City represents but a small portion of the mileage of street railways under electrical operation in the United States, and it is known to every one of you that any man who has been trained on this system, and whose character is good, can claim a place and obtain a standing by the very reason of his apprenticeship here, on any system anywhere in the world. So then, so far as we are concerned, we can look without any special discomfort at a combination whose results have been beneficial to us."

The immense audience which crowded the spacious hall were evidently in accord with Mr. Vreeland's remarks, judging from the hearty applause which followed. After the reading of the secretary's report a committee ascended the platform and made the presentation already described.

Mr. Vreeland acknowledged the gift in a few well-chosen words. A high-class vaudeville entertainment followed, and was thoroughly enjoyed by all present.

John M. Roach

The newly-elected president of the American Street Railway Association, John M. Roach, has had a long and most successful experience in electric railroading, and is generally looked upon by those acquainted with the street railway interests in this country as one of the most astute and successful managers of street railway properties in the United States. Like many other men of success, he has achieved his knowledge of and distinction in his chosen profession by beginning at the lower rungs of the ladder, and has successively shown his ability to master the prob-



JOHN M. ROACH

lems connected with railways operating with horse, cable and electric power, exhibiting in each a remarkable grasp upon the fundamental principles of the transportation and mechanical questions involved.

The subject of this sketch was born in Noble County, Jackson Township, Ohio, on Jan. 30, 1851. His ancestors came from Virginia and settled in the garrison on the Muskingum River, near Beverly. Mr. Roach left Ohio when eleven years of age, and went to Rockford, Ill., where he attended a high school for one year. After this he went to Corinne, Utah, and from that place to Helena, Montana, covering the entire range of the Rocky Mountains and spending three years in that section of the country prospecting for gold. On a "bucking" broncho he rode to Walla Walla, Washington Territory; Portland, Oregon; Oakland, and down into the lower part of California, around White Pigeon, Utah, and back to Helena, Montana.

After roving around the western part of the Continent for seven years, making and losing large sums of money, he returned to Rockford for a year, and settled in the city of Chicago on Oct. 7, 1872, entering the employ of the North Chicago Street Railroad Company as a conductor. He was an absolute stranger in the city, and had no friends nor acquaintances there. After serving the company as a conductor for four months he was taken into the office and made a cashier. From that position he served in all the intermediate positions, until in 1889 he was made general manager of the North Chicago Street Railroad Company, and in 1897 general manager of the West Chicago Street Railway Company, in both of which positions he remains in the companies which have succeeded to the control of these properties.

Mr. Roach married Miss Kate Lyon in 1872, at Rockford, Ill., and has one son, F. Lyon Roach, born in 1875. Mr. Roach is a member of the Union League Club, Marquette Club and Union Club, of Chicago, and a Knight Templar, Lincoln Park Commandery.

Personal

MR. SIEZO MISAKI, chief engineer of an interurban road connecting the city of Osaka, Japan, with the neighboring city of Kobe, was in Chicago during the convention and was much interested in the exhibits.

MR. W. S. DIMMOCK, general superintendent, and W. D. Tarkington, master mechanic, of the Omaha & Council Bluffs Railway & Bridge Company, attended the Chicago convention and renewed acquaintance with many of their old friends.

PROFESSOR ALEXANDER B. W. KENNEDY, one of the leading electrical engineers of London, has taken into partnership Mr. Bernard Maxwell Jenkin, who has been for some years past his principal assistant. The new firm will be very strong in engineering circles.

MR. W. J. COOKE, vice-president of the McGuire Manufacturing Company, was reported as ill at his home, and typhoid fever was feared. Mr. Cooke's many friends will sincerely hope that this danger may be averted and that he will soon be around again in his accustomed travels.

MR. F. S. DRAKE, formerly general manager of the Nassau Electric Railroad Company, of Brooklyn, and later master mechanic of the Brooklyn Rapid Transit Company, has now become connected with the St. Louis Transit Company as mechanical engineer, and attended the convention with friends. Mr. Drake has had a very valuable experience in electric railroading, dating from 1889 to 1890, when he was engineer in charge of construction of the first electric railway built in Buffalo. He later went to Pittsburgh and then to Brooklyn.

MR. F. L. FULLER, resigned, on Oct. 1, his position of general superintendent of the West Chicago Street Railway Company, to accept that of assistant to the president of the United Power & Transportation Company, of Philadelphia. This company, as is



F. L. FULLER.

generally known, is a recent organization and controls and operates a large number of formerly independent railway and lighting companies in the neighborhood of Philadelphia and Wilmington, Del., also in other parts of Eastern Pennsylvania and in New Jersey. Among the companies included in this consolidation are the Wilmington City Railway Company, Wilmington City Electric Company, Wilmington & Chester Traction Company, Chester Traction Company, United Traction Company, of Reading; Reading & Womelsdorf Electric Railway Company, Holmesburg, Tacony & Frankford Electric Railway Company; Roxborough, Chestnut Hill & Norristown Railway Company; Trenton Street Railway Company, of Trenton, N. J.; Citizens' Electric Light & Power Company, of Delaware County; Delaware County & Philadelphia Electric Railway Company, the Lebanon Valley Street Railway Company, the Edison Electric & Illuminating Company, of Lebanon; Wilkesbarre & Wyoming

Valley Traction Company, Wilkesbarre, Dallas & Harvey's Lake Railway Company, and the Metropolitan Electric Company, of Reading.

To this company Mr. Fuller will bring a long experience in electric railroading, obtained in Chicago and elsewhere, which has given him a high reputation in this line of work. Mr. Fuller's connection with street railways dates from January, 1888, when he entered the service of the St. Paul City Railway Company, at which time he was appointed foreman of the Selby Avenue cable line, just then put in operation. In the following year the company decided to substitute electricity for horses on the greater part of its system, and at that time Mr. Fuller was appointed assistant superintendent. He remained with this company until the consolidation with the Minneapolis system in April of 1893, when he resigned and entered the service of the West Chicago Street Railway Company, of Chicago, as assistant superintendent. At this time the latter company had two cable lines in operation, but on the rest of the line horses were employed. In 1894 it was decided to change all the lines not operated by cable to electric, and Mr. Fuller was appointed superintendent. In 1895 he was made general superintendent and remained in that position until Oct. 1, this year, when he accepted the position mentioned above. Mr. Fuller will make his headquarters in Philadelphia.

MR. E. S. DIMMOCK has been made general manager of the Bay Cities (Mich.) Consolidated Railway Company. Mr. Dimmock has been engaged in steam railroading practically all his life until four years ago. He was in early life for seven years apprenticed in the mechanical department of a prominent road, and later became superintendent of motive power of the Union Stock Yards at Omaha, and superintendent of electric lighting of the stock yards. He is a practical engineer and machinist and will be a valuable acquisition to the Bay Cities Company. He is a brother to W. S. Dimmock, superintendent of the Omaha & Council Bluffs Railway & Bridge Company.

MR. H. F. J. PORTER, whose portrait is presented herewith, is well known through his connection with the general subject of hollow-forged open-hearth and nickel-steel shafts, and, in particular, upon their adaptability to street railway power plants. Mr. Porter has so long been an advocate of this type of forging for such service that his name has become closely associated with it in the development that has been witnessed in all sections of the United States. The earliest installations were made at Chicago, and to that city belongs the credit for much of the prestige now held by such shafts. Now that the hollow shaft has been firmly established in favor for use in large plants, it is hard to appreciate the immense labor involved in its introduction, for not only was it necessary to show its superiority over wrought-iron shafts which had been most generally in service in smaller plants up to that time, but Mr.



H. F. J. PORTER.

Porter found a more or less firmly rooted antipathy to steel for this service, owing to the failures experienced in solid shafts made of low grade steels. Mr. Porter was formerly Chicago representative of Bethlehem Steel Company, but of recent years has been connected with the company's general sales department at South Bethlehem. He has not, however, confined himself to commercial life, but has delivered many lectures before technical institutions, principally on subjects connected with recent developments in high-class forging. His most recent work in this direction was an interesting talk on "The Position of Forging in the Arts," given Oct. 19, before the Political Economy Club at Chicago. Shafts of fluid-compressed open-hearth and nickel-steels, annealed and oil-tempered, have been adopted for practically all of the more recently planned large power stations in the East, notably those of the Metropolitan Street Railway Company, at Ninety-sixth Street, New York; the Third Avenue Railroad Company, of New York, and the Boston Elevated Railway Company, and it is safe to say that this practice will be closely followed in all future work involving the enormous units demanded by modern street railway practice.

MR. IRA A. McCORMACK has resigned his position as general superintendent of the Brooklyn Rapid Transit Railway Company to accept that of vice-president and managing director of the

Syracuse Rapid Transit Railway Company. Mr. McCormack is known as one of the ablest managers in the country, and had been engaged in steam railroading for twenty years before going to Brooklyn. During this time his record was one of continual promotion. He filled each position in a most satisfactory manner, and was at one time located at Syracuse in charge of the interests of the West Shore Railroad Company. He moved to Brooklyn in June, 1895, to take charge of the eastern district of the Rapid Transit system, but was soon appointed general superintendent.

As the Brooklyn Heights Company gained control of the various lines that now go to make up the system of the Rapid Transit Company they were placed in charge of Mr. McCormack, who soon had them running with the same evenness that has been brought about on the original lines of the company. Mr. McCormack's success has been attributed to two things, his just treatment of the employees, and his interest in behalf of the railroad company. He always felt that there were two duties of equal importance attached to his position, one being to the company and the other to the men. Mr. McCormack has the reputation among the rank and file of the company of treating his men with the greatest civility and this conduct he also inculcated among the minor officers of the road in their dealings with the men under them. During all the late difficulties with the men of the Rapid Transit road it was said that no harsh words were uttered against the superintendent. Mr. McCormack will occupy the position recently held by Mr. E. W. Moore, who resigned on account of large business interests elsewhere, except that Mr. McCormack will reside in Syracuse, which his immediate predecessor did not. Mr. C. Loomis Allen, present general manager of the Syracuse Rapid Transit Company, will continue in that position.

AMONG THE MANUFACTURERS

THE GOLD STREET CAR HEATING COMPANY, of New York, has been awarded a contract for several hundred electric car heaters for the Glasgow tramways.

THE SIEGRIST LUBRICATOR COMPANY, of St. Louis, Mo., has recently published a new and tasteful catalogue, which they will be glad to send to any reader on application.

THE Q. & C. COMPANY, of Chicago, has announced that it now has exclusive control of the sale of Magnolia anti-friction metal to railroads, both steam and electric, of the United States, Canada and Mexico.

RUSSELL & COMPANY, of Massillon, Ohio, builders of the Russell single valve automatic cut-off engine, have recently issued a very tasteful catalogue containing general and detailed views of this engine, together with engravings showing the company's works.

HENRY L. PRATHER, of Cleveland, Ohio, has recently closed a contract with the Rochester Railway Company, of Rochester, N. Y., for the cast welding of several thousand joints on 4½-in., 6-in. and 9-in. rail. The welding system of the Milwaukee Rail Joint & Welding Company will be used.

THE J. G. BRILL COMPANY, of Philadelphia, has recently secured what is undoubtedly the largest order for trucks ever placed in a European country. It was awarded by the Electric Railway & Tramway Carriage Works, of Preston, Eng., and was for 700 trucks of the Brill 21-E and maximum traction types.

THE LYNN INCANDESCENT LAMP COMPANY, of Lynn, Mass., is manufacturing an incandescent lamp for street railway use, which embodies a number of important improvements. The lamp is anchored and cannot droop or be broken by the motion of the car. The lamps are made to burn in series on 500, 525, 560 and 600-volt circuits and are carefully selected so that they are uniform and long lived.

WILSON & COMPANY, of Brooklyn, N. Y., manufacturers of the Wilson trolley pole catcher, call attention to the fact that this device locks and holds the trolley pole fast the instant the trolley leaves the wire and does not draw it down below the trolley

wire in this contingency, as stated in the last issue. The company has a large number of letters from prominent railway companies, speaking in the highest terms of this device.

THE UNION BOILER TUBE CLEANER COMPANY, of Pittsburgh, Pa., has recently finished what is said to be the largest contract ever awarded for cleaning boilers, being twenty-two water tube boilers, containing an aggregate of 10 miles of 4-in. tubes—a task no other concern in the world has the equipment to accomplish. The company has also just shipped eight machines to England and Scotland. The initial machine for export was shipped just one year ago. One of the latter was a repeat of the first order.

THE LORAIN STEEL COMPANY, of Lorain, Ohio, has just published what is probably the most tasteful rail catalogue which has ever been published. The rail sections, which are usually illustrated by line sections are here represented by fine vignette half-tone engravings, which adds much to the appearance of the book, while making the section shown no less convenient for measuring purposes. The rails are all reproduced full size, and there are some sixty-five of them, including both slot and service rails. The special work, crossings, joints, etc., are illustrated in the same way.

THE MANUFACTURING PLANT of the Vulcanas Forging Company, situated between Wason Street and Case Avenue, Cleveland, was entirely destroyed by fire Oct. 25. The fire was discovered by the watchman in making his rounds and had gained such headway by the time of the arrival of the fire apparatus that it was utterly impossible to save the building. Several freight cars which were standing in the rear of the building waiting to be loaded with forgings were also destroyed. The building was two stories high, and about 175 ft. long x 50 ft. wide. The loss is estimated at \$30,000.

THE GENERAL INCANDESCENT ARC LIGHT COMPANY, of New York, is issuing circulars and price lists devoted to underground electrical apparatus. The Tailleux coupling boxes, service boxes, junction boxes and coupling joints and Ferguson's all copper safety catches are among the devices illustrated and described. The company has branch offices in all the large cities, and manufactures arc lamps, incandescent lamps, pure drawn copper switches, automatic clock and voltmeter switches, push button switches, fan motors, power motors, dynamos, switchboards, rheostats, underground materials, Wright's discount meter, etc.

THE TRADE PAPER ADVERTISING AGENCY, 150 Nassau Street, New York, has made a valuable addition to its force, in securing the services of Sam A. Elkington, who has been associated as advertising manager and advertising writer for the past ten years with a number of the leading trade journals of this country. There are few men more successful as an advertising expert, or one that is more familiar with technical journals than Mr. Elkington, and advertisers desirous of using trade papers will find his services of great assistance and value to them. Mr. Elkington will have charge of the Philadelphia office of the company.

THE CHRISTENSEN ENGINEERING COMPANY, of Milwaukee, has recently published a revised edition of its catalogue on the Christensen straight air brake apparatus, which gives not only views and complete information of the company's air brake, but a short synopsis of the progress of the company since it entered the field, and a discussion of the desirability of the use of straight over automatic air for electric railway service. It is interesting to note that the company has sold and delivered, during the past two years, nearly 1000 equipments, and that during that time the cost of maintenance for these equipments, computed from the sale of repair parts, has been only a fraction of 1 per cent.

THE BULLOCK ELECTRIC MANUFACTURING COMPANY, of Cincinnati, reports sales for the month of September involving sixty-one machines ranging in size from 3 kw. to 150 kw. Among the more important were fifteen engine-type generators for United States Army transports and ten 50-h.p. motors to operate at 200 r.p.m. for Messrs. Dick, Kerr & Company, of London, England. Several repeat orders were received, among them being the following: Maryland Steel Company, Baltimore, Md., third order; Consumers Park Brewery, Brooklyn, N. Y., third order; Atlas Cement Company, Northampton, Pa., fifth order; Missouri Lead & Zinc Company, Joplin, Mo., third order. When representative concerns, such as those named, find it to their advantage to continually add to their equipment of Bullock apparatus, it can mean but one thing, and that is, that the machines have given perfect satisfaction. A new bulletin, just issued by the com-

pany, describes type "N" motors. This is the first bulletin of the standard 6 ins. x 9 ins. size which has been issued. Those interested in electrical literature will appreciate this reduction in size, as it is more readily filed than the larger pamphlets. It may be had by addressing the company.

THE SIMPLEX ELECTRICAL COMPANY, of Boston, Mass., reports an active demand for "American" car heaters. In addition to many recent orders in New England and in the West, the company reports the sale of 600 heaters to the United Railways and Electric Companies of Baltimore, Md., this being the third successive order received from Baltimore within the past two years. The Simplex Company claims great durability for the "American" car heaters, and lays particular stress on the claim that their coils never rust out, as they use a special non-corrosive wire instead of steel alloy. While the wire is far more expensive than that commonly used, the results more than justify this practice—so the company claims. Since the Simplex Company announced the sale of enamel car heaters, there has been much interest evinced and sample equipments ordered by street railway companies. The peculiar advantages claimed for the enamel heater are, that owing to the resistance wires being completely imbedded in enamel uniformly distributed over cast iron plates, there is no possibility of injury or trouble developing by any meddling or carelessness on the part of passengers, and that the heaters being entirely waterproof offer no opportunities for trouble when the cars are cleaned, even if a hose is used. The company insists that this is the heater of the future.

THE RESULT of a series of tests carried on by Professor R. C. Carpenter, of Cornell University, upon "Cling Surface," a compound for belts manufactured by the Cling Surface Manufacturing Company, of Buffalo, was published in the May issue. Those whose attention was attracted to that article will be interested in a letter which Professor Carpenter sent under date of Oct. 7, to the same company. In this he says: "Later tests of the use of Cling Surface on belting substantiate in every particular the statements made in my report of April 17. They also indicate higher efficiency of transmission and less loss of power in the case of belts treated with Cling Surface than in the case of belts not so treated, when working under the conditions prevailing at the time of the earlier test. This is due to the fact that the slipping of a belt causes considerable loss of power, the power so lost passing off in heat. The use of Cling Surface reduces the slipping and consequently reduces the loss of power occasioned by the use of belts that slip. During the past six months I have had occasion to observe the practical use of Cling Surface in a number of instances. In all such cases Cling Surface has improved the belts by softening them, and as far as I can determine in the limited time (seven months) tends to preserve the leather of which they are constructed."

New Publication

The Growing Magnitude of Electrical Industries. Prepared by T. Commerford Martin for J. G. White & Company.

The small brochure bearing this title gives briefly an idea of the advance made in electrical interest and investments during the last few decades. The subject matter is divided into various headings devoted to the different branches of electrical interests, and interesting figures are given of each. For instance, Mr. Martin estimates the gross income of the telephone companies during the last year as about \$50,000,000, and gives the number of conversations over the Bell lines as a little over two and one-quarter billions. The central electric lighting and power stations of the United States, have a gross income yearly of about \$66,000,000 and are capitalized at about \$600,000,000. The isolated and municipal lighting plants represent a capital investment of about \$400,000,000. Of electric railway work, the writer says: "The capital liabilities of the street railways of the United States at the close of 1898, were \$1,621,820,000, a gain in one year of nearly \$150,000,000. A conservative, authoritative estimate made in 1897 was that the street railways were then earning gross at least \$150,000,000, a fair figure in view of the fact that in three Eastern States with less than one-third of the mileage, the earnings in 1896 were \$64,000,000. It is therefore safe to say, in view of the rapid growth of carrying capacity, that the total earnings in 1898 were not less than \$175,000,000. It appears that 220 roads earned \$130,000,000 in that year. There are about 900 roads or systems. If the net be taken at around 40 per cent, there was applicable on bonds and stock, the sum of from \$60,000,000 to \$70,000,000, or from 4 per cent to 5 per cent over the whole capitalization." As a summary Mr. Martin estimates the investments in all electrical industries in the United States at about \$3,260,000,000.