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DO IT, AND DO IT FIRST

While it is true enough that public utilities in general and electric railways in particular often do not get a square deal from the public and the newspapers, this is due in many instances to delay in correcting causes for legitimate complaint. To wait until such complaint reaches the stage of public outcry and indignation is one of the surest ways to become so unpopular and so distrusted that there is no chance for a fair hearing even when the utility is clearly in the right. Once condemned by public opinion for neglect of actual and curable faults, the condemnation is indiscriminately applied and a good understanding is almost impossible to establish. Any railroad manager who finds these observations trite is invited to think whether or not there are causes for complaint on his system—say about some detail of his service—that he could have removed but has neglected. The really popular railroad managements are those who anticipate faultfinding. To do the right thing and to do it first—not under the compulsion of agitation or as the result of an order from a public service commission—is one of the shortest roads to a good understanding with the community.

BUREAU OF STANDARDS

An example of the opportunities for helpful co-operation between the federal government and the state governments is afforded by the proposed relations between the Bureau of Standards, Washington, and the public service commissions of the different states. These were outlined by Dr. Rosa, of the bureau, at the last meeting in Washington of the Association of Railway Commissioners in a paper describing the facilities of the bureau and referring to the work in the way of establishing standards which it could undertake. The bureau has not only already conducted important scientific research along railroad lines for the Interstate Commerce Commission but it has also acquired a very high international reputation in the establishment of physical and industrial standards in the electrical and other industries. Its equipment and organization are such that work of scientific investigation can be conducted along very much more thorough lines than would be possible for any individual state, and its conclusions should carry a correspondingly greater weight. Such a plan, of course, would give the bureau no legal authority over the utilities, but it would act in a sense as a clearing house for technical information desired by the state commissions. For this reason, and because disregard of its work would give rise to

diverse, inconsistent and confusing conclusions in the different states, the plan seems to be directly in the line of business efficiency and economy.

PROPOSED INCREASE IN FREIGHT RATES

The prevailing opinion among traffic men throughout the United States is that the Interstate Commerce Commission will ultimately grant the 5 per cent increase in freight rates. In case such action is taken by the commission, it is doubtful whether further general increases will be allowed for some time. In view of this fact and that there is a possibility of the grant of an increase in freight rates in the very near future, the electric interurban lines engaged in interstate commerce should not lose sight of the fact that they, too, can profit by it. Consequently they should be prepared for concerted action along with the steam railroads. In fact, they should now have filed with the Interstate Commerce Commission their tariffs urging a proportionate increase. It is believed that the commission will postpone action for some time on any further requests for general increases in rates after it has rendered its decision in the present case because of the sentiment in some quarters that future decisions on rates ought to be based largely on the valuations determined by the Interstate Commerce Commission, which is just beginning its task of valuing all the interstate carriers.

THE POWER OF SUGGESTION

In a thousand instances, in factory and office, the principles of psychology have in recent years been turned to increasing advantage in obtaining predetermined results. The use of the power of suggestion has been particularly effective, and we note with pleasure a concrete example of its application to the electric railway field. To be specific, the title of James Harmon, claim agent of the Louisville & Northern Railway & Light Company and the Louisville & Southern Indiana Traction Company, was recently changed to "safety agent." This change was made for the express purpose of showing the public that it was the desire of the railway to make its main effort toward safety of transportation and not to suggest the necessity of handling claims growing out of accidents. The words "claim agent" connote not only severed limbs and bruised bodies but also legal wrangles between company and injured passenger, whereas the title "safety agent" keeps first before the mind of the public the fact that the paramount duty of the company is to avoid killing and maiming people. Claims still

have to be settled and the company must be protected therein; but when the public grasps the idea that a claim award is secondary and comes only after the company has failed in its safety work, there will, we believe, be less difficulty encountered in the settling of claims. An interesting variation along this same idea of safety suggestion is the practice followed by the Washington Railway & Electric Company and the United Railroads of San Francisco of apportioning among the platform employees a premium based upon the decrease experienced in damage awards during an operating year. There is no reason for doubting that the germ contained in these two ideas will by its suggestiveness, if properly fostered, result in much better public relations in regard to the vexatious question of damage claims.

DEVELOPING YOUNG MEN FOR RAILWAY WORK

In an address recently delivered before the New England Railroad Club George M. Basford deplored the lack of provision for recruiting the ranks of the trained workers in railroad work. As the same general principles apply in the electric railway field, their statement by one who has had as much to do with training young men as Mr. Basford should prove suggestive to electric railway managers.

As an illustration of perfect organization, Mr. Basford cites an orchestra, in which each player performs his part perfectly, and the result is harmonious co-operation. This is due to training and is analogous to the condition which should exist in railroading if systematic provision was made for it. He contends that as a rule such provision is not made, and as a result railroad work does not attract young men of ability of hand or head because they see no opportunity to make systematic progress in the industry. Equipment representing enormous investment is intrusted to men but poorly prepared for such responsibility, and even if their work is well done it is not appreciated by their superiors.

The railroads are suffering to-day from their failure to establish effective apprentice systems twenty years ago; hence they do not now have a supply of men ready for advancement. Even in the trades essential to the successful maintenance of rolling stock, "skilled" workers have to be made over night, and their ignorance and clumsiness are sources of expense to their employers.

Another feature of steam railroading emphasized by Mr. Basford is the lack of sympathy between the operating and the mechanical departments. There appears to be between them a great gulf over which the mechanical men cannot pass. This is the reverse of what should be the case. Where a mechanical man has shown executive ability in the conduct of his affairs he is particularly well fitted for promotion in the operating department because of his knowledge of equipment and maintenance problems. There should be provision for promotion to all grades in each department until each man occupies the position which he can fill most effectively. And there should be no barrier against a trans-

fer from one department to another to promote efficiency of men and organization. It is the future which is held in prospect rather than the immediate job in hand that makes it possible for a company to retain men for a reasonable time in disagreeable work, and good organization must provide this future. The lack of it is driving railroad men into industrial positions, where they are rewarded by better salaries and by opportunity for advancement limited only by their ability.

Mr. Basford paints a dark picture of the present conditions in railroad work on the human side. While attention is being lavished on materials and methods, men have been left to shift for themselves. And never were loyal, capable men more needed than now. As a cure for the trouble, he advocates training such as is now being inaugurated by a conspicuously few pioneers. This training must be thorough, well-planned and continuous through the educational period. It must be given through night and day classes under systematic guidance by skilled instructors. Apprenticeship has succeeded when it has had a chance. The fear that the unions will hamper the inauguration of systematic instruction is not well founded. The question of opposition should not be raised until the amount of instruction already agreed upon has been provided.

Having before us in outline some of the salient conditions in steam railroad work, we may well compare these with their electric railway parallels. The electric railway differs only in detail from the steam road. The power is generated in central power plants and is distributed direct or through substations to many small units of rolling stock, but the general transportation problems are the same. In the small roads there is necessarily closer co-operation among departments, as there are comparatively few employees, and the interrelation of the work of all is clearly appreciated. While many roads have too few employees to warrant the installation of elaborate training methods, no road is so small that it can afford to neglect the subject in its entirety.

Co-operation among the roads in a given community should make classes for instruction of various sorts possible, and if there is no one available who is capable of handling the educational situation it is high time that changes should be made in the upper ranks of the electric railway organization. Certain large individual electric railways and the combinations of smaller ones are giving this matter of training careful consideration, but even here, where the opportunity and the necessity are so great, the methods in use seem to be largely of an experimental character. Oversight of the educational work falls to already overburdened officials who, while realizing its importance, cannot give it the requisite attention. Has not the time arrived when skilled, special supervisors should be appointed for this duty? The steam roads have found it necessary. Why not the electric roads also? Such men will be difficult to find at first, but if they are needed and can be assured of a fair chance to "make good" and to receive a reasonable recompense for doing so, they will be forthcoming.

EXPLICIT DIRECTIONS FOR PUBLIC UTILITY ACCOUNTING

An analysis of the fundamental reasons underlying the installation of prescribed public service accounting in various states discloses the fact that there have been at least three definite objects in view in the mind of legislators—first, to establish uniformity in accounting between all corporations of the same class; second, to establish an accounting system that would show clearly and accurately the specific sources of all incomes and the exact purpose of every expenditure, and, third, to state the fundamental principles according to which accounts should be kept so as to prevent the charging of items to wrong accounts. The first two objects involve the theory of public service accounting, and with the great improvements made in accounting classifications and financial statements they have been largely realized. The last point, however, is the one in which the accountants and bookkeepers of public utility corporations are primarily interested, for it is most closely associated with the daily practicability of the accounting system. Legislators and their agents, public service commissions, have in the past endeavored to state clearly the proper principles to be followed in the accounting practice of the field, but the fact is that their instructions have nearly always lacked the specific details and careful illustrations that were necessary for their successful carrying out.

A striking commentary upon this shortcoming is contained in a paper on "Depreciation" read before the Wisconsin Electrical Association by Halford Erickson, of the Wisconsin Railroad Commission, published elsewhere in this issue. Much emphasis has been laid on the necessity of depreciation provisions and the choice of the proper determinative method, but concerning the actual devices for recording depreciation on the books much less has been said. Repairs, renewals, betterments, improvements, alterations, replacements, depreciation, provision for reserve for depreciation, depreciation reserve, depreciation fund, depreciation reserve fund—all these terms have been placed before the public utility accountant and no small part of the resulting confusion can be traced to a lack of proper explanation and examples in regard thereto, when the system was installed.

The prevalent misunderstanding as to the distinction between the depreciation reserve and the depreciation reserve fund is particularly mentioned by Mr. Erickson, but it deserves even greater emphasis than he placed upon it. It is probable that more confusion exists with regard to reserves and funds than with any other nomenclature, yet to the scientific accountant there is an absolutely clear-cut line of demarkation between them. A reserve is a portion of proprietorship (supplies, undivided profits, profits) which has been set aside for some specific purpose; it is an accountability and should always appear only on the liability side of the balance sheet. Funds (general funds not being here considered) represent assets that have been set aside out of the general assets to be devoted to some specific

purpose and must always appear only on the debit side of the balance sheet. The confusion between these terms is probably due to the fact that often a fund and a reserve are set up to cover the same thing, such as depreciation. That portion of the assets corresponding to profits cannot, as a rule, be identified as such, although the profits are indisputably vested in the assets. Disbursements, therefore, cannot be made out of profits, but only out of cash in amounts equal to certain measurements of profits. Hence, when the intention of a corporation to provide for a certain inevitable outlay, such as depreciation expense, is signified by setting up a depreciation reserve out of the proprietorship to be deducted automatically before a figure representing the amount available for dividends is obtained, this reserve is often strengthened by the withdrawal from the general assets of an equal amount of actual cash or money values to be set aside and used only for actually meeting the depreciation expenses. Public service commissions understand this theory, but why do they call such a fund a "reserve fund"? This mixture of terms serves no purpose; they would better remember Kipling's familiar line: "East is East, and West is West, and never the twain shall meet." When a reserve, the bookkeeping device, and a fund, the actual segregation of assets, have been set up to cover depreciation, for example, it is far preferable to place "depreciation fund" and "depreciation reserve" on opposite sides of the balance sheet and let the common word describing their purpose show their relationship.

The lack of this proper terminology has been sufficiently confusing to public service corporations, but the accounting difficulties have been increased many fold because of the omission of explicit directions as to how these and other accounts should be constructed. When a depreciation reserve alone is used, when it is also supported by a depreciation fund, when property is discarded, scrapped or renewed, when charges due to depreciation are not carried through the construction accounts—in fact, in every contingency that may arise in accounting for depreciation—a set of specimen entries should be made in order to show the exact working and interrelation of all accounts that might be concerned. Mr. Erickson's paper contains some valuable information concerning the proper debit and credit entries to be made for depreciation that well illustrates the direction that instructions to public utility accountants should take.

Public service commissions occupy in public utility accounting work a position analogous to that of the systematizer in the business world. Two of the chief duties of the latter in installing an accounting system are to see that short, explicit and non-technical instructions are given for its use and then to watch its operation and explain instructions that are not clear. Needless to say, efficient systematizing demands a proper explanation in the first place rather than extensive corrections later. From observations made on several visits to bureaus of accounting and statistics of different public service commissions, we are led to believe that these public bodies might well follow the example

of the private systematizers. It is notorious in this country that public organizations are negligent in working according to the principles upon which the success of private enterprise is based; but if other public service commissions will adopt the frank corrective attitude of the Wisconsin Railroad Commission there will be improvement at least in the practical success of the accounting systems promulgated in the field of commission work.

WHAT IS THE CLAIM DEPARTMENT DOING ?

Do electric railway managements know enough about what their claim departments are doing? This question is suggested by the discovery by the president of one of the large systems that the ambitious young men in his claim department were doing things of which he highly disapproved but of which he had had no idea until he found them out by chance. The question asked has a very important bearing on the efforts of electric railways to set themselves right with the public.

Of the two cases that came to the notice of the railroad president referred to, one was that of an accident in which an automobile had been struck by a car under circumstances which placed the blame upon the railroad. There was no question of personal injury involved and the owner of the automobile was in no way inclined to mulct the railroad. The obliging representatives of the claim department who promptly called upon the former owner assured him that there would be no opposition to paying a fair repair bill, which, as it finally developed, amounted to less than \$50. When, however, this bill was sent to the railroad, a curt letter was received stating that further investigation had shown that the company was in no way in fault, that no representative of the claim department had been authorized to promise settlement, and, in fact, no settlement would be made. What had happened was that the claim department decided that the owner of the automobile would not bring suit for the small amount involved, so it was perfectly safe to turn down the claim altogether. This assumption on the part of the claim department representative was justified. No suit was brought, but the company had turned a friend into an enemy who could not be convinced of its fairness or honesty by any amount of argument.

The other case was that of a young woman whose foot had been caught in a splinter 9 in. long projecting from the edge of a badly worn rail. The young woman's face was seriously cut by her fall, but she took no action except to report to the company the dangerous spot where the accident had happened. Almost immediately she was visited by a representative of the claim department, who asked her if she was going to do anything about the accident. Her reply was that no action against the company had been thought of, but that if it would pay the doctor's bill that had been incurred as a result of the accident payment would be accepted. After a delay of three or four months payment of the bill was finally refused.

In the latter case, however, the injured person was

indisposed to let the matter drop and brought suit, mainly at the instigation of friends, who urged her not to allow the company to evade its responsibilities. In this case if the company had done the decent thing to start with it would have escaped with the payment of a doctor's bill of a few dollars, whereas now it has a suit on its hands and has made at least a score of bitter enemies among those who know the circumstances of the case.

The position taken by the company in these cases was unquestionably due to the ambition of claim department representatives whose idea apparently was to defeat every claim that might be made, justly or unjustly—a disposition fostered, no doubt, by their experience in dealing with hundreds of claims from people who have little or no just grounds upon which to base their demands for damages. When these cases were reported quite unofficially to the president of the company concerned, he expressed prompt agreement with the statement that if that sort of thing was going on all the time it was no wonder that the company had so many enemies. The incident seems worth reporting for the suggestive value it contains for other railroad executives who are trying to establish good relations with the public, and whose efforts are, perhaps, being defeated by unfairness, not to say imbecility, on the part of claim agents.

SOMNOLENCE IN CAR DESIGN

Judging by descriptions of recently built cars, either the railway company designers or the manufacturers are suffering from what might be called painful conservatism. Apparently the possibilities of saving weight by means of the so-called "side-girder construction" are, in the majority of cases, being completely overlooked, and designs are being turned out daily which retain to all intents and purposes the moss-grown principle of construction whereby a car is supposed to consist of a light superstructure imposed upon an entirely separate floor framing. The idea underlying such a design is simple. Carried out to the final analysis, it amounts to a flat car with a house upon it.

In the days when wood was the only material available for car construction there was, perhaps, some justification for this method. Even then, however, it was by no means a necessity, and the 1910 committee of equipment of the American Electric Railway Engineering Association explained in detail how a side-girder effect could be produced with wood. At that time, of course, the availability of steel overshadowed the construction as outlined, but the comment at least showed the desire of the committee to point out the way toward rational methods of design. Certainly, no design can be called rational if it involves the use of shallow, heavy sills—crowded between the floor above them and the wheels below—when the work of supporting the load can be done equally well by making the whole side of the car into a deep and light girder.

Obviously the old principle of design necessitated "taking two bites at the cherry," because the car siding

had to be installed under any circumstances, and if it was made to do no work it amounted in the end to just so much extra weight to consume power, to wear out the track and to make more expensive repairs. It is, of course, true that longitudinal sills, especially center sills, have a certain value in the absorption of buffing strains, but in street railway service, where the operation of single cars is practically the universal rule, this consideration can hardly be taken seriously. Indeed, some fifteen years ago, when the side-girder type of construction came into use on a large scale on steam roads, it was introduced on the 50-ton coal and ore cars, which, when handled in heavy tonnage trains, were subject to the most terrific abuse through coupler strains.

A modification of this design has been used to some extent in both interurban and city cars. This consists in the use as a beam to carry the load of the car siding between the sill and the belt rail, the side posts being designed only to support the roof. Undoubtedly this scheme is infinitely superior to the old scheme of carrying all the weight upon heavy sills, and it permits, obviously, a lighter and more rigid construction and a lower car floor. However, it cannot be said to be more than a makeshift, designed for a combination construction of steel and wood.

In the all-steel cars which have become so common of late the retention of the old idea of the house on a flat car is doubly harmful. Not only does it involve extra weight but, as pointed out by a prominent and very successful designer of electric railway cars, it involves also a lack of co-ordination in resisting stresses that inevitably causes rapid deterioration. This point is obvious enough when one considers that the side of the ordinary street car between trucks must act as a beam with a height equal to about 40 per cent of its length whether it is intended to do so or not. If this beam does not act as a whole—in other words, if it is carried upon a shallow sill at its base—any deflection of the sill will either buckle the plate at the top part of the beam or else spring the side posts out of the vertical by an amount roughly equal to the deflection.

With wooden constructions these distortions can be successfully absorbed because of the inherent elasticity of the material, but with the solidly riveted steel sheets and framing there exists no opportunity for play except by actual loosening of the rivets. Once a rivet becomes loose there are no means for making it tight again unless the car body is rebuilt, and the inevitable results are leaking roofs, working side posts and rapid deterioration by both wear and corrosion. On the other hand, if the whole side of the car from roof to sill is designed to act as a girder or truss in carrying the load, with the posts capable of resisting the horizontal shearing strains set up between the top and bottom members, a construction of great rigidity and extreme lightness is obtained. This principle has been in practical use on steam railroad cars for a long time. It is by no means new for electric railway equipment, and its obvious neglect is hard to understand.

EXHAUSTING THE PUBLIC'S PATIENCE

The paper which was read by C. M. Larson before the Wisconsin Electrical Association and published in a recent issue of the *ELECTRIC RAILWAY JOURNAL* bears the title of "Street Railway Traffic Surveys in Relation to Railway Operation, Management and Regulation." It is not our purpose to comment now on this general subject other than to say that Mr. Larson's excellent presentation and traffic survey suggestions speak for themselves. It is of even more importance to examine at this time the sore spot in public relations on which Mr. Larson has placed a warning finger. Electric railroading is a pretty complicated business, but it is not so complicated that the manager cannot explain to his patrons the reasons for the adoption of certain policies when such explanation is necessary.

Mr. Larson singles out particularly Rule No. 55 of the American Electric Railway Transportation and Traffic Association, which prohibits employees from divulging information on traffic disturbances to any but authorized officials of the company. Of course, there are many good reasons for this rule from the standpoint of discipline and ultimate legal consequences; but is anything more exasperating to passengers than sitting in a stalled car in utter ignorance of the cause of their plight or how long the delay is likely to last? A pin prick is not a stab, but for all that it is enough to make a man bide the time for revenge on his tormentor.

Without doubt, literal obedience to Rule No. 55 has caused thousands of such annoyances, small in themselves but big in their cumulative effect. The plain remedy is to frame rules of this kind so that they may be interpreted with some degree of tact. In the first place, the platform man should be instructed to take a sympathetic rather than an unconcerned attitude toward the marooned patron. He should explain the difficulty of quickly securing exact information and as soon as he does learn the expected duration of delay he should have the authority to give it out.

Of course, there are other petty annoyances besides this. One is the use of small-lettered and badly lighted car signs which are not legible until it is too late for a prospective passenger to stop the approaching car; a second, and a related one, is the use of route names which are similar enough to cause confusion; a third is the absence of shelters at transfer points. But doubtless the greatest infliction is to read a boast about the excellence of the service when an apology for deficiencies would be more in order. Such things as these may excite only a vague, intangible feeling of enmity which does not find concrete utterance until the company comes before the local council or commission for a new privilege. Then the manager will be sorely perplexed to see how many knives have been quietly whetted against his corporation. Publicity without polite and earnest attention to the smaller amenities of transportation life is as worthless as the prayer of Hamlet's uncle, who realized too late that "Words without thoughts never to heaven go."

Rapid Transit Progress in London

This Article Reviews the Progress Made in Recent Years to Consolidate the Transit Facilities of London, Mentions the Betterments Made or in Progress and Describes the Latest Experiments in Center-Door Cars

London is not only the largest city in the world but it is also provided with the greatest variety of means of transportation. The conflicting interests of the original transportation companies prevented a uniform plan of development and later the unhampered growth of the omnibus led to ruinous competition in many sec-

tion on Sept. 1, 1913, and the East London Railway, which is simply an interconnecting tunnel leased jointly by four steam railroads and by the Metropolitan and the District railways.

Among the bus companies the London General Omnibus Company is the largest in London and has traffic



Rapid Transit Progress in London—A Poster Satirizing the Dangers of Too Much Surface Travel

tions and annoying gaps on important lines of travel elsewhere. The only form of co-operative action was the joint ticket agreements of the Underground Railways. The importance of this interchange service may be realized from the fact that in 1912 about 142,500,000 through tickets were sold on the lines of the District Railway and the London Electric Railway.

In 1913 the City & South London, Piccadilly, Hampstead and Bakerloo tubes and the District lines were placed under one management, and in the same year all but the last-named company were welded financially by Speyer & Company. The same banking firm also obtained control of the Central London Railway in 1913, and it now shares the common management. As will be noted from the statistics hereinafter published, the Speyer group is by far the most important rapid transit factor in London. In addition, it controls the London General Omnibus Company, this company having been acquired in 1912, and has extensive interests in the London & Suburban Traction Company, which in turn controls the London United Tramways, the Metropolitan Electric Tramways and the South Metropolitan Electric Tramways. The economical co-ordination of these three classes of service—namely, underground, tramway and bus—is in the hands of Albert H. Stanley, managing director, who went to London in 1907 from the general managership of the Public Service Railway, Newark, N. J.

The other underground railways of London consist of the Metropolitan Railway, the Great Northern & City Railway, which was acquired by the Metropolitan Rail-

TABLE I—MILEAGE OF UNDERGROUND LINES IN LONDON, DEC. 12, 1912

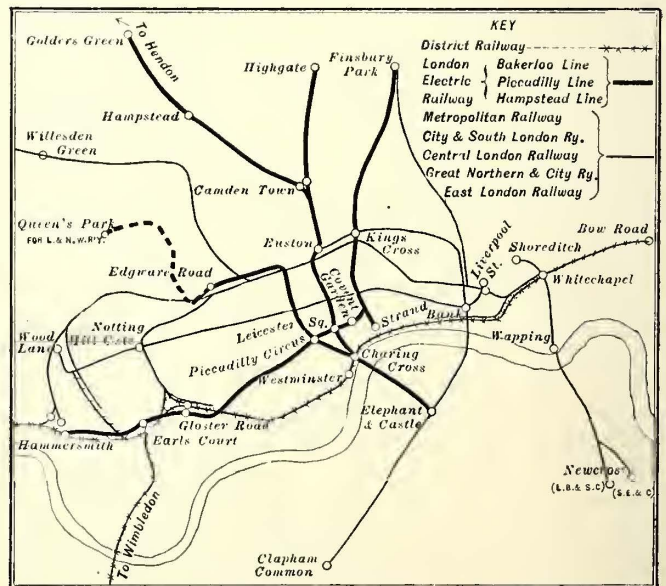
Road	Route	Single Track
East London	6	12
Central London	7	14
City and South London	7	16
Bakerloo	4	11
Charing Cross, Euston & Hampstead	8	16
Great Northern & City	4	8
Great Northern, Piccadilly & Brompton	9	19
†Metropolitan	26	59
Metropolitan District	29	59
Metropolitan & District Joint Lines	2	5
*North & Southwest Junction	5	15
*North London	14	Unascertained
Waterloo & City	2	4
	123	

*Steam.

†This company also works 43 miles of line which is outside the area covered by this article.

arrangements with nearly all the other smaller bus companies, which include Messrs. Tillings, the Associated, the Tramways (M. E. T.) Omnibus Company, the British Automobile Traction Company, the Metropolitan and New Central Company. By these traffic arrangements co-ordination and logical development of the bus business has been secured, and the public has the advantage of a service of omnibuses distributed with a view to catering for the traffic requirements.

The remaining traction interests of London are the



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Rapid Transit Progress in London—The Traffic Heart of the Metropolis

suburban branches of the steam lines, the Brighton Railway being electrified and two others preparing for electrification, and the London County Council Tramways. Unlike the lines of the London United Electric Tramways, the municipal lines have penetrated the heart of London by a route on the Thames Embankment and also by a tunnel to Kingsway.

for express and local traffic at Earls Court. The maximum number of trains which can be run through Earls Court Junction in an hour—namely, forty-two in each direction—has been reached under existing conditions. At Warwick Road, which is only a short distance from Earls Court station, the lines cross, and there was only one way of obtaining further facilities, and that was to do away with the crossing. This undertaking has now been completed without the slightest disturbance

six Wimbledon and four Putney. As the result of increased business on the District Railway, fifty cars were added in October, 1910, thirty-two in November, 1911, and fifty in 1913. In accordance with the District standard, these cars were 49 ft. 6 in. long over all, weighed 31 tons and were equipped with two GE-69 motors each and Type M control. The new cars have steel underframes, aluminum fittings and fireproofed wood. The trucks are also of wider wheelbase and

TABLE VI—SHOWING CHANGES IN SCHEDULE RUNNING TIME DURING PAST FOUR YEARS ON LONDON TUBE LINES

	Interval, Minutes	Time, Minutes	Speed, M.P.H., Including Stops	No. of Trains in Each Direction	Seating Accommodation in Each Direction	Interval, Minutes	Time, Minutes	Speed, M.P.H., Including Stops	No. of Trains in Each Direction	Seating Accommodation in Each Direction
Elephant & Castle to Edgware Road—4.26 miles, nine intermediate stops	2½	17	15.0	362	54,300	2½	15	16.49	390	73,320
Hammersmith to Finsbury Park—8.89 miles, nineteen intermediate stops	2¾	35	15.24	340	51,680	2½	28	19.05	403	75,764
Golders Green to Charing Cross—5.93 miles, ten intermediate stops	10	23	15.4	*140	21,840	2 5/6	15	23.72	307	41,752
Highgate and Hampstead to Charing Cross—4.28 miles, ten intermediate stops	5	16	16.05	*419	65,364	2 5/6	12	21.40	294†	46,452
Camden Town to Charing Cross—2.51 miles, six intermediate stops	2½	9½	15.8	5,59	87,204	1 5/12	8	18.82	601	88,204

*During 1909 alternate trains only ran through to Golders Green, others being reversed at Hampstead during the slack hours.
†Highgate only.

to traffic, and the number of trains running through Earls Court station in each direction has been increased and will soon reach fifty per hour. Three new short lines were constructed—one approximately ¾ mile in length on the Ealing Branch, another just a little under ¼ mile, between Earls Court and West Brompton, while the third will provide an extra “up” line for the London & Northwestern steam trains. Both the new Putney and Ealing lines pass under a portion of the Earls Court Exhibition, the first at a depth of about 10 ft. and the other at a depth of 30 ft.

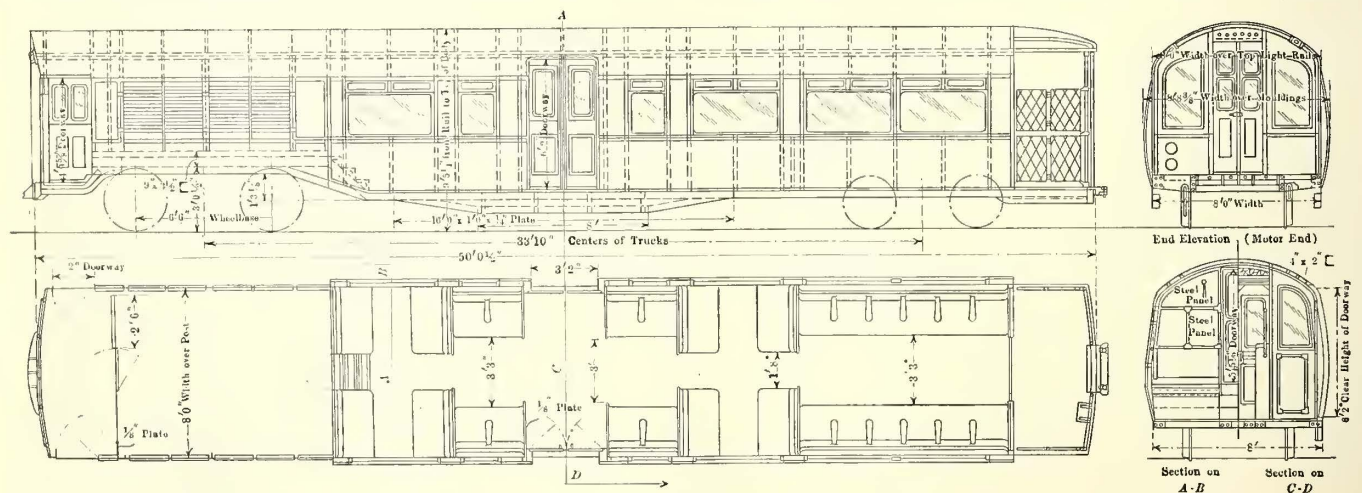
The result of these alterations is that slow and fast trains to Wimbledon can start from Earls Court simultaneously, the fast trains running ahead at West Brompton, and also the running of extra trains between

glass wind shields have been installed at the center doors.

The Speyer interests propose to extend the District Railway 6 miles from Wimbledon to Sutton as an independent company but operated by the District Railway.

IMPROVEMENTS ON THE TUBE LINES

Some very interesting improvements have been made on the Bakerloo, Piccadilly and Hampstead tube railways, one of the most important being the education of the public in rapid movement. The betterment as a whole is well shown in Table VI, which compares the years 1909 and 1913 as to speed and service. Without any increase in rolling stock, these changes increased the seating accommodation in each direction from



Rapid Transit Progress in London—Plan and Elevations of First Center-Entrance Car for the “Tube” Lines

Earls Court and Turnham Green. During 1912 also many trains were added to the South Kensington, Mansion House, Richmond, Ealing and other routes.

The variety of service on the District Railway, which has been operating eight-car trains since June, 1910, is illustrated by the fact that of forty trains which pass every hour between South Kensington and Mansion House the destinations are as follows: ten Circle, four Richmond, twelve Ealing, four Hounslow,

54,300 to 73,320 on one line, from 51,680 to 75,764 on another, etc. The most astonishing increase in schedule speed was on the Golders Green-Charing Cross line, namely, from 15.4 m.p.h. to 23.72 m.p.h. Stops at the ordinary station now average fifteen seconds. Among the experiments to be tried to secure faster loading is that of shifting the guards to the platforms of the station in order to handle the crowd to better advantage. The signal system would permit a headway of thirty

to forty seconds, but this has not yet been attained in practice owing to other causes.

The Hampstead line holds the record in frequency of service in running forty-four trains per hour, or a train every eighty-two seconds, on the main line. One special feature of the signal system is an indicator fixed at the stations immediately preceding the junction at Camden Town by which the Camden Town switchman informs the motormen whether they should approach the junction station at normal or half speed. Thus the switchman can call trains into the junction station at uniform intervals and so avoid the checking or stopping of trains by signals on the main line.

Owing to the growth of interchange traffic between the Piccadilly and District lines, an escalator was installed at Earls Court station, the point of interchange, capable of carrying 10,800 people in each direction per hour. This escalator has proved so satisfactory that others will soon be installed at other stations to assist the elevators and in some cases to supersede them. Escalators are being installed at Oxford Circus, Charing Cross, Paddington and Baker Street, and proposals are now forward for several others, particularly at interchange stations.

Several elevators on the system have been fitted with a new electrical device whereby the closing of the ele-

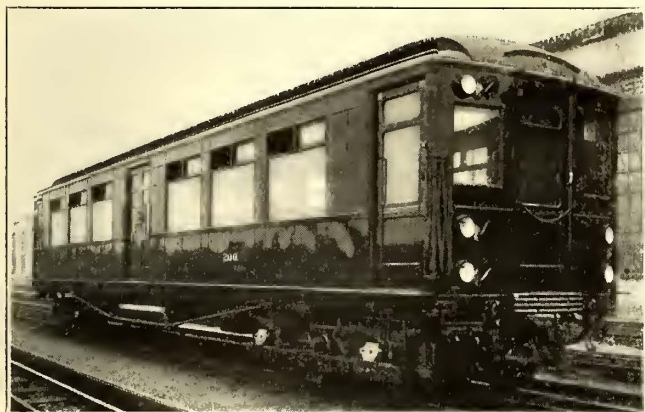
railways, so as to enable the service of trains to be increased from twenty-four per hour with five cars each to forty trains hourly of seven cars each. It is also proposed to make a connection at Euston with the line of the Charing Cross, Euston & Hampstead (tube) Railway so that through trains may be run between



Rapid Transit Progress in London—Interior of Center-Door Car for Metropolitan and District Lines, Showing Glass Wind Shields

Highgate, Hampstead and Golders Green in the north of London and Clapham Common in the south of London.

The Central London Railway is constructing a 3¾-mile extension from the present terminus at Wood Lane to make a physical junction with the Great Western Railway at Ealing. The work is being carried out by



Rapid Transit Progress in London—Recent Type of Center-Door Car for Metropolitan and District Lines

vator gate operates the necessary starting mechanism. This eliminates considerable waste time, and at a busy station like Piccadilly Circus, where there are eight elevators, the new device will permit three additional trips per hour.

INTER-OPERATION WITH STEAM LINES

The extension of the Bakerloo line from Edgware Road to Paddington (Praed Street) has been completed in connection with escalators to join the Bakerloo platforms with the station of the Great Western Railway. This extension will be continued through to connect with the London & North Western Railway at Queens Park with running powers over the latter railway's tracks to Watford 15 miles from Euston station. This operation of city cars into the suburbs rather than the opposite policy is all the more interesting in view of the early electrification of the steam line. The contract for this service is on a rental basis. It will save the steam railroad the enormous cost of reconstructing the station at Euston while affording the London Electric Railway the opportunity of extending its service at low cost.

The City & South London Railway, which has been acquired by the Underground Railways and has become part of the general scheme of that company, has obtained powers to widen its tunnels from 10 ft. 2 in. in diameter to the same size as that of the other tube



In 1700 Mistress Anne Went about in a Sedan.

In 1800 so they say A jolting coach was then the way.

By 1900 we'd enough Of smoky trains that used to puff.

Now we have perfection found The bright electric UNDERGROUND.

Rapid Transit Progress in London—The Improvement of Transportation in Two Centuries

the Great Western Company and should be completed toward the end of 1914. The Central London also proposes to extend its tube to Gunnersbury and make a junction there with the London & South Western Railway. The speed on the Central London has been increased, and the running time has been decreased

from twenty-eight to twenty-three minutes from Wood Lane to Liverpool Street. The Great Northern, Brompton & Piccadilly (tube) Railway is also to be extended.

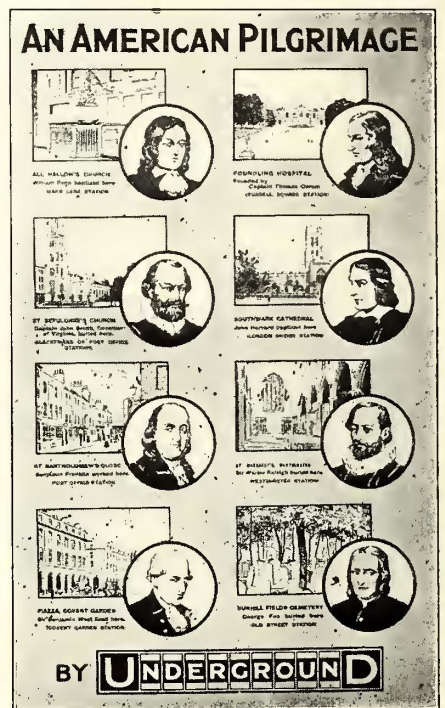
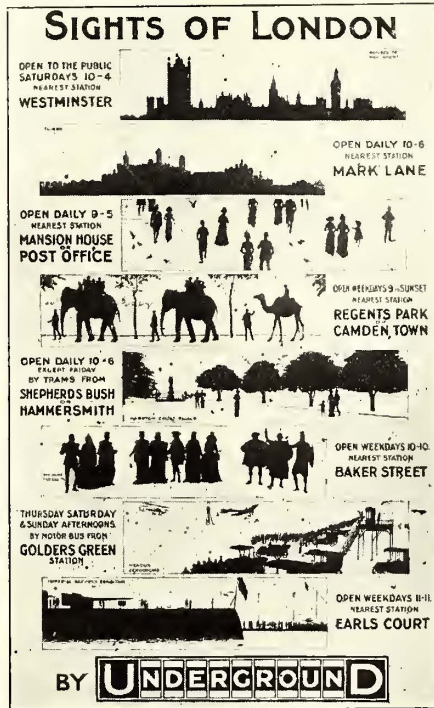
TRIALS OF CENTER-ENTRANCE CARS

Another important work on the London Electric Railway is the experiment with center-entrance cars which has been under way for the past year. The standard motor cars of the tube lines have entrance and exit at the rear only, owing to the fact that the motorman's cab and the control equipment take up the entire front of the car. The experimental cars are of two types, one with sliding doors and three with swing doors.

A notable feature of the sliding-type center-door car is that on account of the limited tunnel clearances the roof slides into pockets with the door sections. The vestibule roof on the platform is also arranged to slide with the corresponding door. It is customary for pas-

IMPROVEMENTS ON OTHER LINES

Improvements have also been made or are under way on underground lines outside the Speyer group. The Metropolitan Railway has enlarged the station and track facilities at Baker Street and is preparing for a general renovation and for faster service. It has also received franchises for extensions to Lothbury and other places. The East London Railway, which connects Shoreditch and New Cross, has now been electrified. At present this company has no rolling stock, as its line has been used jointly as a connecting link by other railways. The road is 5¾ miles long, of which 1¾ miles is underground. The capital for the electrification has been provided by the Great Eastern Railway, but the South Eastern Railway will take care of the general renovation and maintenance, the Metropolitan Railway will handle the automatic signaling and electric track equipment, while the District Railway will supply



Rapid Transit Progress in London—Three Styles of Posters, One Imaginative and Two Historical

sengers in London to open the doors themselves, but in this instance the conductor can also open the center door by means of a wire rope and sheave transmission from the platform.

The other cars, which were reconstructed at the company's shops, consist of a train of motor car, control trailer and trailer. They have been furnished with inwardly swinging doors which give a clear opening of 2 ft. 4 in. at the knee line. The doors are set back 7½ in. from the tread, but to prevent passengers from standing in the niche thus formed the lower panels of the door are covered with a boss or projection which makes it impossible to stand opposite them. The doors swing against bulkheads and are self-closing and fitted with electric locks operated from the conductor's platforms.

The locks and doors are interlocked so that a red signal lamp glows when doors are open or unlatched and a green light only when doors are shut and locked. At the time of writing only experimental cars are actually working, but twelve motor and two trailer cars of the latter type of center-entrance car are to be introduced on the Queens Park Extension, and these cars are now in course of erection. Details of the car design are shown in an accompanying drawing.

power, lighting and pumping facilities. It is proposed to introduce an independent service on this line.

ADVERTISING TRAFFIC

The artistic and clever posters of the Underground Railways have been frequently reproduced in these columns, and those presented in this article prove that the company's high standard is being maintained. One of the accompanying halftones is made from a poster which satirizes the congested surface traffic conditions of London and intimates that the "Underground" is a safe and quick way out of the turmoil and risk of street travel. Another, entitled "Milestones," shows transportation progress from the days of the sedan chair to the clean and fast underground. This poster was especially timely because a play of the same name was then attracting much public attention. A new poster of original design satirizes the winter weather of London by means of brownies which represent the evils of neuralgia, colds and other effects of bad weather, all of which may be avoided by traveling underground. The Americans who visited London last summer were catered to by the poster entitled "An American Pilgrimage," which presented portraits of men and views of places associated with men famous in American his-

tory. The silhouettes are also an effective form of poster publicity. A more recent innovation is the use of post cards with miniature reproductions of posters, particularly those relating to places associated with famous writers. These cards carry on the back the names of the localities and the birth and death dates of the authors.

It might be supposed that, having used the slogan "Travel Underground" so long, the London Underground Railways would be embarrassed in advertising the bus service. On the contrary, the traffic routes have been so co-ordinated that the publicity department can make a point of suggesting the best way to reach particular places by combinations of the different facilities. Almost a score of bus-rail connections with through ticket service have been inaugurated within the last year.

The slogan that is applied to this service is "Travel Above Ground." Among the circulars issued in connection with the service are lists of evening classes in scientific, commercial and other studies as given at schools on or near bus routes. The circular gives the name of the institute, the hours and nights when sessions are held, the route numbers of the buses and the most convenient alighting places.

Beginning with May 17, 1913, the publicity department of the company began the fortnightly publication of "T. O. T." (Train, Omnibus, Tram) for general distribution by all conductors "to give news of what is new, to recall to the memory what is old, in the way of traffic facilities." This is a four-page bulletin containing data of the company's traffic and its facilities, descriptions of places worth visiting whether open-air resorts or buildings, lists of events, changes in service, etc.

References to the power house are made in the form of popular essays on water, coal, electricity and other essentials of a power plant. "Automatism" was a particularly clever essay on the automatic features of the system in ticket machines, elevators, train indicators and signals.

INFLUENCE OF TITANIUM IN RAIL STEEL

The progress which metallographic methods have made in recent years is reflected in a characteristic way in four bulletins issued by the Titanium Alloy Manufacturing Company, of Niagara Falls, N. Y., entitled "Rail Reports." In these are shown the results of tests on a number of samples of standard and titanium-treated open-hearth rails which were sent by several different railroad systems to the laboratories of the Titanium Alloy Manufacturing Company in accordance with its standing agreement to publish full reports upon all such samples consecutively as received. All the samples were from "A" rails (the top rail from the ingot, which usually shows the most excessive segregation). In each case both the standard and titanium-treated rails had been rolled by the same mill, under the same specifications, with the single exception of the use of 0.10 per cent titanium in the treated steels.

The four bulletins give in detail the results of chemical and physical and microscopic tests of nine different pairs of samples. A convenient summary of the results of the chemical and physical tests for the nine pairs of samples is given in Bulletin No. 4 in form of a long table from which the following general conclusions are drawn:

"The ultimate strength for the heads of the titanium-treated rails averages 1.4 per cent greater than for the standard open-hearth, while the average elongation instead of being slightly lower, as might be expected, is

29 per cent higher. In the flanges, where the elongation averages 10 per cent higher in the treated rails, the ultimate strength is also slightly higher (0.7 per cent) than in the standard open-hearth rails.

"The average hardness in the webs of the standard open-hearth rails is 24 per cent greater than in the heads and flanges, while in the titanium-treated rails the average difference is only 5 per cent.

"In the heads of the titanium-treated rails the impact resistance averages 35 per cent higher than for the standard open-hearth. The figure is 40 per cent higher in the webs and 60 per cent higher in the flanges.

"In the White-Souther endurance test the number of revolutions of the machine for the titanium-treated rails averages 54 per cent greater than the standard open-hearth, and in the Landgraf-Turner endurance test the average endurance for the webs of the standard open-hearth rails is 37 per cent less than for the heads and flanges, while in the titanium-treated rails the difference is only 16 per cent."

To sum up these points, it seems certain that these treated rails, when laid in the track and subjected to the strains and shocks of service, will form a safer line than would the untreated rails. If excessive segregation is dangerous, the use of ferro-carbon-titanium in open-hearth rail steel would seem imperative.

A series of sulphur prints and microphotographs given in the four bulletins are a distinctively novel feature. The sulphur prints are made by placing photographic paper on the polished cross-sections of rail steels. This paper is moistened with a very weak sulphuric acid solution, and the sulphur in the steel reacts with the acid, forming hydrogen sulphide. This in turn combines with the silver in the paper, producing dark spots thereon. The sulphur print is a rapid and accurate method of determining the quality of steel. and excessive segregation shown by this method indicates a weakness which the detailed physical tests confirm.

Carbon, phosphorus and sulphur segregate under similar conditions, so that the degree of segregation of sulphur as shown by a sulphur print determines the comparative degrees of segregation of phosphorus and carbon as well. Ample evidence is given that this parallelism in the segregation of carbon, phosphorus and sulphur is a reality.

In addition to the prints cross-sections of the rails were also etched with iodine to reveal segregation, and the pictures of these give, on the whole, the same indications as the sulphur prints. The photomicrographs were made of sections taken from the top of the head, center of the head, the web, the bottom of the flange and the end of the flange. Further microphotographs were made of unetched sections as well as of sections under different etching treatments.

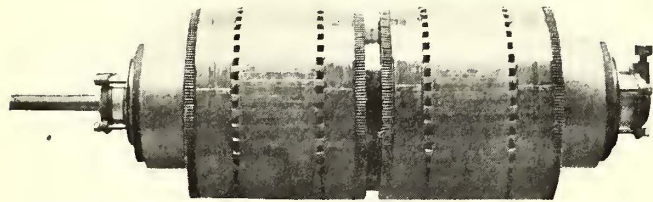
The Swedish railway authorities have worked out a plan for extensions and improvements of the State Railways over a period of ten years. This plan has now been submitted to the government for approval, and it will involve a capital expenditure of about \$81,168,290. Of the above-mentioned amount it is proposed to expend \$12,856,800 on the electrification of considerable sections of the main lines, among which may be mentioned the line between Jörna, Malmo and Trelleborg, and the lines between Stockholm and Gothenburg and Malmo and Gothenburg. It is further proposed to electrify the railway between the large iron mines in the North and the port of Lubac, in the Bay of Bothnia, which will require a sum of about \$2,030,790. The continuation of this line from Kiruna to the Norwegian frontier is now being electrified.

Trial of Booster Control in Paris

The Writer Describes a New Multiple-Unit System in Which a Booster Set Is Used to Control the Building Up of Voltage—Economies in Energy Consumption Are Quoted

BY CHARLES JACQUIN, ELECTRICAL ENGINEER, PARIS, FRANCE

One of the most important problems of electric traction is that of efficiency in acceleration and retardation. If we ignore commercial claims, it must be admitted that very little progress has been made in this field, especially with d.c. equipment. The standard method of combining series-parallel operation with the use of resistances has two important drawbacks—it wastes appreciable energy in starting and stopping, and, in



Metropolitan Railway, Paris—Armatures of Booster Regulator

multiple-unit equipment, it leads to great complication.

In single-phase equipment the speed can be regulated by the use of an auto-transformer or an ordinary transformer to vary the voltage applied to the motors. This method looks very simple on paper, but those who have had experience know that it is not so attractive in practice. The absence of resistance losses is certainly of great advantage on suburban lines, but it is of little importance on trunk lines with few stops. The "reverse of the medal," as we say in France, is the difficulty in passing from one voltage step to another.

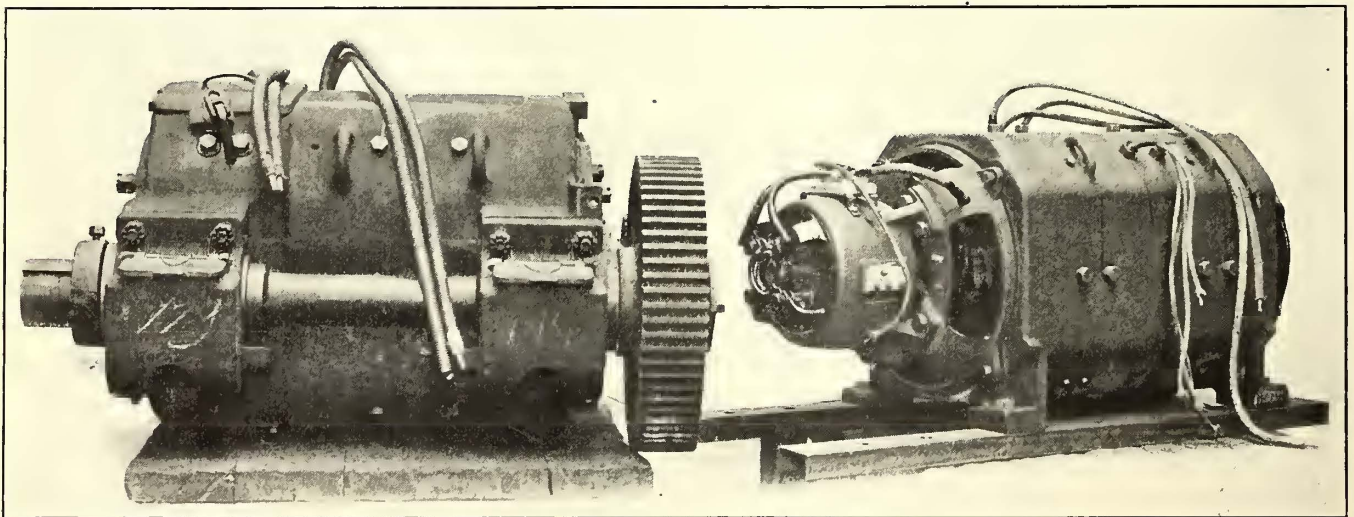
In 1894, just twenty years ago, the Ward-Leonard

simple. These tests, which were made on the former Western (now State) Railways, were considered a great success.

About 1895 the Western Railway made further tests with the straight Ward-Leonard system, comprising a booster in series with the traction motors instead of a gas-electric set. In this outfit the booster produced an emf which permitted the motor voltage to vary from zero to double the line potential. The tests were discontinued because the starting was not automatic, regeneration was practically impossible and, lastly the system did not allow multiple-unit operation.

It was not until 1913 that any further work of importance was done in this field. Then an important step was taken by the Jeumont company (Ateliers du Nord et de l'Est de la France à Jeumont) in the construction of a new control equipment for the Metropolitan Railway of Paris.

The most curious point about the new control is that it is merely a small modification of a device which has been applied to European mining machinery for the last four or five years. In short, it is the application to electric traction of the Ward-Leonard principle in which the voltage at the traction motor armature terminals is varied by means of a motor-generator set, the currents in the field circuits of the traction motors being independently varied by means of another motor-generator set both mechanically and electrically associated with that just mentioned. The railway apparatus has been developed chiefly by M. Legouez, chairman Société pour l'Industrie des Chemins de fer. The surprising results hereinafter quoted were obtained



Metropolitan Railway, Paris—One of the Two 175-hp Traction Motors per Car and Regulator or Booster Group, Showing Comparative Sizes

system was tried on the Heilmann locomotive, which carried a gas engine coupled to an electric generator. On this locomotive the speed regulation of the traction motors was obtained by varying with a small special exciter the independent shunt excitation of the main generator. This method had the disadvantage of weight, but the saving of energy in starting and stopping was incontestably good and the control was very

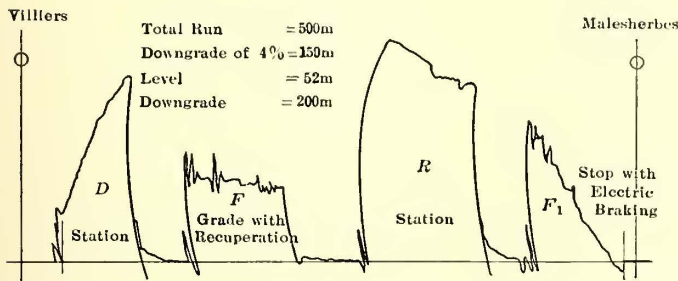
from a test of several months' duration on a Metropolitan train.

APPARATUS AND CONNECTIONS OF BOOSTER CONTROL

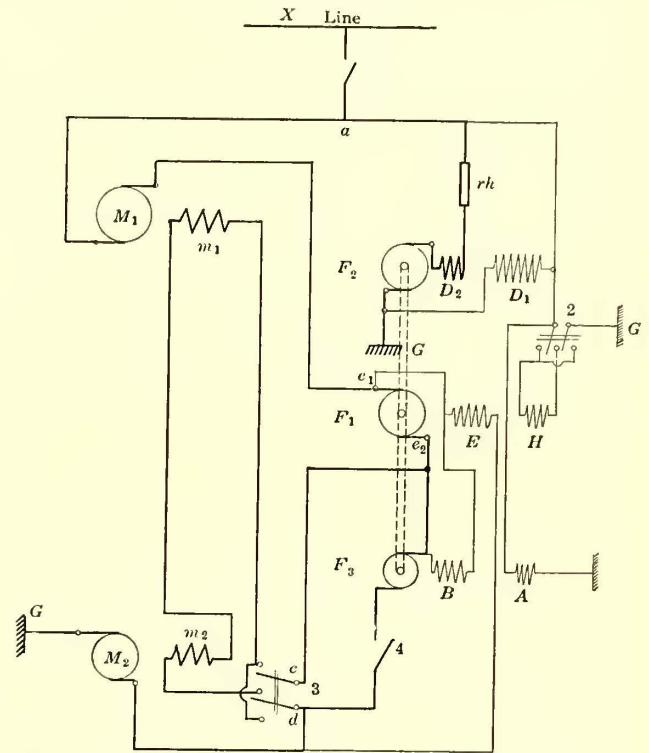
The wiring scheme of the Jeumont company's control system is shown in one of the accompanying diagrams. The letters M_1 , M_2 and m_1 , m_2 represent the rotors and fields of the ordinary d.c. traction motor, the two arma-

tures being permanently operated in series and the two fields being permanently connected in series. The machines F_1 , F_2 and F_3 represent the motor-generator set, the functions of which will now be explained. F_1 and F_2 represent a booster group and F_3 a small regeneration dynamo. The booster group itself comprises two commutating machines F_1 and F_2 , the rotors of which are mounted mechanically on the same shaft, one working as a motor and the other as a generator. The functions of these machines are reversible, depending upon operating conditions, but F_1 is always connected in series with the traction motors by a two-way switch "3." By means of switch "4" the armature of F_3 , the regeneration dynamo, is joined in parallel with the field coils of the traction motors. This machine serves for varying the excitation of the traction motors. The machine F_2 , which operates at a constant speed, is simply a combined dynamo connected across the line, its shunt-exciting circuit being shown as D_1 and its series circuit as D_2 . The regulating generator F_1 has two exciting circuits, one being the circuit H which receives a constant

In starting from rest, switch "1" is closed first, the reversing switch "2" of the regeneration dynamo being in the proper position. Then the booster group is brought to normal speed with the small rheostat rh , machine F_2 now acting as a motor. Until this moment



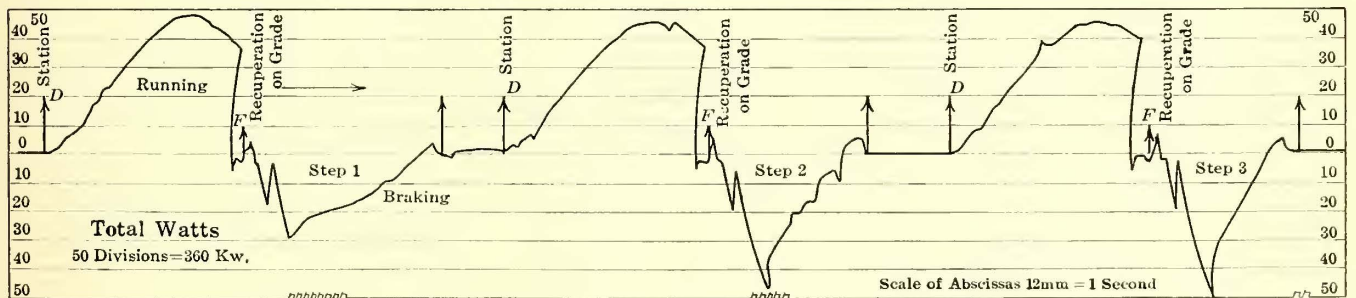
Metropolitan Railway, Paris—Energy-Consumption Curve on Run Indicated



Metropolitan Railway, Paris—Circuit Connections of Booster Control System

current from the line X and the other the circuit E connected in shunt with its own armature and that of machine F_3 . The regeneration dynamo F_3 also has two exciting circuits, one, A , connected directly across the line X to produce a constant excitation, the other, B ,

switch "3" has been kept open to avoid excessive current in the main motor circuit. As soon as the booster group has attained its normal speed switch "3" is closed according to the direction of propulsion. The real starting operations follow next.



Metropolitan Railway, Paris—Energy and Current Curves of Booster Control System

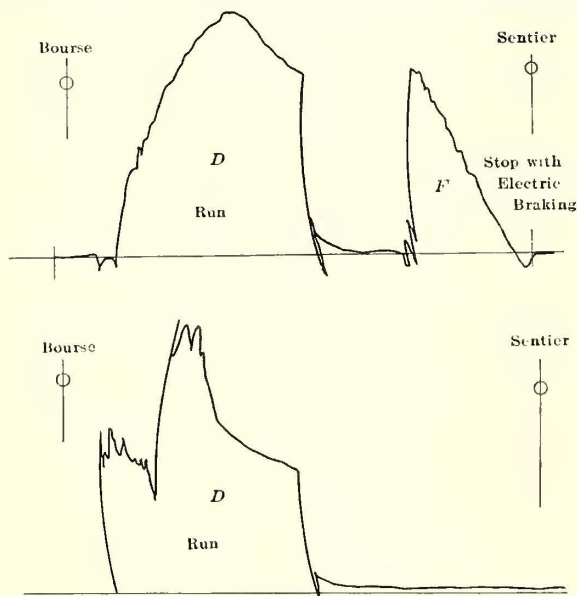
connected in parallel with the armature circuit of the regulating dynamo F_1 to give an excitation varying in direction and intensity with the emf of this machine; that is to say, the excitation of F_3 depends upon the speed of the traction motors.

At first the emf of machine F_1 is in a direction to subtract from the main line voltage and thereby to decrease the voltage impressed on the traction motors. Under these conditions F_1 operates as a motor and drives F_2 as a generator, which therefore returns

energy to the line X. Subsequently, as the main traction motors accelerate, the voltage across F_1 is reduced and finally reaches zero, under which condition the two traction motors operate as if in ordinary series connection, receiving the full line voltage. When the higher speed of travel is reached the dynamo F_2 runs as a motor and drives F_1 as a generator to produce an emf which adds to that of the line until the voltage impressed upon each traction motor is equivalent to that obtained during ordinary parallel connection. In this fashion, as the accompanying curves show, acceleration is obtained without waste of energy or discomfort to passengers. The reverse of the foregoing movements occur during retardation, the switch "2" being reversed, thereby altering the excitation of machine F_1 , varying the emf impressed upon the traction motors and causing energy to be returned to the line.

ESTIMATED ENERGY SAVINGS

The tests show an energy saving of 20 per cent. For instance, on one run the energy consumption of an ordinary multiple-unit equipment was 60 kw-hr. and of



Metropolitan Railway, Paris—Comparison of Energy Consumption, Showing Better Graduation of Voltage During Acceleration of New System Compared with Standard Multiple-Unit Control

the new Jeumont equipment only 48 kw-hr. In braking it was found possible to regenerate 30 per cent of the energy used in starting. If the Jeumont system was applied to all trains of the Metropolitan Railway, the annual saving would be 20,000,000 kw-hr., or \$200,000, at the very low rate of 1 cent per kw-hr. Other accessory but not insignificant advantages of this saving in energy would be less heating of the air in the subway and in the cars. Brake wear and the resulting metallic dust would also be proportionately reduced.

During the running period this control acts as a regulator to maintain a constant current automatically despite variation of speed due to grades, curves, etc. This system can readily be applied to multiple-unit trains with great simplification of apparatus. For instance, it would permit on a Metropolitan motor car with ordinary multiple-unit control the elimination of two contactors, of one reverser and of the starting resistances, a total of 990 lb. As the new devices weigh 4070 lb. per motor car, the actual increase in weight due to using a more efficient control would be 3080 lb. The new system can be readily adapted for several

maximum running speeds to permit most economical operation over sections with varying conditions. Three such maximum speeds were in service on the test train mentioned.

ELECTRIC RAILWAY REPORTS OF BUREAU OF CENSUS

Preliminary figures of the forthcoming quinquennial report on the electric railways of the following thirteen states have been given out by Director W. J. Harris of the Bureau of the Census, Department of Commerce. The statistics given in the accompanying table relate to the year ended Dec. 31, 1912. The totals do not include reports of mixed steam and electric railroads or railways under construction during the census year which had not begun operations.

Connecticut and Rhode Island railways during the decade 1902-1912 showed general gains. The gross income less operating expenses showed an increase of 102 per cent, while the number of revenue passengers carried increased 91 per cent. The number of miles of track increased 54 per cent during the decade. The operating companies numbered ten in 1912, as compared with thirty-one in 1902.

During the decade 1902-1912 there were general gains in Virginia. The gross income of electric railways in that State showed a gain of 335 per cent, while the net income increased 753 per cent. Revenue passengers carried increased in number 108 per cent and the number of persons employed 234 per cent. The miles of track increased during the decade 56 per cent, while the number of companies decreased from twenty-one in 1902 to twenty in 1912.

Georgia electric railways also showed substantial gains for the decade 1902-1912. The number of operating companies increased from ten in 1902 to fourteen in 1912, or 40 per cent. The miles of track increased from 300 in 1902 to 440 in 1912, or 47 per cent. The revenue passengers carried increased 167 per cent. The gross income, including that from the sale of current for light and power, amounted to \$7,421,747 in 1912, as compared with \$2,375,224 in 1902, or an increase of 213 per cent. The operating expenses were \$3,600,445 in 1912, as compared with \$1,232,320 in 1902, or an increase of 192 per cent. The total horse-power increased 191 per cent. The output of stations operated by the railways amounted to 54,510,462 kw-hr. in 1912, as compared with 34,233,902 kw-hr. in 1902, or a 59 per cent increase. The current purchased in 1912 amounted to 71,309,660 kw-hr., figures for the quantity purchased in 1902 not being available.

Electric railways in Florida showed a gross income in 1912 of \$1,969,315, as compared with \$529,743 in 1902, a gain of 272 per cent. Revenue passengers carried numbered 27,236,240 in 1912, as compared with 8,249,542 in 1902, a gain of 230 per cent. The miles of track increased from 62 in 1902 to 165 in 1912, a gain of 167 per cent. The output of the stations increased from 5,184,495 kw-hr. in 1902 to 25,026,663 kw-hr. in 1912, a gain of 383 per cent.

The gross income of Alabama electric railways, less operating expenses, showed an increase of 214 per cent during the decade 1902-1912, while the number of revenue passengers carried showed an increase of 175 per cent and the number of miles of track an increase of 48 per cent. The power equipment showed an increase of horse-power of 296 per cent. The operating companies numbered twelve in 1912, as compared with nine in 1902.

The number of operating electric railways in Louisiana increased from eight in 1902 to thirteen in 1912, or 63 per cent. The miles of track increased from 199 in 1902 to 285 in 1912, or 44 per cent. The persons em-

ployed in the industry increased 90 per cent and the revenue passengers carried increased 70 per cent during the decade. The gross income in 1912 amounted to \$6,901,751, as compared with \$2,910,244 in 1902, or an increase of 137 per cent. The operating expenses were \$3,136,080 in 1912, as compared with \$1,758,989 in 1902, or an increase of 78 per cent. The horse-power of the engines increased 223 per cent, and the output of the stations increased 199 per cent.

The number of electric railways in Mississippi increased from five in 1902 to twelve in 1912, or 140 per cent. The miles of track increased from 25 in 1902 to 117 in 1912, or 363 per cent. The number of persons employed showed a 221 per cent increase and the revenue passengers carried an increase of 251 per cent during the decade. The gross income was \$910,390 in 1912, as compared with \$258,654 in 1902, or an increase of

an increase of 420 per cent. The financial report shows that the gross income in 1912 was \$2,944,154, as compared with \$370,481 in 1902, or an increase of 695 per cent. The operating expenses for 1912 were \$1,705,727, as compared with \$257,248 in 1902.

The number of Minnesota electric railways increased from five in 1902 to nine in 1912, or 80 per cent. The miles of track increased from 338 in 1902 to 555 in 1912, or 64 per cent. The number of persons employed increased 167 per cent, and the revenue passengers carried increased 155 per cent. The gross income in 1912 was \$9,685,158, as compared with \$3,727,648 in 1902, or a gain of 160 per cent. The operating expenses were \$5,882,755 in 1912, as compared with \$1,719,687 in 1902, or an increase of 242 per cent. The total horse-power increased 451 per cent and the output of the stations increased 128 per cent.

OPERATING AND FINANCIAL STATISTICS FOR ELECTRIC RAILWAYS IN THIRTEEN STATES

	Connecticut and Rhode Island	Virginia	Georgia	Florida	Alabama	Louisiana	Mississippi	Oklahoma	Kansas	Minnesota	Colorado	California
Number of companies	20	20	16	10	12	15	12	18	21	9	17	44
Operating	(a) 10	18	14	10	11	13	12	17	21	9	16	35
Lessor	10	2	2	..	1	2	..	1	..	..	1	9
Miles of line	1,087	418	340	140	222	198	107	214	395	328	348	1,766
Miles of single track	1,398	561	440	164	(c) 303	285	117	251	452	555	467	2,606
Miles of single track in State†	(b) 1,432	561	419	..	(c) 305	..	118	..	493	..	..	..
Cars, number	3,412	946	730	269	596	747	197	300	477	1,139	785	4,652
Passenger	2,799	794	645	228	475	681	155	257	388	1,044	551	2,791
All other	613	152	85	41	121	66	42	43	89	95	234	1,861
Electric locomotives	5	..	..	..	..	..	..	3	..	..	..	49
Persons employed	8,179	3,563	2,652	975	1,973	3,236	507	791	1,367	4,267	2,498	16,749
Salaried employees	446	482	337	113	230	119	63	151	161	485	226	1,748
Wage earners‡	7,733	3,081	2,315	862	1,743	3,117	444	640	1,206	3,782	2,272	15,001
Power:												
Horse-power, total	97,245	100,904	82,881	17,868	48,930	43,745	9,850	9,675	12,280	113,583	48,532	48,311
Capacity of dynamos, kw	67,522	75,894	56,609	12,710	32,800	32,890	6,650	7,630	8,860	79,568	29,692	30,817
Output of stations, kw-hr. (in thousands)	157,634	116,299	54,510	25,026	82,955	86,263	9,954	16,393	17,357	89,236	97,915	11,274
Current purchased, kw-hr. (in thousands)	27,336	6,810	71,309	502	4,795	23,086	3,695	4,082	18,793	64,132	8,458	481,625
Passengers carried (in thousands)	316,749	114,601	103,592	34,041	74,889	117,037	12,849	25,491	41,312	249,490	107,502	683,326
Revenue (in thousands)	266,385	91,980	86,601	27,236	62,493	94,052	10,883	22,120	35,527	186,918	86,597	520,741
Transfer (in thousands)	46,570	20,704	15,180	6,110	10,321	21,355	1,445	2,982	5,156	61,611	18,813	150,298
Free (in thousands)	3,793	1,916	1,810	694	2,073	1,628	520	389	628	960	2,092	12,287
Car mileage (passenger, express, freight, etc.) (in thousands)	47,930	19,902	19,211	6,144	13,313	21,812	3,532	6,142	11,110	32,793	17,202	116,553
Income statement:												
Gross income †† (in thousands)	\$14,457	\$7,247	\$7,421	\$1,969	\$4,344	\$6,901	\$910	\$1,449	\$2,944	\$9,685	\$6,630	\$34,845
Operating expenses (in thousands)	9,090	3,875	3,600	1,155	2,401	3,136	651	970	1,705	5,882	3,264	21,684
Gross income less operating expenses (in thousands)	5,366	3,371	3,281	814	1,943	3,765	259	479	1,238	3,802	3,365	13,161
Deductions (taxes and fixed charges) (in thousands)	3,439	2,434	2,557	424	1,195	2,295	..	..	874	1,890	2,106	10,696
Net income (in thousands)	1,926	937	1,263	389	747	1,470	..	..	363	1,912	1,258	2,464

†Excluding track lying outside of States of companies within States and including track in States owned by outside companies.

‡Number employed Sept. 16, 1912.

††Includes income from sale of current for light and power.

(a) Operating companies in Connecticut, 8; in Rhode Island, 2.

(b) Miles of single track in Connecticut, 997; in Rhode Island, 435.

(c) Exclusive of 2 miles not in operation.

252 per cent. The operating expenses were \$651,866 in 1912, as compared with \$192,056 in 1902, or an increase of 239 per cent. In the power plant equipment the horse-power of the engines increased 286 per cent, and the output of the stations increased 230 per cent.

The gross income for Oklahoma electric railways for 1912 was \$1,449,278, as compared with \$577,957 in 1907, a gain of 151 per cent. Revenue passengers carried increased 133 per cent and the number of persons employed increased 110 per cent. The miles of track increased 151 per cent, and the output of the stations in kilowatt-hours increased 717 per cent. The number of operating companies increased from eight in 1907 to eighteen in 1912, a gain of 125 per cent.

During the decade 1902-1912 the number of electric railways in Kansas increased from twelve to twenty-one. The miles of track increased 201 per cent in this time, and the persons employed increased 348 per cent. The Kansas electric railways carried 35,527,363 revenue passengers in 1912, as compared with 6,832,064 in 1902, or

The increase of operating companies in Colorado reported in 1912 over 1902 was eight, or 100 per cent. Their aggregate gross income showed an increase of \$4,402,714 (198 per cent), and their net income increased \$867,605 (222 per cent) over 1902. The miles of track increased 233 (100 per cent), and the number of revenue passengers carried increased 104 per cent.

The number of electric railways in California increased from thirty-five in 1902 to forty-four in 1912, a gain of 26 per cent. The gross income amounted to \$34,845,771 in 1912, as compared with \$9,967,838 in 1902, an increase of 250 per cent. The revenue passengers carried increased 186 per cent during the decade; the miles of track increased 214 per cent, and the number of persons employed increased 208 per cent. The total horse-power increased 27 per cent, but the bulk of the power consumed by the electric railways was purchased as current, 481,625,400 kw-hr of purchased current being reported in 1912. The quantity of current generated by the railways decreased 75 per cent.

Some Problems of Public Utility Accounting

Abstract of Paper Read Before Wisconsin Electrical Association on Jan. 16 on Subject of Depreciation—Need of More Explicit Directions from Public Service Commissions Concerning Accountancy of Depreciation Emphasized

BY HALFORD ERICKSON, MEMBER OF WISCONSIN RAILROAD COMMISSION

The subject of depreciation is one which has gained a great deal of prominence, especially since the introduction of government regulation of public utilities. In discussing depreciation heretofore, however, most of the emphasis has been laid upon the necessity of providing for it and the proper method for determining it. Concerning the methods of recording depreciation upon the books of the plant—or, in other words, the accountancy of depreciation—less has been said. It is true, of course, that technical societies and technical journals have dealt more or less exhaustively with this subject. On the other hand, it is also a fact that in most standard books on accounting the subject is passed over without offering detailed information in the matter.

By depreciation is usually meant the gradual lowering of value of the property and equipment used for industrial and other purposes. In a broad sense it can be analyzed and explained under the following four headings:

(1) Wear and tear, or minor renewals that are ordinarily made up of repairing or replacing minor equipment as well as the smaller parts of the larger equipment as they wear out, break or become otherwise useless.

(2) General decay, or that which cannot be made good through the ordinary minor repairs included under (1). General decay also includes what is sometimes described as decrepitude, or decline in value due to age and the action of the elements.

(3) Obsolescence, or the gradual lowering of the value of property owing to progress and developments in the art which render the old equipment uneconomical, or owing to public requirements by legislation, ordinances, etc.

(4) Inadequacy, or a reduction in value resulting from unexpected developments and growth in business and demands for enlarged service coming from the public.

According to the definition of depreciation as a lessening in value, it includes maintenance or upkeep as well as the general decrease in value usually termed depreciation. In most systems of accounting, however, these two classes of outlays are kept apart. Upkeep or minor repairs are charged directly into the maintenance accounts, while such replacing of the larger parts as must be made from time to time is charged to depreciation. These latter charges are as much a part of operating expenses as ordinary maintenance expenses are. Investors justly insist that such depreciation shall be made good in the rates made for the services rendered. If it were not made good in some such way, the plant would in a comparatively short time be unable to render efficient service and the stockholders' investment would sooner or later be an almost total loss.

When rates are high enough to cover such depreciation, it follows as a matter of justice that the amounts so earned for depreciation should be set aside for the purposes for which they were collected and not withdrawn for dividends or for any other purpose. Without some such reserve to draw on, it is often difficult for plants whose credit is strained to secure money to meet the cost of such extensive renewals as are frequently

necessary to keep up the standard of service in the public utility business.

When the amounts earned for depreciation have not been properly set aside both for rate-making and for other purposes, the chances are that the present value, or the cost new less depreciation, rather than the original cost or the cost new, will be used as the basis for the valuation of the plant. There is a marked tendency in this direction on the part of appraisers almost everywhere. They appear to regard depreciation earned and improperly withdrawn in about the same light as capital withdrawn from the business. For many plants such omission of depreciation from the value upon which rates are based is likely to result in rates that are considerably lower than would otherwise be the case. The losses to the plant through the lower rates may then in the long run be even greater than its temporary gains from the withdrawal of the depreciation allowance.

The omission of the depreciation charges from the operating expenses results, of course, in higher net earnings than is the case when the depreciation allowances are included. This omission, in fact, creates false net earnings, which in turn often lead to unreasonably high valuations of the plant for taxation and other similar purposes. The reason for this is that in appraising property for taxation assessors often determine the market value by capitalizing the net earnings on about a 6 per cent basis. If the net earnings are too high, because depreciation has not been included in the expenses, the assessed valuation will also be too high and the plant will have to bear higher taxes than should be levied on it.

The amounts earned for depreciation and set aside in funds constitute valuable assets in the business. They, in fact, represent a source from which money for new extensions can be borrowed and kept until the outlays can be conveniently financed in the regular way. There are also many other purposes for which such bonds may be profitably employed. Thus they may enable the plant to do business on a cash basis and thus to profit by all discounts.

An examination of the books, records and annual reports of many plants cannot fail to show that there are many shortcomings in the methods employed in recording the various transactions connected with depreciation. Whether this is due to the fact that the best practices in such matters have been overlooked or to the fact that the Railroad Commission in its classification of accounts has omitted detailed explanations upon these points is not clear.

Many, for instance, do not seem to distinguish clearly between maintenance and renewal items or between renewals and new construction. The result of this is that these accounts are often either overstated or understated. Many also fail to make proper entries for property discarded and the new property taking its place, and as a result the construction accounts do not show even approximately the original cost of the property. Such errors constitute serious drawbacks in appraisal work, for they deprive the appraisers of some of the most important elements that enter into the valuation.

There also seems to be some confusion as to the respective meanings that are attached to the depreciation reserve account and to the depreciation reserve fund account. The depreciation reserve account, as the term is commonly understood, is an account created by withholding a portion of the revenue for the purposes of renewing worn-out and discarded equipment or plant. The depreciation reserve fund account, on the other hand, resembles a sinking fund account. It is created by the transfer of actual cash to the depreciation fund, which cash, unless temporarily invested, is there held until used for renewals. The distinctions between these two accounts are often overlooked and the one is often used for the purposes of the other.

Shortcomings of the kind described often lead to complications that are out of line with the best practice. It is quite likely, however, that many of these shortcomings can at least in part be traced to the fact that the commission's classifications do not always go far enough in explaining the methods to be employed. For example, no detailed description is given of the various entries that are necessary in order to show the full results of setting aside the depreciation allowance, the taking out of the discarded property, the replacement of it by new property and the treatment of the scrap value. In this case the classifications show that the allowance for depreciation should be charged to a depreciation account in the operating expenses and credited to the depreciation reserve account, but they do not make such further explanations as may be necessary to the best practice of dealing with depreciation. For instance, they do not show very fully that the discarded property should, for its original cost, be credited to the construction account and charged to the depreciation reserve account; that the new property taking the place of that discarded should, for its cost, be charged to the construction account and credited to cash, and that the scrap value of the discarded property should be charged to the material account and credited to the depreciation reserve. With such omissions in the commission's classifications it is perhaps not to be wondered at that there should be shortcomings in the records of many utilities.

Moreover, the classifications do not show as fully as they should the fact that when the depreciation reserve is secured by cash and a depreciation reserve fund account is created it is necessary to draw a voucher check for the amount, charging it to the fund account and crediting it to cash; that when a depreciation reserve fund has thus been created the cost of discarded property should be charged to the depreciation reserve and credited to new construction; that the entire cost of the new unit replacing the one discarded should be charged to the construction account, and there should be credited to the depreciation reserve fund account so much of this cost as may agree with the cost of the property replaced, while the amount by which the new property may exceed the cost of the old should be credited to cash, and that the scrap value of the equipment discarded should be charged to the depreciation reserve fund account and credited to the depreciation reserve account.

Each of the entries described above should be accompanied by such explanations as will give a fairly complete history of the property involved for both sides of the transactions. Such explanations greatly facilitate analyses of the construction accounts that may become necessary from time to time. Especially is this true under the following circumstances: If the changes due to depreciation are not carried through the construction accounts—that is, if these accounts are not credited with the cost of the property taken out and charged with the cost of the property put in, but are simply charged with the amount by which the cost of the new property

exceeds the cost of the property discarded—then an analysis must be made not only of the construction accounts but also of the reserve and perhaps other accounts in order to obtain some light on the original cost of the plant. This figure can be readily obtained if the accounts contain the proper data in the explanation columns.

The classifications of the commission also fail to draw as distinct a line as is desirable between maintenance and renewals. The relation between these is so close that it is almost impossible in all cases to outline in advance just what items should go into the one account and what items should go into the other. This is being looked into at present. It is quite possible that it will be found that the best way to deal with the matter will be to determine as best one can the total cost of both repairs and renewals and then to set aside into the reserve the entire amount and charge to it as made not only all the renewals, but all the repairs as well.

Other shortcomings in the classifications might also be pointed out, but the foregoing are sufficient to indicate that the commission may be partly to blame for the fact that many utilities do not keep all of their accounts in accordance with the most approved methods. Some of these omissions in the classifications have already been supplied by supplementary issues, and others will probably be covered in the same way in the near future.

[The latter part of Mr. Erickson's paper was devoted to the subject of rates in the electric lighting and power field. In this portion Mr. Erickson discussed the thesis that the total cost of service should be so distributed that each branch of the service and each class of customers therein would bear as nearly as practicable a just share, and that the cost-of-service basis should be the legal basis for rates.]

GASOLINE TRAMWAYS IN INDIA

The *Times of India*, of Bombay, contains the following editorial note on the advantages of "petrol" or gasoline tramways in India for cheap urban transit:

"One of the mechanical problems which have to be solved in India is the provision of quick mechanical transport in the smaller towns. In the great cities like Calcutta, Bombay and Madras electricity has established itself, and despite low fares and long distances has proved profitable. But there are many lesser towns where the traffic will not stand the heavy first cost of electric traction. In these circumstances the experience of Karachi is most valuable. The London *Times* calls attention to it in an article on the report of the East India tramways. The Karachi trams were laid in 1882 and first operated by steam. This proved a failure and had to be replaced by horse traction. This was little better, the company had to be reconstructed, and it struggled along until the simplex petrol tram was introduced in 1909. In the past four years the profits have increased by 380 per cent and the company is now flourishing. We are not, however, concerned with the financial position of the company—that has no doubt been largely influenced by the growth of Karachi—but with the operating expenses. The average cost of work is 9.8 cents per car mile, after making allowance of 1.6 cents per car mile for depreciation, which is a liberal figure. The lowness of these costs is best understood by comparison. The average cost per car mile on the electric tramways of Great Britain is 13.08 cents and that of motor omnibuses varies between 14.2 cents and 22.8 cents per car mile. The comparison is not, of course, exact, but it is sufficient to indicate the remarkable cheapness of the petrol car in certain conditions and seems to open up a wide field for its adoption in the lesser towns of India."

The Evolution of Railway Motor Lubrication*

The Writer Describes the Steps Taken in the Lubrication of Railway Motors Since the Early Days, and Concludes with Data on the Work of the Brooklyn Rapid Transit System

BY ALFRED GREEN, GALENA SIGNAL OIL COMPANY

Ever since the operation of electric cars numerous ideas have been advanced as to the proper method of lubricating the bearings of different motors. In their first efforts the motor designers did not realize the great importance of this subject, for if they had they would never have arranged the lubrication of both armature and axle bearings in the crude and absolutely unmechanical manner which was followed for many years. Thousands of these motors are still in service and will be for years to come, so that methods of improving their lubrication with a view to minimum cost of maintenance are yet in order.

GREASE LUBRICATION

With the design of the first motors of commercial value, it was soon demonstrated that it would be impossible to use oil as a lubricant. These motors were equipped with compression grease cups, but on account of the bad track conditions that existed everywhere at that time it was impossible to maintain the compression cup and a number of them were lost in service. Of course this often meant the loss of an armature.

About 1891 the General Electric Company put on the market the noted WP-30 motor, and soon after that the Westinghouse No. 3 appeared. Both of these designs had a grease receptacle cast as part of the motor shell or frame on which were hinged covers like those in the usual modern motors. The designers of the No. 3 motor realized that it was necessary to heat the grease so that it would continue to feed to the bearing, and they placed a piece of copper wire in the receptacle which extended from the armature shaft to the grease for use as a heat conductor.

FELT, GREASE AND OIL

The next change was the insertion of a felt feeder in an oil well placed beneath the armature bearing and extending to the armature shaft. This method formed a grease and oil combination until the felt became filled with grease, then capillary attraction stopped and the feeder became useless.

However, all grease-lubricated motors designed after the GE-800 had the same lower feeder feature as the No. 800 with this exception, namely, the felt was secured to a flat bronze spring which was supposed to keep the feeder against the armature shaft or axle. Some bearings had one feeder and others had two. This method proved an expensive failure. The next change was to a motor having a housing with armature bearings and so constructed that a felt feeder extended from the bottom of the oil well in the housing up to the armature shaft. This feeder was held in position by a fork and spring. The amount of oil in the well depended on the height to which it could be carried without overflowing and causing unnecessary loss. The felt pad or feeder is split and is so arranged that the fork cannot cut off the supply of oil to the bearing.

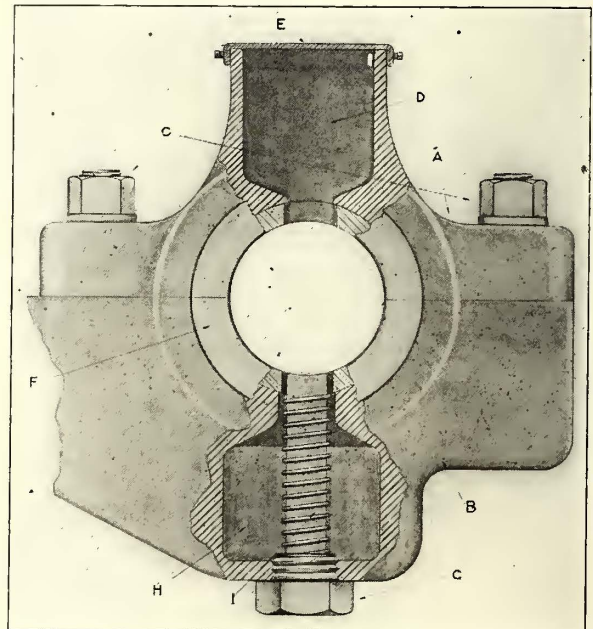
WASTE PACKING

While the split-felt method was a vast improvement over the previous efforts, it did not prove satisfactory.

The next change was so to arrange a motor housing that it could be packed with waste packing. While this was more reliable than anything that had been thought of previously, the one necessary feature had been neglected, namely, the oil could not be placed in the bottom of the housing constructed in this way so as to feed to the bearing of capillary attraction. This difficulty was overcome by drilling a hole on the opposite side. Until this change was made the oil was poured on top of the waste, and when the flood reached the armature shaft more or less of it was carried along the shaft into the motor and onto the commutator, thus causing serious trouble.

THE FIRST WELL-LUBRICATED MOTOR

At last, however, the Westinghouse No. 101 motor was brought out with lubrication features that could aptly be termed nearly perfection both as to efficiency and economy: A few minor mechanical improvements



D—Grease chamber. H—Oil well. I—Felt and spiral spring.

Motor Lubrication—GE-800 Axle Bearing with Grease at Top and Oil Felt Feeder at Bottom

now in hand would make it still better. These changes embody the rearrangement of the housing so that the oil which passes around the bearing will be returned to the oil well instead of running into the street as at present designed. Although the oil may have been used once, it has not lost any of its value as a lubricant for re-use because when it returns to the bearing by capillary attraction any foreign matter in it will settle in the bottom of the oil well or be retained by the waste packing.

TAPERED BOLT FOR BOTTOM OF MOTOR SHELL

One of the mechanical defects which have caused trouble and expense was the attempt to hold the motor housing with two vertical bolts which were placed op-

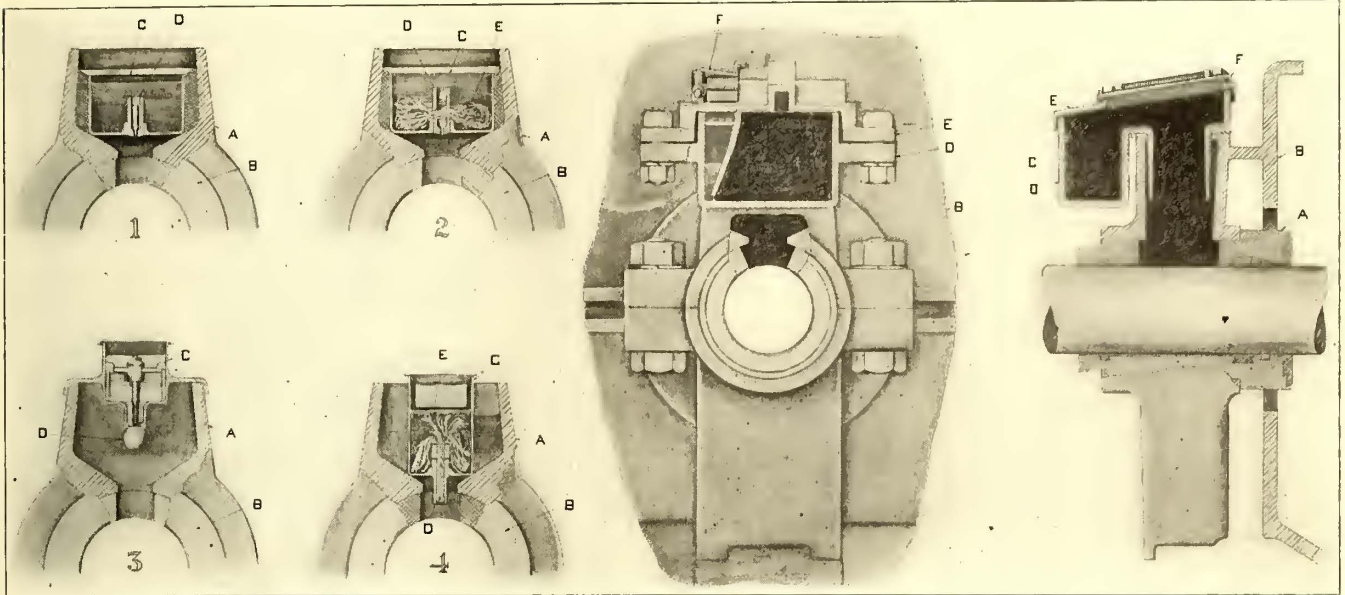
*Abstract of a paper presented before a regular monthly meeting of the New England Street Railway Club, Boston, Mass., Jan. 22, 1914.

posite each other with a small dowel pin on the side to take the armature thrust. This construction failed and was changed so that the two bolts were set at an angle of approximately 45 deg. and on top of the housing. While this was an improvement it was not all that

of the motor shell, the tapered end of bolt to extend into a tapered hole in the bottom of the housing.

NEW LUBRICATION OF OLD MOTORS

While the lubrication of what is termed the "waste-



No. 1—C—Placed in grease chamber of bearing.
 D—Needle-valve post operated through car vibration.
 No. 2—C—Oil cup. D—Post with wick feed.
 No. 3—C—Ball-type cup.
 D—Ball valve operated through car vibration.
 No. 4—C—Wick-feed cup. D—Post with vertical wick.

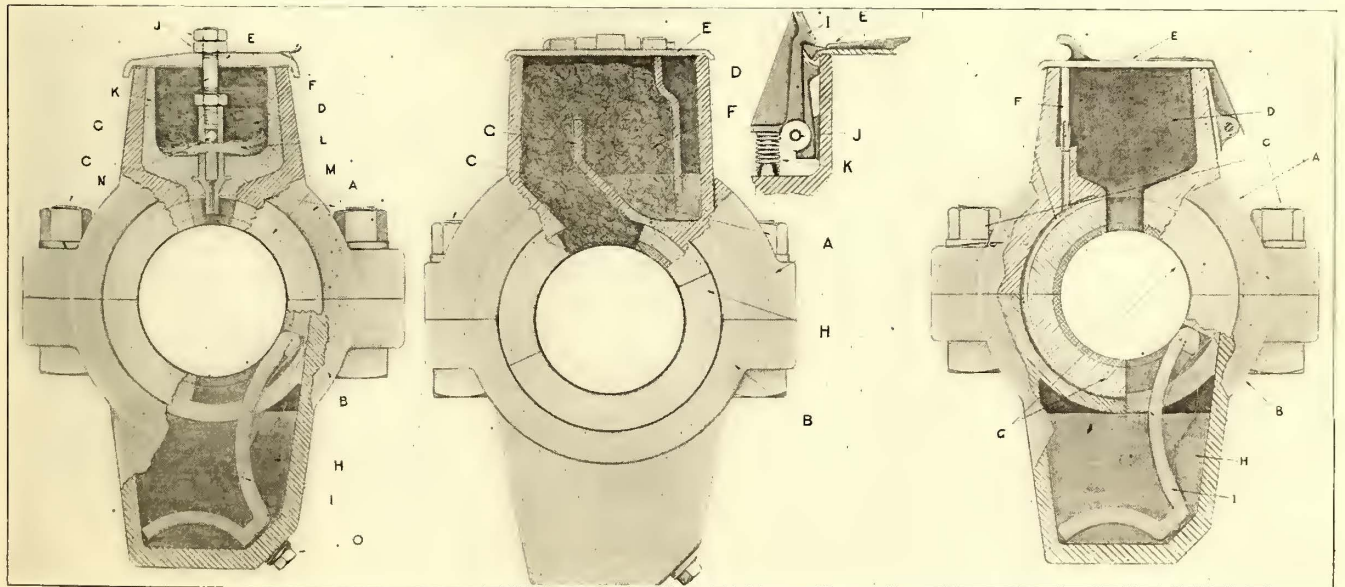
D—New capillary feed-oil box for grease-type motors welded into old grease receptacle.
 E—Cover.
 F—Lid through which oil supply is replenished.

Motor Lubrication—Four Removable Types of Oil Cups Used on Motors Adapted to Grease Lubrication

Motor Lubrication—Capillary-Type Armature-Bearing Oil Cup, Welded to Grease Receptacle Westinghouse 68, 81 and Similar Motors

should be expected to withstand the hammering which a surface railway motor receives in average operation.

fed motor" (which term applies to the type of motor with bearings lubricated by oil, fed by capillary attrac-



F—Supporting post around which babbitt is cast with thread in top for removable post G, which holds cover E.
 K—Babbitt cup molded into grease receptacle. L—Wick feed.

A—New axle cap for underhung motors.
 F—Capillary waste feed.
 J—Cover catch.
 K—Spring for cover catch.

D—Grease chamber.
 H—Oil well.
 I—Flat felt feeder.
 F—Duct for renewal of lubrication in bottom well.

Motor Lubrication—Babbitted Oil Cup for Westinghouse 68, 81 and Similar Motors

Motor Lubrication—New Capillary-Type Axle Cap Replacing Grease Caps on Old-Type Motors

Motor Lubrication—Westinghouse 68 Motor; Original Method of Lubrication with Grease at Top

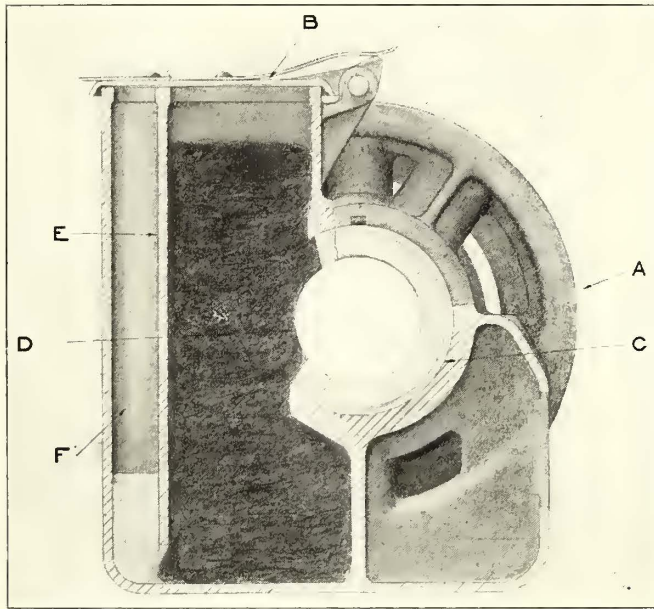
It has therefore been strongly recommended by at least one large system which utilizes this type of motor that a tapered-end tap bolt be screwed into the bottom half

tion through wool waste) has proved a success, the question as to the best method of lubricating the old-type motors has been and is the cause of considerable

study. The conditions to be overcome are rather difficult, and especially because it is so necessary to take the human factor into serious consideration.

The life of all bearings depends largely upon the ability to maintain constantly a film of lubricant between the bearing and the revolving part.

The intermittent flooding of oil onto a bearing is not



B—Cover.
D—Waste feed.
E—Partition between oil well and waste.
F—Oil well.

Motor Lubrication—Waste-Fed Armature Bearing, Westinghouse 101 Type

only poor practice but costly in ultimate results. This condition has existed where many methods have been tried to use oil on motor bearings which had been designed for grease.

The failure of these methods brought forth a number of different types of "oil cups" which were designed so to regulate the flow of oil that the bearing would be supplied with an even amount of lubricant during the entire period the car was in service. Operating and track conditions vary upon many of our city and interurban electric railways, and some types have proved more successful than others in attaining this end.

In regard to the removable cups, numerous methods have been tried to secure them in the motor frame, but none has proved entirely satisfactory. It is difficult to impress the average shop man with the importance of giving proper attention to this point upon inspection or when replacing the cups.

One method which has been tried on the axle bearings of a number of equipments is the following:

If the motor is overhung, the lower cap can be removed and the partition, which is extended to keep the present feeders separated, is taken out and the space is packed with waste. This packing is supposed to hold enough oil to run between inspection periods, and the packing is changed upon overhauling. Should the motor be underhung, the partition must be cut out of the motor frame the same as the cup. This enables the shop man to pack the receptacle properly and allows a greater surface of packing to be in contact with the axle.

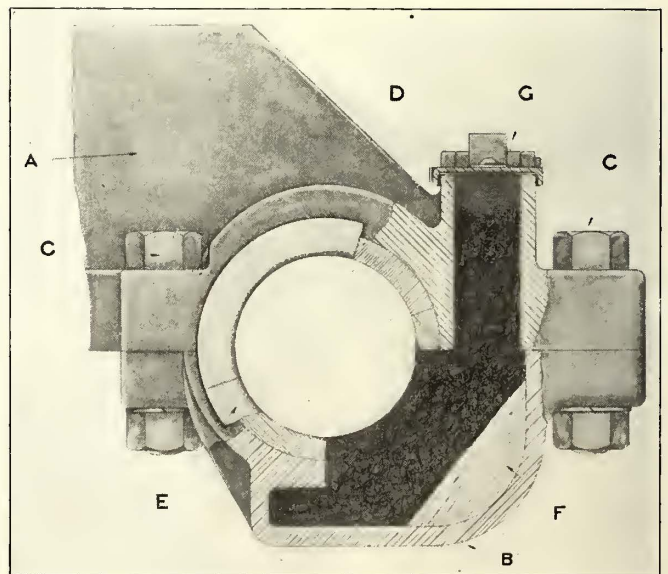
This method has not proved all that was expected of it for the following reasons: The top half of the bearing carries the weight of the motor and therefore the top bearing wears much faster than the lower one. Hence

the success of this method depends upon the care given to it, for it can be readily understood that a rapid wear of the upper half of the bearing allows the packing to fall away from the axle, and once the upper half of the bearing becomes dry, the babbit either breaks or cuts itself out. The consequence of a broken babbit is the scoring and wearing of the axle, making it impossible to get satisfactory results with bearings which are substituted for the worn bearings removed.

TROUBLES WITH NEW MOTORS

The foregoing troubles are not only true of the older motor designs, but even in the newer ones numerous axles have been scored owing to the lack of lubrication which had been brought about by the falling away of the waste packing from the axle itself. The axle cap is also so designed that instead of the waste being jarred toward the axle when the car is in operation it settles into the pocket formed in the back part of the cap. To overcome this trouble it has been necessary to place inside the cap two blocks of wood cut on an angle of approximately 45 deg., upon which blocks a piece of sheet iron is placed. This method keeps the packing against the axle no matter how hard the service is, and if the waste is properly cared for the results will be very satisfactory. The blocks and sheet iron, however, cannot be used in the old-type axle caps or motor frame on account of their construction. The placing of the oil cup or box in the top part of the motor frame gives greater assurance that the bearing will be properly lubricated.

One of the greatest improvements made more recently for the protection of axle bearings, and one which has well proved its worth, is to cover the axle between the motor axle caps with a sheet-iron shield, which is faced with felt on the edges in order to attain dustproof and waterproof construction. Previous to this, the maintenance cost of axle bearings was out of all proportion



D—Waste feed.
F—Block of wood faced with sheet steel to prevent waste from falling away from the axle.

Motor Lubrication—Waste-Fed Bearing, No. 101 Axle

to the work performed, and the wear on the axles at the bearing points was excessive owing to the working of dirt and sand into the bearings and the consequent grinding.

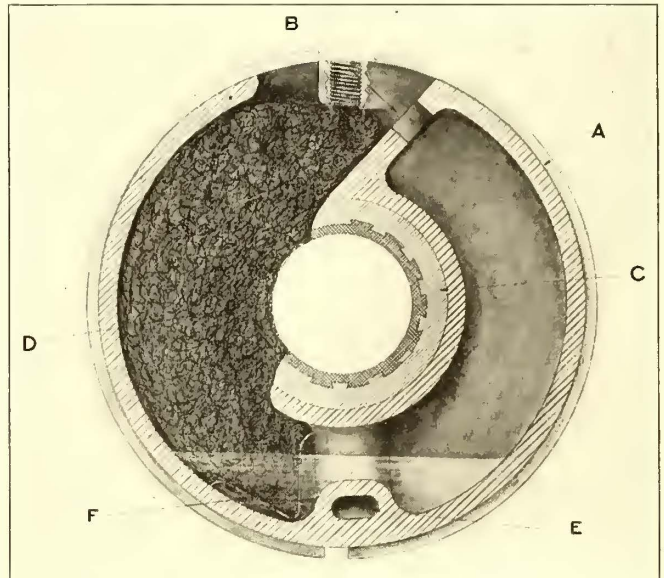
THE AXLE COLLAR

One of the important parts that have recently received very scant attention until within the past year

or so has been the axle collar. The damage that this simple part has caused is beyond all conception of its original cost and duty. Since the initial operation of electric railway cars we have been satisfied to use any kind of metal without regard to size, or oftentimes to proper fit or adjustment.

The axle collar is the part that we must depend upon to keep the motor in its proper position so that the alignment of the gear and pinion can be properly maintained. The proper alignment of the several parts means on a large property the saving of thousands of dollars a year. The question is, Have we saved all that was possible by giving proper care to this item? The answer is, We have not. What has been the practice? The axle collar until very recently has been made of cast iron, malleable iron or steel. The end of the motor bearings with which it comes in contact is in most cases an iron or steel shell with $\frac{1}{4}$ in. or less of hard babbitt on its face and of the supposed proper thickness. This babbitt face is the weakest part of the bearing on account of the construction of the shell, and thousands break off after being in service but a short time. Sometimes the axle bearing is made of bronze, and until the end of the bearing is worn off by coming in contact with the axle collar the general results are excellent, because the gear and pinion remain in a position to run with the least noise possible and to give the best results. Further, the gear case is in such condition that it can be continued in service without patching. However, the trouble returns once more when an attempt is made to face the bronze bearing with babbitt and to bring it back to standard, for no matter how well the casting may be tinned there is not enough metal,

destruction of the end of the axle bearing by the wheel wash and dirt of the street. In the later design of motors this trouble is obviated by a casing which covers both the axle collar and the end of the bearing. For the old-type motors, axle collars are being made with a fiber face and the rim of the axle cap is extended as much as possible to protect both the fiber and the end



B—Drilled hole for supplying oil to bottom of housing.
D—Waste feed by capillary attraction.
F—Perforated steel plate for supporting the waste.

Motor Lubrication—Waste-Fed Type of Lubrication for Westinghouse 50-L Motors

of the bearing. This will mean a saving of material, the keeping of the gear and pinion in proper alignment, and the operation of the car with less noise and saving in gear cases. When the apparatus is thus maintained in a proper condition the gear case will not be ruined by the gear cutting out the side, as is often the case—a condition which ruins the gear in turn.

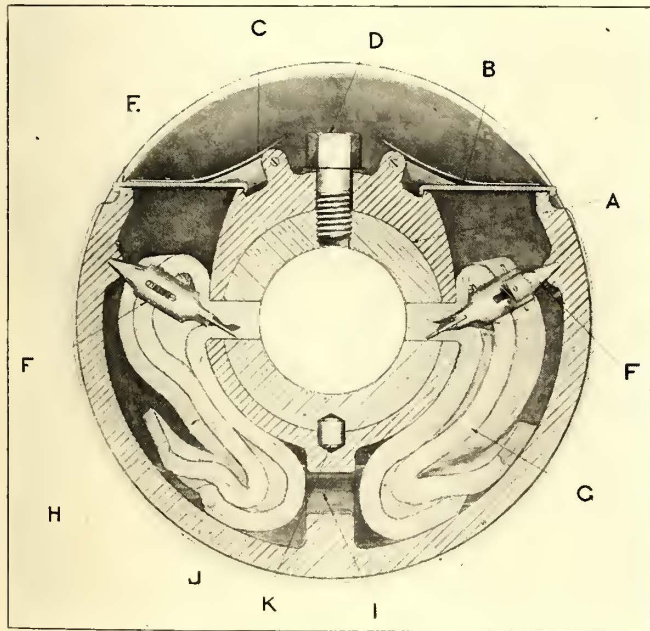
GEAR CASES

The gear case, apparently, is considered of less importance to-day than in the earlier days of the industry. It is not oil-tight, water-tight or dustproof. As a consequence, gears and pinions have been prematurely worn out owing to their having been ground by sand which had got into the case, or because of the lack of lubricant which had got out of it.

Another bad feature of the present construction is the small door placed on the top of the case. This is supposed to be used for the inspection of the gears and the putting in of additional lubricant. As this opening is on a line with the gear, the grease which is thrown from the gear goes through the opening. Eventually nothing is left in the case to lubricate the gears, and, in addition, the outside of the case has accumulated grease and dirt, which costs money to remove at every overhauling. This same opening is so placed as to admit a large quantity of the water and dirt which is thrown onto the gear case by the wheel wash.

More attention than ever is being given to the better quality of gears and pinions. The price paid for what the gear cases are supposed to protect will make it imperative to maintain them in such a manner that the results expected from the gearing will be realized.

Several new gear cases on the market are better in construction than those that have been in service during past years, but the opening in the vital part of the gear case has been left with no protection from the wheel



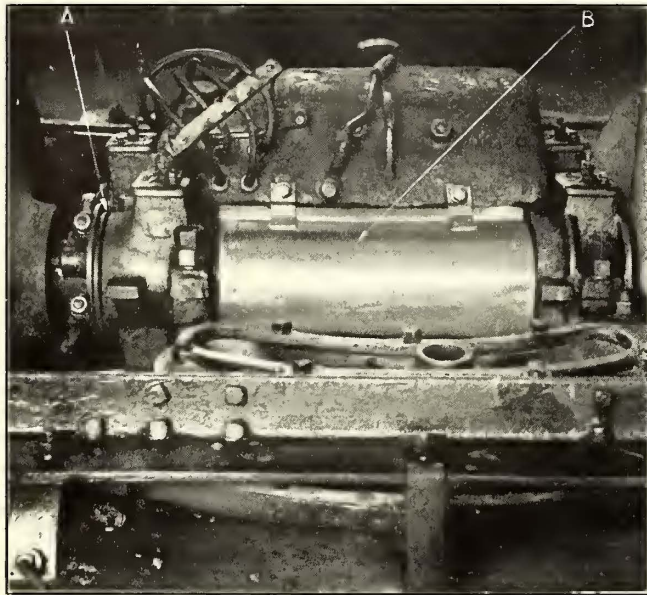
B and E—Covers for oil wells.
D—Cap bolt for holding upper half of bearing in proper position so bearing cannot bind the felt.
F—Spring-prong fork holding felt in position.
G and H—Flat-felt wicks feeding oil to bearing.

Motor Lubrication—Felt Feed Lubrication for Armature Bearing, Westinghouse 50-B and E Types

or it is not tough enough to give the results that were obtained with the original casting.

Another method to regain the proper thickness on the end of a bronze bearing is to rivet a brass or bronze piece onto the worn part and to turn this off to the proper thickness. The axle collar as constructed is nothing more than a grinder which is assisted in its

wash and sand of the street. The construction of this cover is so flimsy that it is practically useless. As this is true, will it not be worth while to make the top of the gear case blank? To inspect gears it would certainly be more workmanlike to remove the lower half of the gear case so that a real inspection can be made, and should a loose gear or pinion appear it can be



Motor Lubrication—View of Truck Showing (a) Fiber Washer Between Axle Collar and Bearing, and (b) Removing Bearings

corrected before the keyway is ruined and it becomes necessary to put in a new armature shaft. On the newer type of gear cases the point where the two halves meet has been protected by an overlapping strip which extends the entire length of the gear case. This design is getting back to first principles. The next move that must be made will be to make the gear case practically oil-tight around the axle, and in the future the manufacturers of railway motors will have to design their equipment to make this possible. A further improvement that is recommended for the cases of the latest types is to place a piece of canvas filled with white lead between the case and the bracket which supports it, thus obviating all wear and keeping the gear case tight and in proper alignment.

LUBRICATION OF RAILWAY MOTORS ON A MILEAGE BASIS

The lubrication of railway motors on a mileage basis has proved its value beyond all doubt. It has made possible economies which never could or would have been thought of in any other way. While the oil costs have been decreasing under this system, the equipment troubles have also decreased to such an extent that from time to time when it was found possible to increase the overhauling and inspection periods the oiling mileage was also extended, and with absolute safety. Nothing proves the real condition of the apparatus more than the cost per thousand miles for lubrication and the results which are obtained with the equipment in service. It would be folly to attempt to save lubricants at the expense of the moving parts and other parts that would be affected thereby, and it is also the height of folly to attempt to flood oil onto bearings that are absolutely unfit for the purpose for which they are being used, in order to overcome their mechanical drawbacks.

As to the overhauling and inspection of equipment the first mechanical department bulletin of the Brook-

lyn Rapid Transit System, which was issued under date of July 23, 1909, read as follows:

"Commencing Aug. 2, 1909, the periodical overhauling of passenger equipment will be changed from the present time to a mileage basis on the surface division, and is expected to have better attention and to be most thorough in the future.

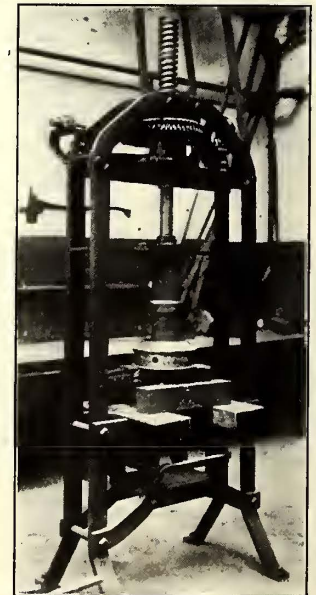
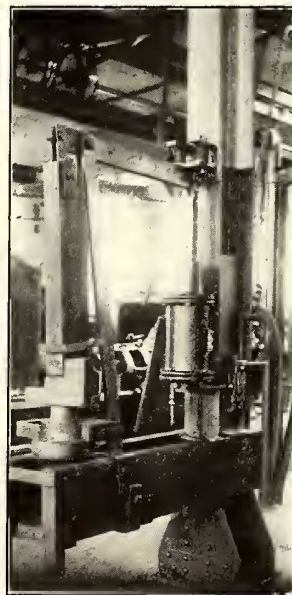
"The following statement shows the mileage basis that is to be followed for such overhauling:

Motor	Mileage Basis
Westinghouse 68	7,000
Westinghouse 81	8,000
General Electric 57	8,000
General Electric 64	8,000
General Electric 80	16,000
Westinghouse 93	16,000
Westinghouse 101	16,000

The system of overhauling on a mileage basis has now been in vogue less than five years, but in that period it has proved to be a practical and efficient means of obtaining results that were never dreamed of before it was brought into existence. During the past four and one-half years the number of miles operated between overhauling periods has been increased from time to time until on Jan. 5, 1914, the following overhauling mileage was made standard, and when compared with that of Aug. 2, 1909, one cannot help but marvel at the improvement brought about in such a comparatively short time:

Aug. 2, 1909.		Jan. 5, 1914.	
Motor	Mileage Basis	Motor	Mileage Basis
Westinghouse 68	7,000	Westinghouse 68	10,000
Westinghouse 81	8,000	Westinghouse 81	10,000
General Electric 57	8,000	General Electric 57	12,000
General Electric 64	8,000	General Electric 64	13,000
General Electric 80	16,000	General Electric 80	13,000
Westinghouse 93	16,000	Westinghouse 93	13,000
Westinghouse 101	16,000	Westinghouse 101	13,000

The inspection of the foregoing equipment now varies between 600 miles for the few remaining hand-brake cars and 1000 miles for the nearly 2000 cars which are



Motor Lubrication—Brooklyn Air Press and Screw Press for Removing Bearings

equipped or are being equipped with semi-automatic air brakes and pneumatic sanders. For the convenience of the transportation department, a leeway of 100 miles either way from these figures is permissible, and this elasticity helps to equalize the number of cars in the shops for inspection from day to day.

The total number of miles operated by the Brooklyn

Rapid Transit System with surface passenger equipment, the troubles and cost were as follows:

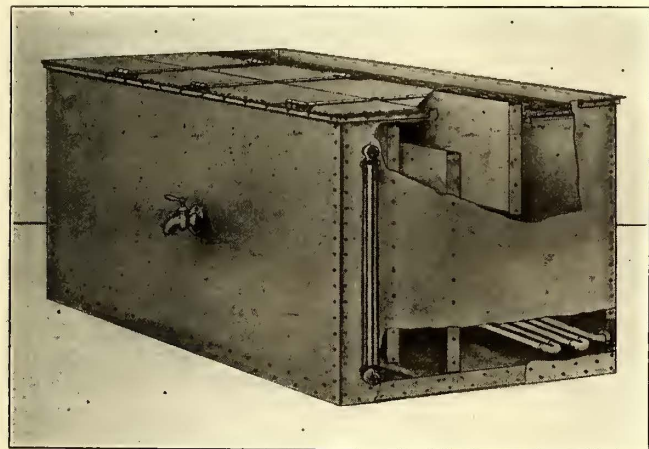
	1909	1913
Mileage	46,026,625	51,841,146
Total number of surface troubles reported	33,386	21,832
Average cost of lubrication per 1000 miles	\$0.192	\$0.168

On the elevated division the change in mileage bases has been as follows:

Dec. 9, 1909			Jan. 5, 1914		
	Motor	Mileage Basis		Motor	Mileage Basis
Westinghouse	50-B	10,000	Westinghouse	50-B	20,000
Westinghouse	50-E	10,000	Westinghouse	50-E	20,000
Westinghouse	50-L	10,000	Westinghouse	50-L	30,000
Westinghouse	300	30,000	Westinghouse	300	45,000

The inspection period of the foregoing equipments at the present time is 1000 miles for motor cars and 1400 miles for trailing cars, with a leeway of 150 miles each way for each class of equipment.

The total number of miles operated with elevated pas-



Motor Lubrication—Steel Oil Reclaiming Tank

senger equipment, the troubles and cost were as follows:

	1909	1913
Mileage	33,494,885	36,287,371
Total number of elevated troubles reported in operation	21,166	3,931
Average cost of lubrication per 1000 miles	\$0.199	\$0.098

The cost per 1000 miles covers the lubrication of motors, trucks and all miscellaneous equipment upon all cars.

A number of factors assisted materially in accomplishing the various improvements in the rolling stock of the Brooklyn Rapid Transit System during the years noted, but among the more important factors were faith in the principles laid down and the consistent determination to obtain the highest efficiency possible in operation. This has been the slogan of the mechanical department: "Efficiency in operation, economy in production." The lubrication schedule prepared by this company* made it possible to co-ordinate the practice at all shops and to have the different foremen maintain the same type of motors with a regularity and sameness that could have been accomplished in no other way. In order to have a check on this system, however, a monthly statement is compiled to show the number of cars and car miles operated, the miles per car maintained, the quantity of the different lubricants used and the cost of the same per 1000 miles. By following this statement closely, it is possible to analyze the results at the different shops and carhouses. Should any foreman fail to make a reasonable showing, or should the

costs increase over the previous month, the reasons for the increase must be explained.

To obtain the most efficient results from the men who are held accountable for the maintenance of the equipment, it is necessary to provide them with proper facilities. In many instances the breaking down of the equipment soon after being overhauled is chargeable directly to the use of unsuitable tools. This has been exemplified by the methods used to install armature bearings in motor housings. The sledge hammer and block of wood have invariably been the only facilities at hand for this purpose. In view of the importance of the armature bearing and the resultant loss due to its failure, it is essential that its fitting into the housing should be so accomplished that it will not loosen or break the babbitt lining, for if that occurs the bearing becomes faulty and unfit for service. To do this work successfully, the Brooklyn company has developed two presses, one operated by air and the other with a worm gear. The worm and gear press is more elaborate, but undoubtedly has many advantages over the air press.

OIL TANKS, WASTE DRAINAGE, ETC.

Much more can be said on the question of proper lubrication, but before concluding I wish to impress upon you the necessity of giving the preparation of the waste packing serious attention because the successful and economical lubrication of the equipment depends upon the proper soaking and draining of the waste before it is put into use. While the installation of proper soaking and reclaiming tanks means a slight expenditure, the value received from such tanks will produce savings much beyond their cost.

PROGRESS REPORT OF JOINT COMMITTEE ON INDUCTIVE INTERFERENCE

A. H. Babcock, chairman of the committee on publicity, California joint committee on inductive interference, has submitted a progress report which follows that published in the ELECTRIC RAILWAY JOURNAL for Oct. 11, 1913. Much attention has been given to analyzing the results obtained from the several parallels on which an investigation has been conducted. These parallels have been previously described. The mass of experimental data and the studies concerning these exposures are embodied in some thirty technical reports. Some of the general results and conclusions indicated by a study of these reports are as follows:

CLASSES OF HARMONICS NOTED

The fundamental (sixty-cycle) wave of voltage or current is relatively of little importance in the production of noise in telephone circuits. It becomes of importance, however, if it gives rise to longitudinal voltages of sufficient magnitude to constitute a physical hazard, to interfere with the operation of grounded signaling devices or superimposed telegraph service, or to operate protective apparatus on the circuits. The harmonics of the voltage and current waves are of chief interest as the cause of noise in telephone circuits, particularly the higher harmonics or those within the range of the voice frequencies. The fundamental and lower harmonics are important as disturbing factors in telegraph circuits.

The foregoing facts show clearly the great desirability, from the standpoint of inductive interference, of having wave forms of voltage and current in power circuits free from all harmonics. That this does not obtain in the present state of the art is a basic cause of the disturbance to communication circuits paralleled by power circuits. Further than this, these facts em-

*Printed in the ELECTRIC RAILWAY JOURNAL for Dec. 7, 1912, page 1145.

phasize the desirability that designers and manufacturers should eliminate, as far as is practicable, those features of design favorable to distorted wave forms.

It has been found in the case of the power lines investigated that the fundamental, fifth, seventh and eleventh harmonics are prominent in the balanced currents and voltages while the fundamental, third and ninth harmonics are prominent in the residual currents and voltages of the power system. By a comparison of the prominent harmonics in the currents and voltages of the power system with those of the induction in the telephone circuit it is evident that the longitudinal induction arises principally from the residual voltages and currents while the transverse induction shows principally the characteristics of the balanced voltages and currents together with some effect from the residual voltage and current.

The effect of the condition of the neutral of the auto-transformers at Salinas, grounded or non-grounded, in so far as the induction from these exposures is concerned, is through the residual currents and voltages of the several high-tension lines connected to these transformers. A representative value of the neutral current at Salinas during the tests conducted at that point is 0.3 amp. It is composed almost entirely of the ninth harmonics together with the fundamental and third harmonics, decreasing in magnitude in the order named. The length of the power circuit between Guadalupe and Salinas is approximately a quarter wave length for the ninth harmonic. This fact may have some bearing upon its large magnitude and is to be further investigated by the committee. Under existing conditions, with the power system in normal operation, grounding the neutral of the auto-transformers at Salinas does not greatly affect the induction in the exposures concerned. Two reasons may be given for this result: (1) the load balance on the power system is such that a relatively small amount of load current flows through the neutral; (2) as three high-tension lines are connected together by the auto-transformers at Salinas, opening the neutral connection to ground of these transformers does not completely eliminate the path for the residual current of any one of the three lines, since it may then flow to earth through the admittance to ground of the other two lines. It is quite evident from these considerations that this case presents special conditions which make it impossible to draw general conclusions applicable to any other case. Further consideration of the effect of grounding this neutral will probably be undertaken by the committee with the idea of determining its effect under abnormal conditions.

The banks of star-connected auto-transformers at Guadalupe and Salinas substations are provided with closed delta secondary windings which supply energy for local consumption. For test purposes the secondary delta of the transformers at Salinas was opened. A large increase in the residual voltage and residual current with a consequent large increase in the induction in parallel telephone and telegraph circuits resulted. In all cases this increase applied particularly to the third harmonic. If star-connected auto-transformers are used, this test indicates, therefore, that from an induction standpoint it is beneficial to provide such auto-transformers with secondary windings connected delta.

On the 8-mile exposure it was possible to measure separately, under different conditions of the telephone circuits, the electromagnetic and electrostatic induction. From this exposure, also, computations of the magnitude of the induction, both electromagnetic and electrostatic, were carried out. In computations of electro-

magnetic induction experience has indicated that the distances between wires and their images cannot be assumed to be twice the height of the wires above the ground. Special tests were carried out in order to determine the equivalent depth of the image conductors. These tests indicated this depth to be approximately 1000 ft. below the earth's surface. Owing to the electrostatic shielding effect of neighboring objects, it was found, also, that the computed electrostatic induction was greater than that actually observed, indicating that in effect the ground surface was brought nearer to the conductors. Electrostatic shielding of the circuits under test, by grounding other circuits on the telephone lead at one point, reduced the longitudinal electrostatic induction particularly.

PRESENT WORK TRANSPPOSITION STUDIES

The field engineering staff is now investigating at Santa Cruz the parallel between the 22,000-volt, three-phase line of the Coast Counties Gas & Electric Company and a toll lead of the Pacific Telephone & Telegraph Company. This parallel is between Santa Cruz and Watsonville and is approximately 17 miles long, the two lines occupying opposite sides of the public highway. The system of the Coast Counties Gas & Electric Company is isolated from ground. The committee plans to conduct on this exposure a series of tests to determine the effectiveness of several different systems of transpositions of the power and telephone circuits. It hopes to be able to determine:

(a) The effect of power transpositions in reducing the longitudinal induction arising from balanced currents and voltages.

(b) The effect of telephone transpositions in reducing the transverse induction arising from: (1) residual currents and voltages; (2) balanced currents and voltages.

(c) The effect of power and telephone transpositions properly located with respect to each other in reducing both the longitudinal and transverse induction arising from balanced currents and voltages.

(d) The relative effectiveness of different transposition systems in reducing electrostatic and electromagnetic induction.

FUTURE STUDY OF EFFECT OF NOISE

In addition to the study of the effect of transpositions the committee will undertake in the near future to determine the effect of known amounts of noise (extraneous current) in the telephone receiver in reducing the intelligibility of conversation over a circuit. Tests will first be conducted to determine the detrimental effect of known amounts of single-frequency extraneous current. This effect will be rated as the equivalent of an increase in the length of the circuit. From such tests with single-frequency extraneous currents the relative detrimental effect of currents of different frequencies will be obtained. This, together with information as to the detrimental effect of currents of complex wave form, will give information by which the law of the combination of the single-frequency effects can be obtained.

Until such time as the committee is prepared to make recommendations to the Railroad Commission it feels at liberty to indicate only in the most general way the results of its investigation. Since its formation, a year ago, the work of the committee has served to emphasize to all members the magnitude of the problem under investigation and the necessity of a thorough consideration of the subject in all its different phases, before the committee, in justice to itself and to the Railroad Commission of California, can make final recommendation to that body for its action.

PROCEEDINGS AT WOOD PRESERVERS' CONVENTION

The tenth annual convention of the American Wood Preservers' Association met in St. Charles Hotel, New Orleans, La., on Tuesday, Jan. 20, with more than one hundred delegates in attendance. Mayor Martin Behrman welcomed the delegates, the response being made by J. H. Waterman, of Galesburg, Ill. The first day was devoted to the reading of reports by the officers, including that of President A. E. Larkin, of Minneapolis, Minn. Some attention was also given to routine matters.

On the second day, Wednesday, Jan. 21, the delegates paid close attention to the delivery of several instructive papers. Clyde H. Teesdale, Madison, Wis., representing the Forest Products Laboratory, spoke on the treatment of ties by the creosote process. Mr. Teesdale said the Forest Products Laboratory had had under way for upward of two years experiments for obtaining data on various conditions in treating plant work. The speaker said that the experiments consisted of a series of runs made on hard maple, red oak, hemlock and loblolly pine cross-ties. The maple, hemlock and red-oak ties were furnished by the Chicago & Northwestern Railroad. The maple and hemlock ties were obtained in northern Michigan, and the red oak in central Wisconsin. The ties had been seasoned about eighteen months before treatment. Five hundred ties, all hewed, divided about equally between the three species, were used. The loblolly ties were furnished by the Illinois Central Railroad and came from Mississippi. After treatment the ties were returned to the companies which had furnished them. The creosote used was purchased by the Forest Products Laboratory from the Semet-Solvay Company, Ensley, Ala.

Mr. Teesdale then explained how the timber was treated in the preserving apparatus. The test consisted of forty-eight runs under various conditions. Eleven ties were used in each run and each species was treated separately. The temperature of the oil, the maximum pressure, draining and weighing the ties were kept as similar as possible in all the runs. The loblolly pine showed the best results, maple ran next in order and red oak and hemlock were on an equal basis.

The paper on "The Protection of Ties from Mechanical Destruction," by Howard F. Weiss, of Wisconsin, was followed by H. H. Gibson's report on "Future Tie Material in the United States." The papers by Messrs. Weiss and Gibson, together with others of electric railway interest, were abstracted in the ELECTRIC RAILWAY JOURNAL of Jan. 24, 1914. The convention was concluded on Jan. 22 with the election of officers as follows: President, George E. Rex, manager of treating plants Atchison, Topeka & Santa Fé Railway; vice-presidents, Carl G. Crawford, R. S. Manley and F. B. Ridgeway; secretary and treasurer, F. J. Angier, superintendent of timber preservation Baltimore & Ohio Railroad.

SPECIFICATIONS FOR CREOSOTE

An additional paper at the annual meeting of the Wood Preservers' Association was the report of the committee on preservatives. The committee, like its predecessors, reported that the only preserving oil which has been shown to have sufficient merit as a preservative was creosote oil. The revised definition defines "creosote" as any and all distilled oils boiling between 200 and 400 deg. C. which are obtained by straight distillation from tars consisting principally of compounds belonging to the aromatic series and containing well-defined amounts of phenols. The report also described methods of testing,

including a thermometer recommended as standard. It also quoted the specifications of several timber-using associations, like the American Railway Association, and recommended that it be instructed to confer with similar committees of such associations with a view of preparing uniform standard specifications. The chairman of the committee did not concur with this recommendation as he believed that the Wood Preservers' Association was the proper one to take the lead in matters of this kind rather than to reconcile the diverse specifications of users.

EFFECT OF RATE OF FARE ON RIDING HABIT

In his discussion of the paper by F. W. Hild at the meeting last week of the American Electric Railway Association, L. R. Nash, of Stone & Webster, presented some curves showing studies which he had made on the effect of fare on riding habit. It was impossible to reproduce the curves in time to use them in connection with Mr. Nash's discussion, which was published on page 253 of last week's issue. Hence they are published below with the accompanying remarks:

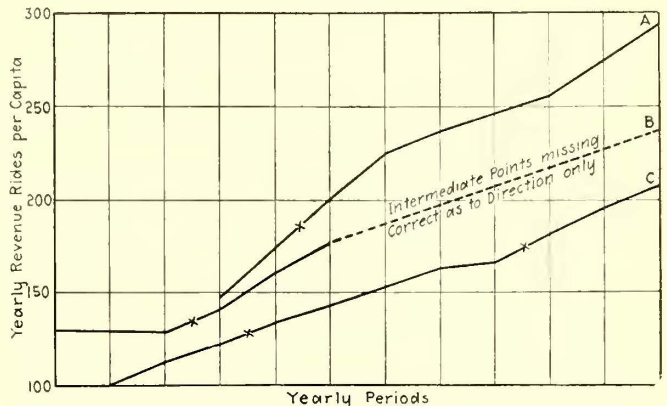


Chart Showing Effect on Riding Habit of Reduced Fares (Rate reductions, one extra ride for 25 cents, shown by crosses*.)

"It was the writer's privilege not long ago to participate in a study of the effect of fare reductions. Definite information was desired to substantiate an opinion that no appreciable stimulus would result from a fare reduction from 5 cents to six rides for 25 cents, and this information was not at hand. It was found upon investigation that there were not more than fifteen large cities in this country where reduced rates were in effect. Nearly all these cities were visited, local conditions observed, and as far as possible statistics of operation obtained. In nearly one-half the cities reduced rates have been in effect since electrification, or for so many years that prior statistics of value were not available for comparisons. In other cases definite information was secured regarding the riding habit for a term of years before and after the reduction in rate. It was thus possible to determine whether or not there were temporary conditions existing before or after the change which would render the immediate results misleading. Curves of rides per capita per year were plotted on which the effects of competition, business depression, strikes, interurban accessions and other significant conditions of the years plotted were indicated. A careful and repeated study of these curves has failed to disclose any large stimulus which could be attributed to reduction in fare. Increases in riding were shown following some reductions, but in each case there were other known contributory factors. It is significant that where such factors were absent the increase in riding was, to use the author's own words, 'slight even to negligibility.'

"It has been thought of interest to submit with this discussion a few of the curves mentioned above. Conditions in some of the cities studied are discussed in the paper or have previously been so fully presented to the association that they are not included in the plot prepared herewith, from which has also been omitted all information not directly pertinent to the matter under discussion. No riding habit curves from which significant data were obtained except for the cities mentioned above have been omitted. It is regretted that the number remaining is small. An examination of the curves shows only one material departure from a continued straight line of riding following a fare reduction. In the case of city 'B' the reduction was preceded by an evident period of depression and followed by an exceptional development in interurban operations which brought many passengers to the city system. In the case of city 'C' the six rides for 25 cents were first allowed during commutation hours only and later came into general use. At neither time is there any evidence whatever of increase in riding.

"With reference to other companies which have operated with reduced fares for comparatively long periods, it may be stated that some are struggling along with unsatisfactory service and insufficient provision for maintenance and depreciation. Others are apparently successful. A search for the reason usually discloses a restricted territory served, short hauls, extra-fare suburban or tributary lines, unusual noon riding or other similarly favorable factors. As the cities which they serve grow these advantages will tend to disappear and the companies will be confronted with rapidly increasing expenses and charges. They may find themselves financially unable adequately to keep pace with natural city expansion, which will therefore to some extent be retarded."

BOILER TESTS WITH ILLINOIS COAL

A paper of much interest was read by Bryant Banister, of Kewanee, Ill., before the Chicago section of the American Society of Mechanical Engineers on Jan. 28. It related to tests made about three months ago at the new boiler house in the Kewanee works of the National Tube Company. The complete boiler plant consisted of four Edge Moor water-tube, four-pass boilers, each having 6132 sq. ft. of water heating surface and 1200 sq. ft. of superheating surface, installed in conjunction with Foster superheaters. The firing was done by a seven-retort Taylor stoker equipped with an air extension grate. Each stoker was provided with a fan and engine. Low-grade Illinois coal in the form of 1.25-in. screenings averaging 11,094 b.t.u. with 21 per cent of ash and 16 per cent of moisture was burned with an efficiency of boiler and grate based on combustible burned of 80.95 per cent, which fact made the report of the tests of considerable importance. Feed water was supplied from a purifying plant and was heated by the exhaust from the auxiliary engine in an open heater.

Much was done to make each boiler setting tight and as free from radiation losses as possible. The setting was first painted with a thick asbestos paint, then covered with 1½-in. coating of 85 per cent magnesia insulation, and finally covered with muslin and again painted to insure no air leakage. The boiler headers were also covered, where exposed, with this same magnesia compound, and the drums were covered with a 3-in. layer of firebrick and cement, and then with magnesia covering. At no point during the test was the setting more than warm, even at the highest loads.

The steam pressure by gage was 117.8 lb., the tem-

perature of escaping gases leaving boiler 412.0 deg., the blast pressure under grate 1.95 in., and the degree of superheat 77.9 deg. The dry coal consumed per square foot of grate surface per hour was 28.5 lb., and the equivalent evaporation per hour from and at 212 deg. per square foot of water-heating surface 3.28 lb.

"SAFETY FIRST" SIGNS IN PORTLAND

The Portland (Ore.) Railway, Light & Power Company has been introducing a novel method for advancing its safety-first campaign. On each one of its cars is being painted the slogan "Safety first," and in addition some short expression, such as "Wait until the car



Portland Safety Campaign—Car with Slogan "Wait Until Car Stops" Painted on Body

stops" or "Help prevent accidents," as shown in the accompanying halftones. The sign on each one of the cars will differ slightly from that on any of the others, so that attention will be drawn to them. It is expected that by this means the interest of the public will be stimulated.

This idea was developed by F. W. Hild, general man-



Portland Safety Campaign—Car with Slogan "Help Prevent Accidents" Painted on Body

ager Portland Railway, Light & Power Company, who has been taking an active interest in the safety campaign inaugurated by the claim department of the railway. The novelty of the scheme, as well as its obvious excellence, has attracted a great deal of local attention, which is shown by the favorable comment made by the public of Portland regarding it.

The Saxony State Railway authorities have decided to begin work on the electrification of their system. The first section to be converted will be that between Klingenthal and Untersachsenberg, after which the Pirna-Dresden-Meissen line will probably be taken in hand.

Equipment and Its Maintenance

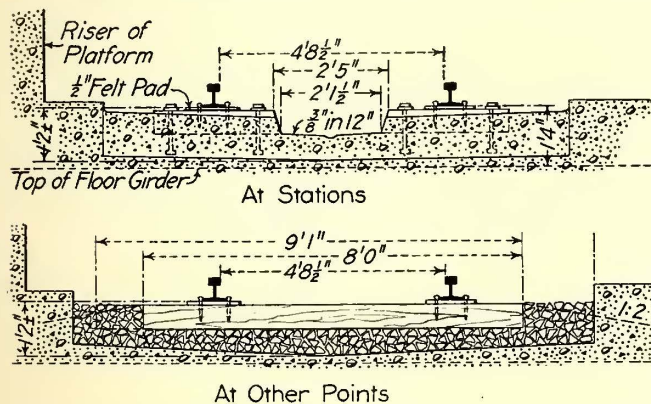
Short Descriptions of Mechanical and Electrical Practices from Every Department of Electric Railroading

(Contributions from the Men in the Field Are Solicited and Will Be Paid for in Accordance with Our Regular Rates.)

GENERAL FEATURES OF PUBLIC SERVICE COMMISSION'S TRACK SPECIFICATIONS FOR NEW RAPID TRANSIT LINES

BY ELLSWORTH L. MILLS, ENGINEER OF TRACKS, SUBWAY SYSTEM, WITH GIBBS & HILL

The Public Service Commission, First District, New York, has undertaken for the first time to design the details of and buy material necessary for the construction of track work. It contemplates handling this material just as a railroad would, ordering directly from the material contractors such supplies as are needed from time to time, and installing it as the subway and elevated work now under way in New York progresses sufficiently to permit of so doing. It was not deemed advisable to let a general contract for the work, as the construction would have to be carried on sometimes



Cross-Sections of New Subway Construction with Screw Spikes, 1/2-In. Tie Plates Over Felt Pads, etc.

under traffic. Again, in some instances, the city might desire to install a portion of the tracks for temporary operation, and it was appreciated that no contractor could bid on doing work under such uncertain conditions.

STANDARDIZATION AND MILEAGE

In order to obtain a standard track construction throughout the dual system (comprising not only the city-built lines, but also the lines now owned and being built by the operating companies, all of which the city has the right ultimately to take over) the commission invited the New York Municipal Railway Corporation and the Interborough Rapid Transit Company to confer with its engineers. The result has been the adoption of a set of standards and specifications which will apply to all new rapid transit lines whether built by the city or by the operating companies. The work will be done under the chief engineer of the commission, Alfred Craven; under the general direction of the deputy engineer of subway construction, Daniel L. Turner, and

under the direct supervision of the writer, representing Gibbs & Hill, the consulting engineers to the commission. The draft made for the public hearing of these specifications is now obtainable from the commission. This draft is subject to some minor modifications as noted therein. Bids for part of the equipment will be received by the commission on Feb. 24.

The following table gives the approximate mileage of the dual system:

INTERBOROUGH RAPID TRANSIT COMPANY		Track Miles
Existing subway		73.0
Existing elevated lines		118.0
Subway and elevated lines for construction jointly by city and company		149.0
Elevated railroad extensions to be constructed by company		10.4
Third-tracking on elevated roads to be constructed by company		10.5
		360.9
NEW YORK MUNICIPAL RAILWAY CORPORATION		Track Miles
Existing elevated lines		105.00
Subway and elevated lines for construction jointly by city and company		110.41
Elevated extensions for construction by company		35.29
Third-tracking and reconstruction by company		9.30
		260.00

The foregoing tabulation shows approximately 324 miles of new single track to be constructed according to the standard specifications.

CHARACTER OF LINE AND STATION TRACK

The floor of the subway will be a concrete invert with a minimum distance of about 1 ft. from the base of the rail to the top of the concrete. The elevated structure will be the usual type of construction with girders on tangents spaced about 5-ft. centers under the tracks.

The track will be of 100-lb. A.R.A. type "B" open-hearth rail on tangents and on curves with a radius of more than 700 ft. and manganese rail of the same section on curves with a radius of less than 700 ft. All curves under 2000-ft. radius will be guarded, using different flangeways for various degrees of curvature. The rails will be secured to 6-in. by 8-in. by 8-ft. untreated yellow-pine ties with 6-in. cut spikes, except at stations. The guard rails are to be fastened to the running rails at intervals of about 3 ft. with a 15-16-in. bolt passing through an adjustable filler block. Spiral spring nut locks are to be used on these bolts. Malleable-iron rail braces will be installed on the guard rail and on the main outside rail on all curves under 700-ft. radius. Rolled open-hearth steel, flat-bottom, shoulder tie plates will be placed on all ties and will be 1 1/2 in. thick by 7 1/2 in. wide by a minimum length of 9 in. Owing to the rather small distance between the floor of the subway and the bottom of the ties, trap-rock ballast is ordered, not too large to pass through a 1-in and not too small to pass through a 1/2-in. ring. This size of ballast permits easy tamping. The base-supported type of splice bar 26 in. long will be used, bolted to the rails with 15-16-in. bolts. The suspended joint is specified.

At the stations the rails are to be secured with screw spikes to 6-in by 10-in. creosoted blocks embedded in

concrete. To prevent the track from getting out of alignment, these blocks will be anchored to the foundation by two 15-16-in. bolts. The tie plates in this construction will be rolled with a ridge or boss for the support of the head of the screw spikes. Cow-hair felt pads, $\frac{1}{2}$ in. thick, are called for between the ties and the tie plates. This type of track was adopted to insure more sanitary and sightly conditions at stations.

The section of the subway is usually such that cross-overs are very costly; therefore sharp turnouts are used extensively. To keep the radii as long as possible under these conditions and eliminate many of the ill effects of sharp curves, a special design for turnouts has been made to ease the curves as much as possible, obtaining in most cases an actual radius very near to the theoretical radius. Wherever the equipment will permit, the rail will be offset and the switchpoints protected by a cast manganese housing. Rolled manganese rail will be widely used throughout the special work.

PURCHASE AND STORAGE

Bids for the material will be asked for on a unit price basis, and approximate estimates of the amounts required will be furnished the bidders. A sufficient quantity will be ordered to take care of the expected requirements of the city for an extended period. This material will be stored in a yard and requisitioned in a manner similar to that followed by railroads. This method of handling the work is expected to produce very efficient results and do away with a middleman's profit and the large amount of wastage of left-over material. All unused material will be returned to the storeyard, and after all the trackwork is completed it will be turned over to the operating companies for their use in maintenance.

EQUIPMENT DEFECTS—RECORDS OF THOSE CAUGHT IN OPERATION OR AT INSPECTION

BY C. W. SQUIER, ASSISTANT ENGINEER NEW YORK MUNICIPAL RAILWAY CORPORATION

In looking over the records of equipment on different roads a wide variation is found in the defects reported for the same type of equipment operated under similar service conditions. This is due somewhat to the use of different methods for reporting and recording defects so that more are recorded on some roads than on others.

The usual system for obtaining and recording defects is to have the motormen or others of the operating department report the defects, and then to have the troubles repaired and recorded by the mechanical department. This is an excellent method for arriving at the defects that cause trouble in operation, but with a careful system of inspection by far the greater number of defects are found and remedied on inspection before they cause trouble on the road. Of inspection discoveries no record is kept in most cases.

To be of any value for comparison a record should include all defects regardless of whether they cause interruption of service or are found on inspection. Such a record will show just what troubles are encountered with a given equipment, and the excessive ones can be picked out for remedial measures. Such a record would also be of inestimable value to the engineer when the time comes for purchasing new equipment, for he is thus enabled to classify the troubles experienced with each piece of apparatus and to make certain that the new design will minimize all excessive troubles. Such a record will give an accurate comparison of different types of equipment, but it should not be used as a comparison of the shops or of the men who maintain the equipment because this would put a premium on sup-

pressing the correct number of the defects discovered.

MAINTENANCE EFFICIENCY COMPARISON OF SHOPS

For comparing different shops on the basis of efficiency in equipment maintenance, we should use some basis which will indicate accurately the attention given to equipment to prevent delays in operation. Where the service is similar it would appear as though the number of detentions per 1000 car miles operated would be a fair comparison. These could be classified according to the different general divisions of a car equipment, such as motors, controller, air-brake, car-body and truck troubles. Another comparison could be made on individual pieces of equipment which require general repairs, say, the number of armatures of a particular type sent into the armature room for repairs per 1000 car miles operated. In classifying these troubles distinction should be made between troubles caused by improper maintenance and troubles due to improper material or workmanship at the general repair shop. Thus in the case of grounded armatures those grounds due to rubbing, oil, dirt, etc., should be charged against the maintenance shop, while grounds caused by an insulation breakdown should be charged against the shop.

The duty of inspectors is to find defects and to remedy them before they cause sufficient trouble to interfere with the operation of the equipment. The best inspectors are those who find the greatest number of defects. Some roads offer a bonus for finding those defects which if left undiscovered might cause serious accidents, like broken or cracked equalizer bars, loose wheels, broken or loose tires, broken spring-plank hangers and motor suspension bars. This plan provides an incentive toward careful inspection, and the location of such defects before they advance far enough to cause accidents is well worth the additional amount paid.

SUPPRESSION OF DEFECT RECORDS

Where shops are compared on their records of equipment defects the following ways are among those which may be used to suppress the facts:

(1) When a car is run in for equipment trouble and several defects are found only one is reported, for by doing this the number of defects is kept low.

(2) Incomplete information is often furnished regarding the damage caused by defects in order to prevent the possibility of more than one defect being charged against the shop. Thus in one case a grounded resistance caused the burning off of resistance leads and controller fingers. The shop reports stated only "grounded resistance" and made no mention of the other damage.

(3) All defects which occur in service are not reported. In numerous cases it is found that when a car is brought in because of trouble the carmen are told by the repairman that it is not necessary for them to put in a defect slip as he will make repairs at once.

(4) When no trouble of the nature reported by the crew is found the equipment is reported as being O. K. even though the shopmen find defects of another character which undoubtedly caused the trouble. As an example, a car which started with a jerk due to poor contact by the controller fingers was reported by the motorman for motor trouble. The shop report read: "Motors found O. K.," which was correct as far as it went, but as it made no mention of the poor contact on the controller fingers the shop saved itself a defect charge.

These few examples will show the undesirability of charging the shop with defects of this kind where an accurate record is desired. Defects should be charged against the equipment, and comparisons of its maintenance should be such as will give a complete and accurate record of all defects which actually occur.

FUSE-TESTING BOARD OF THE THIRD AVENUE RAILWAY

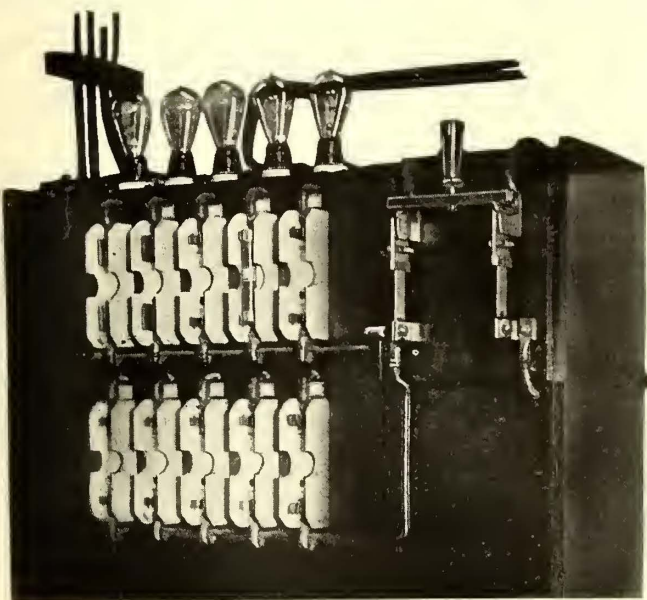
BY R. H. PARSONS, ELECTRICAL FOREMAN

For some time the mechanical department of the Third Avenue Railway, New York, has been refilling the blown cartridge fuses used in the cars of that com-

pany. There will pass through the fuse the current at which the fuse should blow within the time set by the National Electrical Code standard.

On top of the board are five lamps connected in series and so wired with the board that they burn when current is passing through the fuse but not when the fuse blows, because then the lamp circuit is broken. Hence a man who is standing at the board with a watch can test a fuse quickly and positively. The table used in making up the board and also used for testing fuses is shown below. It conforms to the National Electrical Code standard and gives the ohmic resistance necessary to get the proper current through each fuse and the current used to test each fuse. These figures were checked in actual service with an ammeter.

Each fuse block is connected so that it will receive 50 per cent more current than its rating. For instance, the 5-amp fuse block is connected in series with 73 ohms, giving at 550 volts the 7.5 amp current at which this fuse should blow in less than 1 minute.



Fuse-Testing Board, Third Avenue Railway, New York

pany. This practice has proved both convenient and economical, the net cost for the standard sizes of fuses being only 3 cents each.

The only obstacle encountered was the unreliability of the fuse filler. It was found, for instance, that the filler purchased for, and marked, 10 amp would often carry 20 amp indefinitely. To be secure on this point, the department therefore built the simple but effective board hereinafter described.

A frame, 5 ft. 4 in. high and 3 ft. wide, was constructed of 2-in. x 2-in. angle iron, braced by 1-in. x 1-in. angle iron, as shown in the accompanying sketch. An ebony transite board, 1/4 in. thick, was mounted on this frame, extending from the top to a point half way down the frame, for use as a panel. Ten standard fuse blocks were mounted on the panel, each for a designated rated fuse, the rating being painted on the fuseblock.

The board is equipped to test quickly and accurately fuses of the following ratings: 1, 3, 5, 10, 15, 25, 30, 50 and 100 amp. Two fuse blocks are used for the 100-amp fuse, one to test fuses with blades, and one to test fuses without blades.

For the lower current capacities the resistance is made up of heater coils; for the heavier currents of iron wire wound spirally. However, for the 100-amp fuse the resistance consists of car grids, all of the coils and grids being insulated from the iron frame by the use of porcelain bushings.

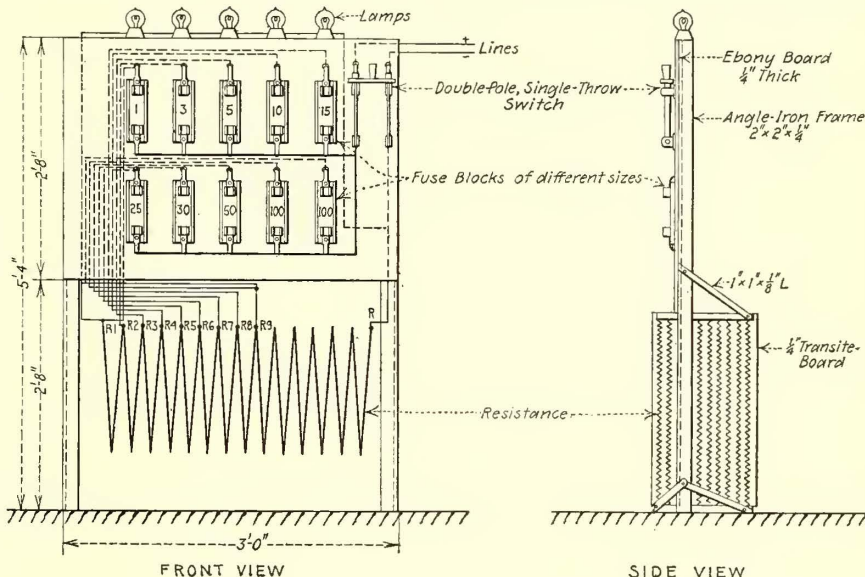
The resistance for each fuse is so arranged that by placing the fuse in its proper position, and closing the double-pole switch shown at the right side of the board,

When refilling fuses a few are made up of each rating and tested. If found to conform to regular specifications the lot is completed, after which a few more fuses are tested. A fuse is considered "O. K." if it blows at the required 50 per cent overload in from one-third to one-half the time set by the Code. In this way one can be certain that a fuse is going to stand up at its rated load and will blow at the required overload.

The board is also used to test each fuse as to its soldered connection, the fuse being placed in the proper fuse block, and the switch closed for an instant only.

TABLE SHOWING TESTING CURRENTS AND RESISTANCES

Rating of Fuse, Amp.	Amp at Which Fuse Should Blow	In Less Than	Resistance, Ohms	Between Points
1	1.5	1 min.	366	R and R1
3	4.5	1 min.	122	R and R2
5	7.5	1 min.	73	R and R3
10	15.0	1 min.	37	R and R4
15	23.0	1 min.	24	R and R5
25	40.0	1 min.	14	R and R6
30	45.0	1 min.	12	R and R7
50	75.0	2 min.	7.5	R and R8
100	150.0	4 min.	3.5	R and R9



Front and End Elevations of Fuse-Testing Board, Third Avenue Railway

The lamps on top of the board will show whether or not the fuse is good.

This manner of testing the fuses comes as near to actual service conditions as is possible because the fuse is subjected an instant to a load 50 per cent more than it is rated to carry instead of the common practice of testing the circuit through a set of lamps.

GEAR FITS

BY NORMAN LITCHFIELD, M.E.

The loosening of gears, while not one of the most serious features of railway motor operation, is nevertheless somewhat troublesome, and the more general use of specially treated gears is bringing up the question of proper methods and practices of holding gears on axles.

The earliest railway motors were provided with gears made in halves clamped together by bolts and further prevented from rotating by a key, the whole arrangement being similar to that used for holding pulleys on a line shaft. But the hammer blows set up with worn teeth soon proved far different from the gentle pull of a leather belt with its automatic slip feature, and the motor designers were forced to look for other methods.

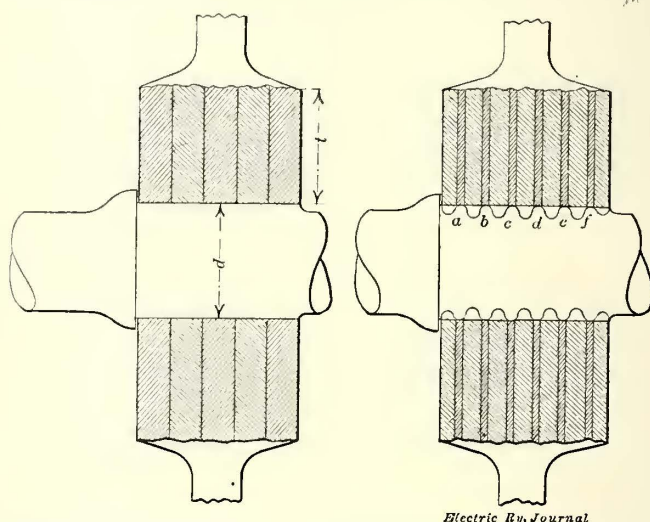
Very naturally they turned for precedent toward the similar problem of holding car wheels on their axles, for which a standard method had been adopted in the operation of steam trains. This consisted of boring out the wheel slightly smaller than the diameter of the axle and then forcing the wheel on in a hydraulic press, a lubricant, usually white lead, being used on the axle surface during the operation. In addition, there were used keys which, if of rectangular section, were set in place in milled keyways before the pressing operation. If keys of circular section were used, they were forced into a hole drilled after the application of the wheel, half in the axle and half in the wheel hub. The advantage of the square key was that it could be driven out at the time of the wheel renewal, and the same keyway could be used in the axle over again, whereas for the circular key a new hole had to be drilled each time. The circular key, however, was more efficient as its application was independent of the pressing operation and therefore did not affect the reading of the pressure gage, a false pressure being often recorded when a rectangular key was used, owing to the wheel binding on the key.

With regard to both the allowance, or the difference between the diameter of the wheel bore and the axle, and the character of the machine work for the fit, there was some little divergence of opinion, some recommending a very smooth bore and fit, others a rough one, some demanding one pressure, some another. However, the preponderance of sentiment was in favor of a pressure equivalent to approximately 10 tons per inch of diameter of the axle and a fairly smooth class of machine work, the latter being favored. A high pressure-gage reading could, of course, be obtained with rough fits. In fact, unscrupulous workmen would sometimes attempt to cover up poor work by surreptitiously prick-punching or otherwise scoring the axle, the prick-punch marks naturally adding to the resistance of the wheel in its onward march on the axle, thus raising the pressure shown by the gage but obviously not providing a very reliable safeguard when the car rounded a curve at high speed. It is, of course, manifest that if punch marks were not desirable, neither were tool marks left by rough machine work.

So much for the practice which had become generally accepted. A complete analysis of the reasons underlying the failure of one method and the success of another is not within the scope of this article, but a few of them can be brought out for discussion. In studying the matter of press fits, it should first be inquired, "What is the force that holds the wheel to the axle?" It is, of course, the friction between the two surfaces set up by the radial pressure of the wheel on the axle, and this pressure in turn is caused by the resistance of the metal around the base of the wheel against being

stretched to the same diameter as the axle. It is evident that the total amount of this radial pressure and the consequent friction will depend upon three things, namely, (1) the extent to which the metal in the hub is stretched in proportion to its original diameter, (2) the thickness of the metal in the hub, and (3) the width of the hub. This does not take into account the effect of different materials, and although this varies largely in different classes of wheels, the general result may be considered approximately constant in each group.

Then, referring to Fig. 1, we may consider the hub as made up of a number of rings each of thickness t , internal diameter d and unit width. The intensity of the strain in pounds per square inch in each ring will depend upon the amount it is stretched, and the total amount of the strain in each ring for a given stretch will increase as the thickness. It further follows that the greater the number of rings—that is to say, the wider the hub—the greater the total resistance to stretching and the greater the equivalent radial force. It is therefore clear that no mere set allowance of "10 tons per inch of diameter" can be expected to work out



Figs. 1 and 2—Effective Areas Under Strain with Smooth and with Rough Machined Press Fits

satisfactorily for all cases of pressed fitting, because the stretch allowance merely determines the tensile strain put on the metal and is of interest only because this strain must be kept within the elastic limit so that the material does not take a permanent set. It is an important factor, but not the only one, the other being the character of the finish.

Consider again the hub divided as before into sections, and examine Fig. 2, where each of the sections is shown in exaggerated form as resting on top of the series of ridges in the axle surface. In this case the unit divides itself into smaller sections, of which only the six, A, B, C, D, E, F, exert their radial grip on the surface of the axle. The shearing force exerted by the ridges may cause a high gage pressure, but when the ridges become pounded or ironed out by the heavy hammer blows of service the wheel loses its grip on the axle and works loose. When it is remembered that even with so large an axle as one of 7-in. diameter we are dealing with a stretch in diameter of only 0.007 in. it is evident that very slight tool marks will prove serious. An experience sometimes met with in applying a wheel a second time to an axle from which it had previously been removed is that it goes on at a higher pressure than it did the first time. What caused the increase?

It may be possible that some change has taken place in the structure of the metal, but it is very probable that in the pressing on and off of the wheel the roughnesses were ironed out to the extent that the actual working width of the hub was increased so that the friction increased accordingly. It therefore appears that in press fits the quality of the finish is of paramount importance, and that the smoother it is, the better.

After the question of the preparation comes that of the amount of tonnage necessary to hold the gear securely in place. Here again an allowance based solely on the diameter of the axle is inadequate, as the diameter of the axle is determined largely by the stresses induced in it by the combination of journal load and side thrust when rounding curves at high speed, the torsional stress from the motor being relatively small. What, then, justifies determining the force necessary to prevent a gear turning around an axle by a formula evolved to take care of vertical loads and side thrusts? With car wheels the usual allowance of 10 tons per inch of diameter is reasonable, as experience has shown that this allowance is one which does not over-stress the metal and yet provides, with the hub dimensions generally in use, sufficient margin of holding power to take care of the excessive and complicated forces induced by curving, braking, heating of the wheel, etc.

In a gear, however, the force is applied at the periphery and is without the complications existing in the case of the wheel. It seems proper, therefore, to determine the maximum force transmitted, either by considering the slipping point of the wheels or some other method, and then to fix a tonnage which will give a fair safety factor, say three. Taking a concrete instance of car with weight on each pair of drivers, including maximum passenger load, of 6.5 tons, assuming the slipping point to be 25 per cent and the diameters of wheel and axle to be 30 in. and 5½ in. respectively, then the maximum force that can be applied to rotate the gear around the axle is

$$6.5 \times 0.25 \times 30 \div 5.5 = 8.68 \text{ tons.}$$

A pressure of 30 tons would therefore give a safety factor of 3.4 and should be ample if the work is properly done.

The above formula does not take into consideration the effect of sudden applications of force or shocks, this being considered as covered by the factor of safety, nor does it include the difference between the coefficient of friction of the spongy surface left by the tool after machining the fit and the coefficient of friction of the rolled surfaces of the rail and wheel tread. The effect of this, however, increases the factor of safety, as does also the fact that the tonnage of the pressed fit expresses friction of motion whereas the holding power, once the gear is in place, is friction of rest and is therefore greater.

SHRINK FITS VERSUS PRESS FITS

BY R. R. POTTER, SUPERINTENDENT OF EQUIPMENT NEW YORK, WESTCHESTER & BOSTON RAILWAY

On account of the severe conditions imposed upon car equipment on electric railways, the several parts require especial care, not only in the design but in the maintenance as well. Undoubtedly one of the vital points is the care of wheels and axles. Next in importance to the use of the proper material is the securing of the wheels and gears on the axles. The general practice on most roads appears to be to bore the various parts to such a diameter in relation to the axle that the desired pressure will be obtained when the wheel or gear is being pressed on to the axle in the wheel press.

The other method, and that which has been followed

on the equipment of the New York, Westchester & Boston Railway, is to bore the parts accurately to a certain diameter in relation to the axle, micrometers being used in measuring, and then to heat the part and place it on the axle without pressure. By this method there is no abrasion on the finished surfaces of the axle, wheel or gear due to the process of application. Also, as heat is applied to the part when it is removed, very little abrasion occurs due to the process of removal. In addition, the parts may be replaced in their original positions a number of times, without loss of holding power.

The axles, at the location of wheel seats, are carefully finished and filed as smooth as possible. Wheels and gears as well as tires are bored 0.001 in. smaller than the axle or wheel center per inch of diameter of bore, and then they are heated and slipped into place. After the wheels have been applied and have cooled, they are tested in the wheel press at a pressure of 10 tons per



Heat Method for Installing Wheels on Axles, New York, Westchester & Boston Railway

inch diameter of bore. The gears are heated at center with a home-made torch using compressed air and city gas but the rims are not allowed to go above 300 deg. Fahr., as measured with a thermometer set with the bulb in a special cup which fits between the gear teeth. It is found that this temperature invariably gives sufficient expansion to permit gears to be slipped on without any pressure. Wheels are heated with the same torch until a drop of water at the middle of the spoke will boil freely when dropped onto it. Wheels sometimes require a slight pressure in addition to the heating to move them into place, but this is negligible in comparison with those used in ordinary press fits.

When wheels or gears are thus shrunk onto the axles, the microscopic points of metal are not smoothed down as they are when a wheel is pushed on cold, and the result is that these points interlock and make a very close and secure fit. In fact, the advantage of the shrinking system is shown by the fact that a wheel that

is shrunk on will require many times more pressure for removal when cold than one that has been pushed on, the same tightness of fit having been allowed in each case.

Another material advantage derived from shrinking on wheels, especially on motor axles, is due to the fact that the wheel hubs should be very accurately spaced in order to have the proper end play for the motor. When wheels are applied without pressure, the distance between the motor bearing faces of the wheel hubs, or between flanges, is brought to very accurate dimensions. When wheels are pressed on it is generally difficult to stop the action of the press at just the right point, the result being that quite a variation has to be allowed between hubs or flanges, or else it is necessary to machine the parts after assembling.

The matter of end play of motors on the trucks of the Westchester cars has always received great consideration, and remarkable results have been obtained through having the bearing faces of the hubs accurately spaced and burnished with a roller similar to that used on the journal bearings. After two years' service the end play of the motors is unappreciable and no motor bearings have ever needed to be rebabbitted.

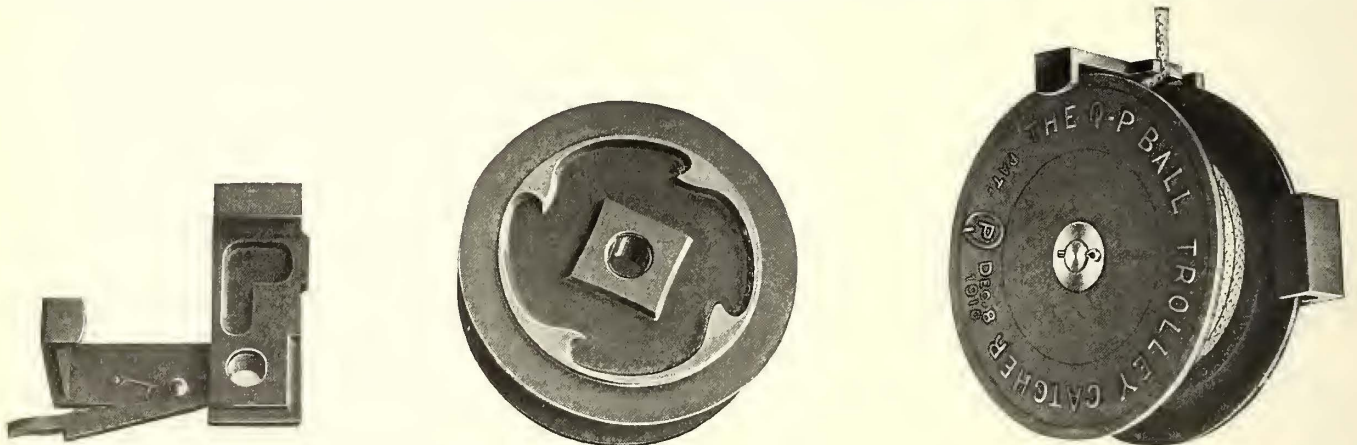
BALL-TYPE TROLLEY CATCHER

A new type of trolley catcher, embodying only eleven parts inclusive of 20 ft. of rope with chain and hook, has recently been brought out by the Q-P Signal

its upward movement within 6 in. of the starting point. Notwithstanding this sensitiveness, the construction is very rugged.

As already indicated, this catcher has an original mechanism to prevent the accidental rise of the trolley pole into a dangerous position. The detail views show this feature as now described: The outer surface of the back of the winding reel has four inward projections, each of which passes in succession over a vertical groove in the supporting frame by the winding and unwinding of the trolley rope caused by the varying height of the trolley wire from the rails. This vertical groove is just deep enough to permit a steel ball to sink into it half way but without binding on the sides; the other half projects into a circular recess in the back of the winding reel and into which the four projections enter from the outer surface. The hub of the reel has a square boss surrounding its center upon which the ball rides when normally revolving with the varying height of the trolley wire.

Brief reference may also be made to other qualities of this catcher. It cannot be carelessly dropped when removed from a car without first breaking the trolley rope. If purposely dropped from the dashboard, it will catch itself within 1 ft., no matter what its position may be in falling. The non-drop feature is especially valuable where the trolley has to be reversed frequently, because this not only saves the catcher from possible damage but reduces the labor of pole transfer to a minimum since the catcher may be removed from



Parts of Catcher, Showing Reel Frame with Latch, Latch Spring and Vertical Ball Groove; Also Ball-Bearing Boss on Reel Hub

Ball-Type Trolley Catcher Hanging on Rope

Company, Needham Heights, Boston, Mass. This catcher operates as follows:

Should the wheel leave the wire, the tension spring of the base will cause it to rise rapidly toward a vertical position. This action unwinds the rope from the reel with sufficient speed to make a square boss on the hub of the reel throw a ball to the top of a groove, in which position the ball engages the next approaching projection on the reel, locking it against further unwinding and holding the pole in that position until released. To prevent the accidental release of the trolley rope after the locking mechanism has operated to catch the trolley, a downward pull on the rope of not less than 3 in. is required to release the locking ball. This requires no additional effort by the conductor, but releases with the first downward pull made on the rope to replace the wheel.

As no spring adjustment is required for the ball, the parts may be so proportioned that no adjustment is ever needed to make the device operate properly. The Q-P ball trolley catcher is so sensitive that it will stop

the dashboard and dropped where it will hang on the trolley rope, balanced by the trolley tension spring. In the latter position the pole may be transferred to the opposite end of the car with the least effort and without danger of having the catcher come into contact with the ground. The reel and frame are made entirely of heavy malleable iron and are practically unbreakable. The strongest trolley base spring will not damage the locking mechanism by violent jamming.

In order to impress the importance of the safety-first movement on the Detroit United lines, the two words "safety first" are being stenciled on all cars as they come from the paint shop. These words appear on both vestibules, inside and out, on the back and front dash and on the side of the car, besides the front and rear entrances. In addition to being painted on the cars, the words "safety first" are being stenciled on the tubular steel poles supporting the trolley at all street intersections, on telephone booths, tool boxes and wreck wagons.

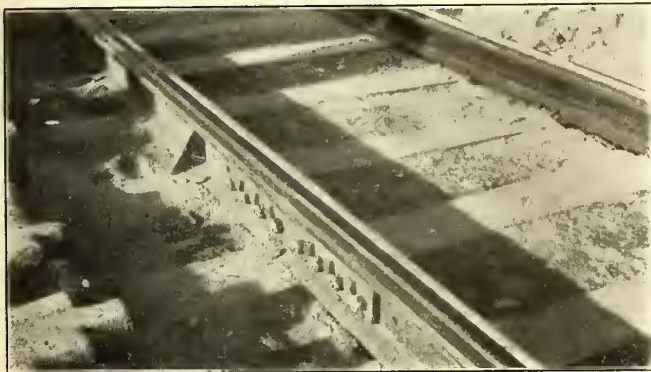
A WELDED MECHANICAL JOINT

G. E. Pellissier, consulting engineer, Springfield, Mass., has recently patented an inexpensive joint for electric railway track, particularly in paved streets. In this joint the attempt has been made to combine the advantages of the mechanical joint with those of the welded joint, and at the same time to make it possible for the railways to install these joints with their regular track force and at a cost comparable with that of the ordinary fishplate joint and bond.

Experience has shown that the purely mechanical joint of moderate price fails, in part, to provide and maintain a continuous rolling surface, to resist all stresses due to temperature changes and to operation of rolling stock and to offer adequate conductivity for

plates, these plates are simple bars of steel 4 in. wide and $\frac{7}{8}$ in. thick and are shrunk on. In other words, the holes in the plate are drilled relatively nearer together than those in the web of the rail, and the plates are then heated by means of a suitable torch (buckeye burner or charcoal oven) to such a temperature that the holes in the plate register with those in the rail. The plates are then put in position and fastened either with drive fit bolts or hot-riveted. The welding operation follows while the plates are still hot.

The chief advantages asserted for the shrinking on of the plates are two—first, the pulling together of



Joint of Shrunk-On and Welded Type in Place



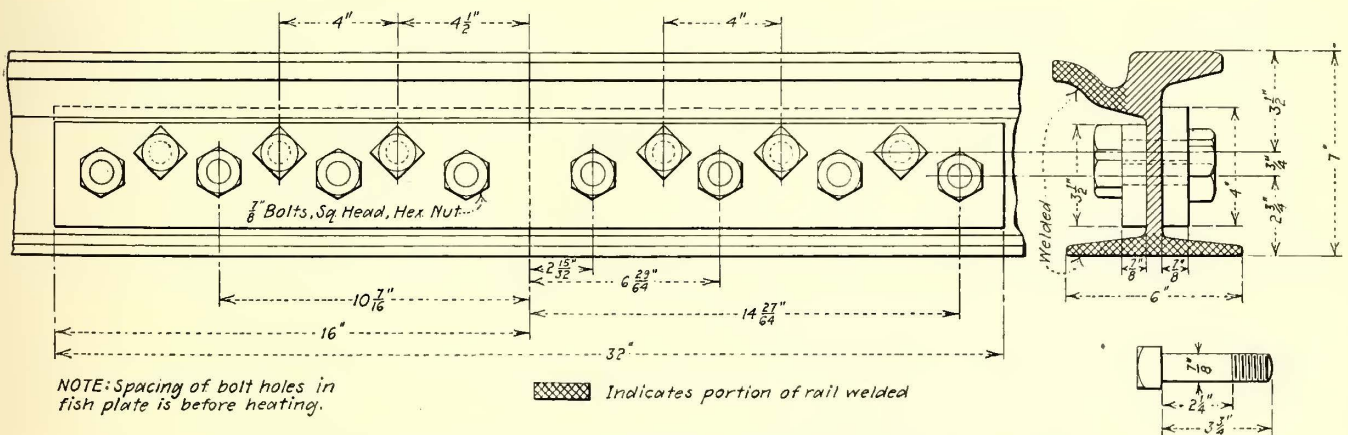
Making a Joint by Means of Oxy-Acetylene Weld

the return current. The new joint is designed to eliminate all of the foregoing objections, and the only question which remains is whether the results obtained under service conditions over a long period of years will be as satisfactory as those of other processes.

As will be seen from the accompanying drawing, the mechanical feature of the joint is due to the use of plates which are bolted or riveted to the web of the

the heads of the rails at the joint eliminates even the slightest crack at that point and secures the benefit of the support of one rail head on the other through friction, not to mention the direct transmission of compressive stresses; second, practically all tensile stresses are taken off the welded section, the function of which is to provide for shear and electrical conductivity.

In designing the plates the drilling may be such as



Combination Shrunk-On and Welded Joint as Installed at Holyoke, Mass.

rail. These plates provide for all tensile stresses. Then the oxy-acetylene torch or electric arc welding process is used to weld those portions of the rail which are not covered by the plate. On new grooved rail it has been found quite sufficient to weld the base and lip, but on old work and T-rail it is the intention also to weld the head.

The most interesting feature of this joint is the method of putting on the plates. Instead of making them engage with the head and base of the rail and allowing for expansion by means of slotted holes in the

to correspond with standard rail drilling. Hence in case a joint proved defective through faulty workmanship, a pair of standard plates could be put on with no more cost or inconvenience than would be the case with any type of mechanical joint. The plates can be applied just as rapidly and easily as the ordinary fishplate and with no greater interference with the remainder of the work. A large company would do the welding with its own men, whereas a small one might find it cheaper to have this done by some local welding company.

These joints can be made in small quantities at a cost

of about \$6 each, divided about \$3.50 for the plate and bolts and \$2.50 for labor of attaching and welding. This figure may be materially reduced for companies which own welding outfits. Joints made by this method the past two years in Holyoke on about 2 miles of track have given perfect satisfaction on track under very heavy traffic and with temperatures varying from 16 deg. Fahr. below zero to 100 deg. above. These rails were not bonded. It is the intention of the owners of the patent to allow the companies to make these joints on a royalty basis, and information regarding this plan may be obtained by addressing Mr. Pellissier.

FIELD-CONTROL MOTORS AND UNIVERSAL TYPE CONTROL FOR CHICAGO ELEVATED RAILWAYS

The mechanical department of the Northwestern Elevated Railroad Company, Chicago, Ill., is now equipping twenty trail cars with a motor and control equipment of new design. The bodies of these trailers were built with the intention of changing them over to motor cars in the future; consequently, the addition of electrical equipment required only some modifications in the trucks and changes in the air-brake schedule to make them operative for motor instead of trail cars. The new motor and control equipment adopted for the change-over is of the Westinghouse No. 302-B-2 double-motor type with ALF-M control. The motor and control equipment represents the latest development in apparatus for elevated railroad service where mixed cars, equipped with motors and control of different manufacture, are to operate in the same train. Changes in the type of air-brake equipment also were necessary to make it member in with that used as the standard on the other Northwestern Elevated cars.

CONTROL EQUIPMENT

The control of these cars is Westinghouse automatic, line-current-actuated, field control arranged to operate in conjunction with the General Electric type M control on the same train. The field-control feature of this equipment is provided by unit switches. Of the fourteen unit switches, two act as line switches and four as field switches, and the latter also provide additional breaks in the circuit. Other switches are installed in connection with the various resistance steps and the transfers from series to parallel operation of the traction motors.

This type has the usual merits of a unit switch control but contains features of particular interest. The control equipment is comparatively simple despite the fact that it is arranged for automatic acceleration and also for operation in the same train with Type M control. The control apparatus is light in weight, yet all parts are amply large to permit ready inspection and maintenance. Each equipment includes the following apparatus:

Two trolleys.	Two control cut-out switches.
One main switch.	Two trip and reset switches.
One main fuse.	One set of relays.
One line switch.	One control cut-out.
One switch group.	One control resistor.
One reverser.	Three control junction boxes.
One main cut-out switch.	One set train line receptacles.
One set grid resistors.	One train line jumper.
Two master controllers.	

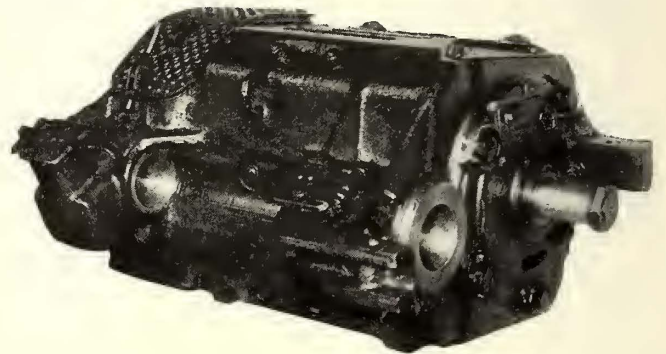
The unit switches and apparatus in general of this equipment are similar to those employed in Westinghouse HL unit switch control.

MOTORS

The field control, commutating-pole, box-frame type motor is shown in the accompanying illustration. It is rated 155 hp at 500 volts and 160 hp at 550 volts and weighs, complete with gear and gear case, 4800 lb. A

special feature of this motor is the field control. Each main field coil is made up of two separate coils which are insulated from each other but held intact as a unit. Each coil does not have the same number of turns; therefore all of the four larger sections of the four field coils are connected in series, and the four smaller ones are also connected in series. Two field circuits are connected in series for acceleration, thus producing a strong field which results in high tractive effort. The field circuit containing the smaller number of turns—namely, the weaker field—is cut out of the circuit for running, giving a higher speed at any given current.

Some of the advantages of field control in this motor are as follows: The accelerating tractive effort is increased for any given current because there are more turns in the field coils, which gives a slower speed than with a motor not arranged for field control. When operating on a short field—namely, with the field that has fewer turns cut out of the circuit—the speed is in-



Field-Control Motor for Chicago Elevated Railways

creased for any given current since the number of field turns in series is reduced and the motors thus have weakened fields. Further, whenever field control railway motors are used, these equipments are very flexible, because a car equipped with field control motors may be used in either limited or local service without change of gear ratio, and at the same time a large saving in energy is effected by their use.

PROPOSED ELECTRIFICATION OF LOS ANGELES & SAN DIEGO BEACH RAILWAY

The Railroad Commission of California has rendered a decision under which the Los Angeles & San Diego Beach Railway, San Diego, Cal., is to make application for extension of its franchise, agreeing, if the extension is granted, to apply for permission to issue bonds. The proceeds of the bonds shall be used to electrify the road and provide better service. The company now operates with steam trains and gasoline motor cars. The company stated that it had endeavored to obtain electric storage-battery cars to be used to replace the steam equipment and the gasoline motor-car equipment, but the matter was dropped for the reason that the manufacturers could not guarantee the operation of cars built to comply with the specifications insisted upon by the company. The estimated cost to electrify the road is approximately \$300,000. The City Council of San Diego has been unwilling to grant the franchises desired unless electrification is promised. The commission took occasion to investigate as to the probable ability of the company to pay bond interest from the operation of the road on an amount sufficient to electrify. From the testimony introduced H. D. Loveland, the commissioner who wrote the decision, believes that operation would easily pay market interest on an issue of bonds sufficient to electrify.

LONDON LETTER

(From Our Regular Correspondent)

As a result of efforts on the part of the Liverpool Corporation to evolve a scheme to relieve the growing congestion on its tramways, especially on the Dale Street and Church Street routes, which lead to the Pierhead, Mr. Mallins has presented a report advocating the construction of a tunnel from the Old Haymarket to the Pierhead and continuation of the tunnel under the Mersey, between Liverpool and the Cheshire side, with branches to Birkenhead and Wallasey, for the accommodation of tramway and all other wheeled traffic. The estimated cost is £3,000,000, to be borne jointly by the various authorities on a ratable value basis. At present there are excellent ferry accommodations between the Pierhead and Birkenhead and other towns on the Cheshire coast, in addition to the Mersey Underground Railway. It is contended, however, that these are inadequate for the service and that the ferry, at least, only tends to congest the traffic in Liverpool. Mr. Mallins' report also considers the construction of a suspension bridge across the Mersey, but the width of the river is considered to be almost prohibitive. The cost of a bridge such as has been proposed would probably be between £5,000,000 and £6,000,000. The general opinion in Liverpool is in favor of the tunnel rather than the adoption of any temporary measures such as increasing the size of the cars. The various Cheshire ferries carry a total of 30,500,000 passengers annually. More than 15,800,000 passengers are transported by the Mersey Railway, while the ferry boats convey about 850,000 vehicles of all descriptions annually. Mr. Mallins estimates that his scheme would be self-supporting with a yearly traffic of 45,000,000 passengers at 1d. and about 1,000,000 vehicles at 6d.

The directors of the Lancashire & Yorkshire Railway have decided to electrify that portion of the system which runs from Manchester, via Prestwich, to Bury, a distance of 9½ miles. It is estimated that frequent service of trains will effect a saving of nearly 50 per cent in the traveling time of patrons over the tramway service. The trains are to be worked with direct current collected from a third-rail as on the Southport line, and not on the high-tension direct-current system with which the company is now experimenting on the branch line between Bury and Holcombe Brook. If the service between Manchester and Bury is a success, it is likely that the company will adopt electricity on other lines. The Bury-Holcombe Brook line will be the first electric railway out of Manchester.

The Stirling & Bridge of Allan Tramways has placed its new petrol tramcar in service on the Stirling to St. Ninians portion of the route. The new service is a decided improvement on the old horse tramcars, which serve other parts of the district.

Work is to be begun at once on the tunneling for the tube railway which is to be constructed by the post office to facilitate the handling of mail matter in London. The first section of the line for which powers were obtained at the last session of Parliament will be over a distance of 6¼ miles from Paddington to Whitechapel. The plan is to lay two tracks each of 2-ft. gage in a single tunnel of 9-ft. internal diameter, except in the vicinity of stations, where two approach tunnels will be provided each 7 ft. in diameter. At the stations there will be two tunnels each of 21-ft. 2½-in. internal diameter, provision being made for two tracks and a platform in each tunnel. At the Western Central District, the Mount Pleasant and the King Edward Building stations the tunnels will be 25-ft. internal diameter and provision will be made for three instead of two tracks. The trains will have no driver but will be operated automatically on the remote control principle. Control cabins will be provided at each station. The train will render each section dead after passing over it and leave it dead until the succeeding section has been traversed. By this arrangement there will always be a dead section between the trains. On approaching a station the train will pass over a short gap in the conductor rails, and the brakes will be applied automatically when the train motors cease to receive current. Thus if the wagon train is intended to stop at the station, it will be shunted to a section of rail which is normally "dead." A train which has been stopped at a station will

be restarted by energizing the section on which it has come to rest.

The experiment of running trail cars on certain of the South London routes has proved so successful that the London County Council proposes to bring this method of transit into more general use. Application is being made to the Board of Trade for permission to run additional trail cars on the southern routes, and, pending the securing of the necessary consent from the government, estimates are being obtained for 150 trail cars and for the equipment of about 200 of the existing electric cars with couplers. The general purposes committee has recommended that the London County Council accept the suggestion of the select committee on motor traffic to create a new traffic branch of the Board of Trade, combining the present traffic duties of the Home Office, the Local Government Board and Board of Trade. This recommendation is made provided the new department "consists of a small number of specially qualified persons selected solely on the ground of their competence, and holding office for a considerable period." The report of the London Branch of the Board of Trade for 1913 appeared recently. It gives statistics of area and population, showing that the influence of the daily movement to and from London extends some 30 miles out, giving a total population of 8,471,146, spread over an area of 2,808 sq. miles. The total approximate number of passengers carried by railways, trams and buses in 1912 was 1,785,602,527, working out on an estimated population of 7,321,978 at 243.9 journeys per capita. The number of passengers in 1911 was 1,658,947,013, and the number of journeys per capita 228.8.

Negotiations are in progress for the purchase of the Gateshead & District Tramways, the Tynemouth & District Electric Traction Company and the Jarrow & District Electric Traction Company by the Northern General Transport Company, Ltd., which has been incorporated to develop transport business in the northern counties, including the carriage of passengers and goods, by motor vehicles, and to acquire undertakings carrying on such business. The Gateshead, the Tynemouth and the Jarrow companies operate tramways in the Tyneside district. The Gateshead company has purchased and is operating a number of motor vehicles in connection with its tramway system in the area adjacent to the Jarrow Company's tramways. The Tynemouth company has decided to acquire and operate a number of similar vehicles.

As the Hastings Tramways has had to abandon the surface contact system, which it has been operating for the past few years on the Front, and as it has failed in its endeavor to get permission to erect overhead wires along the Front, it is experimenting with petrol-driven cars. Trial runs have taken place and an inspection of these cars has recently been made by Major Pringle, Board of Trade inspector. The cars are of the same design in exterior as those now in use and similar in appearance.

The R. E. T. Construction Company, London, has placed at the disposal of the Brighton Corporation a double-deck trolley bus for experimental purposes. Numbers of single-deck trolley buses are in successful operation in various parts of the country, but this is the first double-deck vehicle of the kind. This trolley bus has not been accepted by the Brighton Corporation, but daily excursions are being made with it so as to give it a thorough trial. The bus has a 13-ft. wheelbase and is equipped with two 20-hp completely inclosed interpole motors. The two trolley standards are situated at the back of the vehicle. The present bus has accommodation for thirty-eight passengers, but this capacity can be extended at will. The trials are being made on a road with an extremely bad surface.

The locomotive engineers of the London & South-Western Railway, which is electrifying a considerable portion of its suburban tracks, are concerned about their prospects of employment. Delegates of the engineers have interviewed the directors of the company and are reported to have announced that the general manager and the chairman of directors have stated that the positions of the motormen cannot be guaranteed exclusively for the steam locomotive engineers. At a meeting of the men they urged their executive to use every means to secure the positions of engineers on the new electric trains for locomotive men.

A. C. S.

News of Electric Railways

Franchise Proposition at Toledo with Changing Fare to Provide Fixed Dividend Return on Fixed Valuation

The Toledo Railways & Light Company, Toledo, Ohio, through its president, F. R. Coates, submitted a proposition to the City Council of Toledo on Jan. 28, 1914, for the settlement of the franchise question on a plan similar to that in operation in Cleveland, except as to the dividends on the stock, which are to be 8 per cent instead of 6 per cent. The term of the franchise is fixed at twenty-five years and the city is to have the right to purchase the property at appraised value any time on six months' notice. The rate of fare is to be sufficient to return an income of 8 per cent on the valuation of the physical property at \$7,000,000. A sliding scale of fares is proposed, the lowest being straight 3 cents with free transfers and the highest six tickets for 25 cents, with a 5-cent cash fare and universal transfers. The lowest of the four rates mentioned in the scale is to be tried first and if it produces the return needed it will remain in use. Otherwise the next higher rate is to be tried and experiments are to be made until a rate is reached that will yield an income necessary to pay the fixed dividend return of 8 per cent. Mr. Coates' letter containing the proposition follows:

"The Toledo Railways & Light Company desires to make a proposition to the city relative to an extension or renewal of the street railway grants of the company, and submits the following:

"(1) That it is for the great interest of the community that every person should be carried to his destination, within the city limits, at one fare, without extra charge for transfer, with an exception as shown below, by one company owning and operating all street railway lines in the city, subject to the regulation and under the control of the city.

"(2) That the street car riders, who really pay the cost of operation, should not be burdened in addition to the ordinary cost of transportation with any obligation such as street improvements, maintenance and cleaning of streets, bridge tolls, etc.

"(3) That the company is entitled to net earnings, from the operation of its street railway within the city limits, equivalent to 8 per cent per annum on the cost of reproduction of such street railway property.

"The company proposes the following conditions:

"(a) That the lowest rate of fares, within the present city limits, shall be five tickets for 15 cents, or a 5-cent cash fare, both with universal transfers. Our experience has shown that the public prefer to purchase five tickets for 15 cents rather than to pay a 3-cent cash fare, and this plan will save the public and the company much trouble.

"(b) A fare, within the present city limits, of five tickets for 15 cents, with 1-cent fare for transfer, or 5-cent cash fare with universal transfer.

"(c) A fare, within the present city limits, of seven tickets for 25 cents, or a 5-cent cash fare, both with universal transfer.

"(d) A fare, within the present city limits, of six tickets for 25 cents, or a 5-cent cash fare, both with universal transfer.

"(e) That the company, its successors and assigns, be granted the right, under the terms of this proposal, to operate its street railway for twenty-five years.

"(f) That the company will surrender all its present grants for the operation of street railways within the city limits.

"(g) That the valuation of the property used for street railway operation be fixed at \$7,000,000, such street railway property to consist of tracks, cars, trolley wires and poles, carhouses and shops, but shall not include any power house, substation, underground conduit, feeders, park property, etc.

"(h) That if said valuation of \$7,000,000 is not acceptable to the city, the grant shall contain a provision for determining the reproduction cost of such railway, to the effect that if the company and the city authorities do not

agree upon such reproduction cost within ninety days from the time such grant goes into effect a board of appraisers shall be appointed to determine such reproduction cost, said board of appraisers to consist of one appraiser to be named by the city, one appraiser to be named by the company and the third to be John M. Killits, judge of the United States District Court; the appraisal in writing of this board, or any two of them, to be binding upon the city and upon the company as determining the amount on which the company shall be entitled to net earnings at the rate of 8 per cent per annum.

"(i) That the city shall at all times have the right to inspect the books of the company. The items to be charged respectively to operation and to capital account shall be determined by standard systems now in use, subject to such modification as may be agreed upon from time to time by the city and the company.

"(j) That all net earnings of the company, derived from the operation of its street railways within the city limits, over and above an amount equal to 8 per cent per annum on \$7,000,000 or on the valuation determined as above and such additional capital expenditures as may be made from time to time, as hereinafter provided, shall be held as a special fund to be used only as hereinafter provided, and when said fund shall reach the sum of \$250,000 the company shall immediately put into effect the next lower rate of fare.

"(k) If at the expiration of three months the initial fare that is agreed upon shall not produce net earnings equal to 8 per cent per annum on the valuation and capital expenditures as above, then the next higher rate of fare shall become effective.

"(l) In the event that at any time any rate of fare (then in effect) shall not produce net earnings equal to 8 per cent per annum on the valuation and capital expenditures as above, the deficiency shall be taken by the company out of said special fund until such special fund shall have been reduced to \$50,000, when the company shall then have the right to and may forthwith put into effect the next higher rate of fare which will produce net earnings equal to 8 per cent per annum on the valuation and capital expenditures as aforesaid, and such rate may be increased from time to time when and if necessary to produce the net earnings as above provided; provided, however, that such rate of fare shall not in any event exceed a 5-cent cash fare and six tickets for 25 cents with universal transfers.

"(m) That in and by the grant the company shall not be required to pay for bridge tolls, separation of grades at railroad intersections, paving or repaving of streets, street cleaning and sprinkling, licenses or other special taxes.

"(n) The city shall at all times have the right to regulate the character of the service; provided, however, that no regulation shall be such as to cause the net earnings of the company, with the maximum rate of fare in force allowed herein, to be reduced to an amount less than 8 per cent per annum on the valuation and capital expenditures as aforesaid.

"(o) That the city shall have the right at all times during the term of the grant, on six months' notice, to purchase the railway properties of the company as above defined, at the valuation as agreed upon or determined plus the capital expenditures as aforesaid.

"(p) That the company shall make such improvements and build such extensions, within the city limits, as may be required by the city, the cost thereof to be added to the valuation as herein provided; provided, however, that the company shall not be required to make such improvements or build such extensions within ten years of the expiration of the grant to operate its street railways or if thereby the net earnings of the company will, with the maximum rate of fare allowed for herein, be reduced to less than 8 per cent per annum on the valuation and capital expenditures as aforesaid.

"(q) That the company shall make such arrangements as to re-routing as the city may authorize, tending to better the service and decrease operating expenses.

"(r) The capital expenditures required, ordered, author-

ized or approved by the city shall be capitalized to the extent of 80 per cent of their cost, the balance of such cost to be charged to current operating expenses.

“(s) That the company and the city agree as to the price to be paid for electric power for the operation of the railways, and in event of the city and the company not being able to agree as to such price, the price shall be fixed by the above-mentioned board of appraisers, subject to adjustment at the end of each five years.

“(t) That if the city shall not within fifteen years from the taking effect of the grant exercise its option to purchase the railway, the city may renew the grant or make a new grant to the company for a period of twenty-five years on the same terms, which the company shall agree to accept. In event that the grant to the company to operate such railway shall, at any time, have less than ten years to run, the company shall thereafter have the right to charge, until such renewal or new grant is made, or until the termination of its grant, a 5-cent cash fare with universal transfers; provided, however, that during such time all net earnings of the company over and above the 8 per cent per annum of the valuation and capital expenditures aforesaid shall be held and used as a sinking fund for the retirement of the bonded indebtedness and capital of the company; and the city shall, if it elects to purchase thereafter, have the right to purchase the railway properties at the valuation and capital expenditures as above, less the amount in which the bonded indebtedness and capital of the company shall have been reduced through the operation of such sinking fund.

“(u) That the Mayor of the city of Toledo, or such other representative of the city as may be provided by the grant, shall at all times be a member of the board of directors of the company owning and operating the street railways under the grant.”

The following letter, signed by Mr. Coates, accompanied the proposal of the company:

“On Jan. 14, 1914, I was called before the committee on railways and telegraph of the Council in reference to the franchise question as it related to the street railway system. At that meeting it was agreed to have a conference or conferences immediately to decide on a policy for settling the franchise controversy.

“As no further action has been taken to date regarding this meeting, we desire to call attention to certain facts taken from the report of the city's accountants, Nau, Rusk & Swearingen, of the operation of the street railway system in 1912, as follows:

(a) Earnings per passenger (in cents) in 1912.....	3.13
(b) Cost per passenger of operation, maintenance and taxes in 1912.....	2.82
(c) The above figure is made up of—	
1. Cost per passenger for taxes.....	0.18
2. Cost per passenger for maintenance.....	0.82
3. Cost per passenger for operation.....	1.82
4. Cost per passenger total as shown in item (b).....	2.82

“These figures do not include any interest on investment.

“Examining the different items that make up the cost per passenger to see what item or items can be reduced, we have the following:

“(c-1) Taxes neither city nor company can control, as they are fixed.

“(c-2) Maintenance depends on whether or not it is the desire to keep the property in such condition as to give good service.

“(c-3) The major portion of this item is wages. To reduce it materially would necessitate either taking off equipment or decreasing wages. Service would be impaired by decreasing the equipment. This should not be done. As to decreasing wages, we will not do that.

“Valuation experts who have been working on our property for the past several months made their report as of Jan. 1, 1914, advising that the physical value of the street railway property of the Toledo Railways & Light Company is \$7,000,000 exclusive of intangible values.

“It has always been our desire to see the street railway franchise question settled. We therefore submit with this letter a proposition which, upon examination, you will find gives opportunity for 3-cent fares and also provides for municipal ownership by the city whenever it may be expedient to take over the street railway property.

“We are ready at any time to take up this question with you, with the idea of settling this long-standing controversy. Our books are open to your inspection, as well as our valuation report if it will be of any service to you. In conclusion, if such a proposition is incorporated into a franchise ordinance we will be willing immediately upon its passage and acceptance to commence the operation at such rate of fare as may at that time be in operation in the city of Cleveland.”

City Solicitor Thurston asserts that neither this proposition nor any other will be considered until the company withdraws its suit for a receiver.

Status of Chicago's Proposed Initial and Comprehensive Subway Systems

Under the law of Illinois it was necessary that the signatures of 25 per cent of the registered voters should be attached to petitions for the initial and the comprehensive subway systems which it is proposed to submit to the voters of Chicago at the aldermanic election on April 7, 1914. These petitions must be filed sixty days prior to the election, and the local transportation committee of the Chicago City Council requested that all petitions be turned in to its secretary by Feb. 3. The election board decided that the registered voters signing petitions prior to registration day, Feb. 3, 1914, must have been legal voters at the last date of registration. This decision eliminates the women voters from signing the petition, but it is assumed that it gives them a right to sign additional petitions which may be filed on Feb. 7, on which date the registration is revised. Both the initial and the comprehensive subway system petitions have received a sufficient number of signatures. One hundred and ten thousand names were required and approximately 170,000 names have been attached to each petition.

Serious Interruption of Ontario Hydro-Electric Service

The electric service of the Hydro-Electric Power Commission of Ontario throughout the Niagara district, extending from Niagara Falls, Ont., to Toronto on the north and to London and St. Thomas on the west, approximately 420 miles of high-tension and 20,000 miles of low-tension lines, was interrupted for nearly eight hours on Jan. 31. At about 6 o'clock in the evening a local hurricane swept across the transmission line between Niagara Falls and Dundas in a straight, narrow streak at right angles to the line. The wires were heavily incased in ice owing to a prevailing sleet storm, and thus were also taut and brittle. When the gale struck them two wires snapped and were blown across the others, short-circuiting the line and throwing every city and town in the Municipal Electrical Association's Niagara zone into darkness until nearly 2 a. m. on Feb. 1. The greater part of the delay in restoring service was taken up in locating the break, which when finally found involved the stringing of a considerable length of new wire.

The streets of Toronto are lighted exclusively from the Hydro-Electric system, and many thousand homes are also supplied from that system. The interruption, coming on the busiest night of the week, caused great inconvenience. The service of the Toronto Electric Light Company, Ltd., however, was not interrupted, nor were the street railways of Toronto affected, both being supplied with energy from Niagara Falls by the Toronto Power Company, and having auxiliary steam equipment in Toronto. The civic car lines, of course, were put completely out of business, and residents of the St. Clair, Danforth and Gerrard districts had to walk home through snowdrifts. The street railway in London was kept going from the company's steam plant. The London & Lake Erie Radial Railway, however, was completely demoralized, and passengers from stalled cars were eventually transported to their destinations by buses sent out for them in the middle of the night.

Commenting on the mishap, Adam Beck, chairman of the Hydro-Electric Power Commission, said on Feb. 1 that a second line has been surveyed between Dundas and Niagara Falls, which is 6 miles shorter than the present one. This will be constructed at once.

Elevated Extensions and Third-Tracking in New York

The Public Service Commission for the First District of New York has received the necessary consents, obtained by the New York Municipal Railway Corporation, for the construction of the third-track on the Fulton Street elevated railroad in Brooklyn. The commission has authorized that company to award the contract for the construction of the Liberty Avenue extension of the Fulton Street elevated railroad to the Phoenix Bridge Company, the lowest bidder, for \$707,661. This extension runs from the present terminus of the line, at the Brooklyn-Queens boundary, along Liberty Avenue to Lefferts Avenue, Jamaica.

Bids for the supply of track materials for the equipment of the Fourth Avenue subway, in Brooklyn, from the Manhattan Bridge to Eighty-sixth Street and Fourth Avenue will be opened by the Public Service Commission for the First District on Feb. 24. This is the first track materials called for by the commission under the dual system contracts, and is the first time that the city of New York has ever appeared directly in the market as a buyer of steel rails, etc., for subway use. Heretofore the contractor doing the work of equipping a subway has been allowed to purchase the materials to be used. In view of the large amount of such materials to be used in the dual system, the commission decided to purchase direct. The materials needed for the Fourth Avenue subway will include 45,850 cu. yd. of ballast, 6820 cu. yd. of concrete, more than 2,000 railroad ties, more than 4000 tons of steel rails, and quantities of spikes, tie plates bolts, nuts, etc.. The main points of the specifications are published on page 317 of this issue.

According to a count made by the operating companies and reported to the Public Service Commission, the Williamsburg Bridge is now carrying more passengers than the Brooklyn Bridge. The count was made for one continuous period of twenty-four hours in November, 1913, of the traffic moving in both directions. The result showed that the Williamsburg Bridge during that period carried 313,347 passengers and the Brooklyn Bridge 306,845. The Queensboro Bridge total was 78,980, and the Manhattan Bridge 43,820. The total of all bridges was 742,992, an increase of 12.6 per cent of the total for 1912, which was 659,591.

The Public Service Commission has decided to change the new Broadway subway express station, planned for Seventh Avenue and Forty-eighth Street, to Broadway, just south of Forty-second Street.

Annual Meeting of Cleveland Railway

Only the principal figures in the report of J. J. Stanley, president of the Cleveland (Ohio) Railway, read at the annual meeting of the company on Jan. 29, have been made public. The complete report is in the hands of the printer. The local papers at Cleveland have made capital of the statement that the overdraft of \$217,444 in the maintenance fund will be deducted from the interest fund on March 1, leaving only \$126,218. This, of course, would reduce the fund below the franchise limit of \$300,000, and the fare would be increased automatically. In that case the charge of 1 cent each for transfers would be restored. Mr. Stanley said there can be no question as to the meaning of the maintenance allowance provision of the Taylor ordinance or the decision of the board of arbitration rendered some time ago. He said the maintenance allowance has not been large enough to take care of the ordinary wear and tear, without considering the abandonment of worn-out power plants and other equipment. The city should increase the allowance sufficiently to take care of these things. Mr. Stanley says that so long as the dividends on stock are paid and the expenses provided for the city must work out how the funds shall be applied. The physical property can not be rehabilitated, however, until the \$1,080,624 allowed for abandoned plants and equipment is charged off. This, the officials say, should not be carried on the books. Peter Witt, street railway commissioner, sent to the City Council recently an ordinance granting the company the right to build a cross-town line on East Thirtieth Street, between St. Clair and Woodland Avenues. This would serve a densely populated section of the city and take some of the traffic from the East Fifty-fifth Street line, but it would not result in much new business.

Iowa Road to Be Electrified.—The line of the Southern Iowa Traction Company, operating 25 miles of standard gage steam railway, is to be equipped with electricity by the Centerville Light & Traction Company, Centerville, Ia., by which it has been taken over.

Power from City Plant for "Owl" Cars.—The city authorities of Jacksonville, Fla., and the officers of the Jacksonville Traction Company have entered into a tentative agreement by which the company will be supplied with power from the city's plant for the operation of its "owl" car service between 11 p. m. and 5 a. m.

Commission's Rate-Making Power Upheld.—That the West Virginia Public Service Commission has power to regulate rates of public service corporations and that the commission's orders in such cases are not reviewable by the courts so long as they are within the constitutional and statutory limitations is the decision of the Supreme Court of Appeals in the case of the United Fuel Gas Company vs. the Public Service Commission.

New Officers of the Colorado Association.—The new officers of the Colorado Electric Light, Power & Railway Association follow: President, W. C. Sterne, vice-president and general manager of the Summit County Power Company, Denver, Col.; vice-president, W. F. Raber, general manager of the Arkansas Valley Railway, Light & Power Company, Pueblo, Col.; secretary-treasurer, Thomas F. Kennedy, of the Denver Gas & Electric Light Company, Denver, Col.

Uniform Accounting for Missouri Public Utilities.—The Missouri Public Service Commission has ordered every corporation in the State under its jurisdiction to adopt a uniform system of accounting, to be prescribed by the commission. It is understood that the public service corporations will be classified and systems adopted to meet the requirements of each group. Each public utility will be required to supply the commission with an annual report of its business and its officers, unless it objects to giving such intimate knowledge. In this case a test case will be brought to determine the power of the commission to require such data.

Chicago's Terminal Electrification Ordinance Temporarily Delayed.—The terminal committee of the Chicago City Council, after hearing the arguments of representatives of the trainmen employed in Chicago's steam road terminals, decided to delay the question of electrification until the report of the Chicago Association of Commerce has been presented. This move indefinitely postpones the proposed electrification of Chicago's steam road terminals. The smoke abatement and electrification committee of the Association of Commerce has been at work for several years on this subject, and in the annual report for 1913 was unable to state just how soon the final report of the committee would be submitted to the association.

Commission Activity in North Carolina.—The North Carolina State Corporation Commission has begun active effort to bring all electric light, gas, water and power companies under direct supervision of the State. The commission has issued a call to all such companies other than those municipally owned to file within thirty days complete schedules of their rates and charges for each class of service, together with any schedules of discounts for quantity of service or prompt payment. All these companies will be called upon at the close of each calendar year to make reports covering their operations and showing capital stock, bonded indebtedness, gross receipts from sale of service, operating expenses, salaries of officers and dividends, surplus or profits.

Inquiry Proposed Into Earnings of Topeka Companies.—A committee of Topeka (Kan.) residents recently applied to Mayor R. L. Cofran for an investigation of the books of the Topeka Street Railway and the Topeka Edison Company, the latter operating the lighting plant. The question arose over a provision in the franchise of the Topeka Street Railway which provides that the company "shall annually pay into the city treasury of the city of Topeka 10 per cent of its annual net earnings over and above 10 per cent earned by said railway on its investment." The earnings of the street railway have not been sufficient since receiving the franchise to leave anything over for the city. The report made by the street railway to the State Public Utilities Commission in June, 1912, shows the cost of the road to be \$2,-

790,603, representing actual investment of funds. The paid-up capitalization is \$1,250,000, according to the report, with a bonded debt of \$1,190,000. Operating expenses for the year were \$199,858. The year's revenue was \$441,202.

Chicago Surface Lines Begin Unified Operation.—Operation of the Chicago surface railways was commenced on Feb. 1, 1914, in accordance with the terms of the ordinance authorizing the unification of the Chicago City Railway and the Chicago Railways as the Chicago Surface Lines. In accordance with the terms of this ordinance the through routing of lines in addition to those authorized under the 1907 ordinance also became effective. All lines in the city will be through routed as fast as the Board of Supervising Engineers, Chicago Traction, determines to what extent service balances, and what through routes are desired. Probably one of the most important changes effected under the unified operation was the elimination of twenty-two different forms of transfers formerly used by the three surface railways and the substitution of four forms, two for north and south travel and two for east and west travel, similar to the transfers used by the Chicago City Railway. The slips are printed in four different colors, each color indicating travel in a fixed direction.

Modification of Los Angeles Rail Ordinance.—The Board of Public Utilities of Los Angeles, Cal., has approved the proposed revised girder rail ordinance which has been under consideration by the Council for several months. In addition the board has approved two amendments suggested by C. K. Mohler, railway engineer, and the Council will be asked to incorporate the amendments in the proposed ordinance. One amendment provides that in cases of dispute between the Board of Public Works and any person, firm or corporation performing work under the requirements of the ordinance the Board of Public Utilities shall act as arbiter on the question involved. The decision of the Utilities Board shall be binding on both. The second amendment suggested is that the rail to be laid in general shall not be less than 60 ft. long, and that the joints shall be laid even or opposite on all straight track and as nearly opposite as may be without cutting the rails on all light curves. The work of bonding and making ground return connections shall be done under the direction of the Board of Public Works.

Kansas City Union Depot Operating Plan Rejected.—Plans of the Metropolitan Street Railway, Kansas City, Mo., by which the new union depot would be served by it, were rejected by the board of public works because of the fact that the company does not possess a franchise on Twenty-third Street. A. E. Harvey, chief engineer of the company, presented the plans, which called for the use of Grand Avenue, Main Street, Twenty-fourth Street and Twenty-third Street. Members of the board expressed themselves as willing to permit the company to use Twenty-fourth Street from Main Street to Grand Avenue and Main Street from Twentieth to Twenty-fourth Street. Mr. Harvey stated that he would present new plans excluding Twenty-third Street, and the board concurred with this proposition. An interesting point was brought up when the board held that the company must secure the consent of the board, as well as a permit, in order to do construction work on streets on which it held franchises. The mere possession of a franchise, according to the board, does not entitle the road to proceed as it deems best in laying track.

Seattle Accepts Lake Burien Line.—The Highland Park & Lake Burien Railway, which runs for a distance of 9 miles south of the city limits, has been accepted by the City Council of Seattle, Wash., as an unencumbered gift to the city. A. L. Valentine, superintendent of public utilities, estimates that it will cost about \$40,000 to equip the line for operation and that \$100,000 will be required to extend the line to Fourth Avenue South and Jackson Street to connect with the Seattle, Renton & Southern Railway, which the city plans to acquire and connect with the present municipal line to Ballard. The rehabilitation of the Highland Park & Lake Burien Railway will be considered by the City Council the first week in March. The question of extending the present line operated by the city will be considered at the same time. The plans for the latter work were completed some time ago by A. H. Dimock, city engineer, and call for an expenditure of about \$2,000,-

000. The William Pitt Trimble plan for the construction of both elevated and subway lines in connection with the present surface line of the city will also be taken up by the Council in March.

Duplication of Valuation Work in Portland.—Although the State Railroad Commission has had ten men at work for the last six months on an appraisal of the property of the Portland Railway, Light & Power Company, Portland, Ore., the city commission, by the terms of an ordinance now pending, proposes to obtain additional information on the same subject and present it to the State commission for consideration in its efforts to determine reasonable rates for light, power and transportation services furnished by the company. While the two inventories will cover, to a great extent, the same ground, Will H. Daly, city commissioner of public utilities, says that the additional survey is necessary to procure a proper appraisal from the standpoint of the municipality. The State commission has virtually completed the most difficult part of its work. It has verified the existence of the property that the company previously listed in its own survey. The State's crew is now working on the depreciation survey and next will take up a survey of the unit cost of the various items of property. The company owns approximately \$8,000,000 of real estate in various parts of the city and State, segregated into two classes—that actually needed for operation of the business and that held for investment.

LEGISLATION AFFECTING ELECTRIC RAILWAYS

KENTUCKY

The Kentucky Railroad Commission in its annual report urges the adoption of a law which will enable it to extend its authority to electric railways and other transportation companies over which at present it exercises no control. The report shows that during 1913 three trespassers were killed by interurban lines, but that not a passenger was killed on an interurban electric road.

NEW YORK

The Governor has approved the bill which provides that "the time within which the railroads specified in the certificate of incorporation of the Electric City Railroad may be finished and put in operation is hereby extended for two years from Jan. 29, 1914."

The Public Service Commission of the First District of New York has sent to the Legislature the draft of a bill to amend the rapid transit act so as to allow the installation of public telephone booths in the new subways. The rapid transit act, as it stands now, prohibits the business or sale of any commodity except newspapers and periodicals. The proposed amendment authorizes the commission to make contracts for the installation, maintenance and operation of a public telephone system on all the new rapid transit lines.

The Senate on Feb. 3 passed again the workmen's compensation bill in precisely the form in which it was enacted and approved by Governor Glynn last December. The re-enactment of the bill is for the purpose of forestalling the anticipated attack on the constitutionality of the law in the courts, owing to the fact that the measure was originally enacted before the constitutional amendment authorizing a compulsory workmen's compensation plan had gone into effect.

The State Conservation Commission has prepared three hydroelectric bills. The measures are the first of a series the commission is projecting with a view to state-wide development of hydroelectric power.

Pending a local referendum the Assembly committee on internal affairs has tabled until March 18 further consideration of the bill providing for the repeal of the law prohibiting the laying of electric railway tracks on the Albany Post Road in Westchester County. This bill was introduced by Assemblyman Walter W. Law, Jr., of Briarcliff Manor. The Burns law excluding the electric railways from the Post Road was passed in 1896. Early in January Mr. Law sent to the presidents of the five villages which are affected a letter requesting them to submit the question to a referendum vote. Tarrytown and North Tarrytown will submit the question to the voters and non-resident property owners on March 17.

A resolution has been introduced in the Assembly by the member from the Nineteenth district of Kings providing for an investigation of the activities and personnel of the Public Service Commission of the First District of New York by a joint committee of the Legislature.

OHIO

The Mills bill now pending in the Ohio Legislature has taken much of the time and attention of Mayor Baker of Cleveland recently, because it provides a means of acquiring the street railway system by that municipality. The bill makes bonds issued for the acquirement of such property a direct lien on the property, but in addition it places the entire credit of the municipality behind the bonds. A plan to amend the bill by making bonds a lien only on the property acquired is opposed by Mayor Baker. Cincinnati municipal officials oppose the bill as it stands.

In a letter to the state budget commissioner, the State Public Utilities Commission of Ohio states that two demands for physical valuation of utilities have been made, one for a valuation of the Cleveland Telephone Company and the other for the Cincinnati Traction Company. The letter adds that if these two reports are to be compiled, funds must be provided for the purpose. John Cowan, chairman of the House finance committee preparing the 1914 appropriation bill, states that no appropriation has been made to cover the cost of either valuation, nor will any be made.

Representative Walter J. Agler of Stark County has announced that the proposed bill giving county commissioners the right to annul the franchise of the Northern Ohio Traction & Light Company between Canton and Massillon has been abandoned.

PROGRAMS OF ASSOCIATION MEETINGS

American Society of Mechanical Engineers

Important improvements in the braking of heavy passenger cars will be described in a paper to be read before the American Society of Mechanical Engineers at the Engineering Building, in New York, on Feb. 10, at 8.15 p. m., by S. W. Dudley, Pittsburgh. These tests were conducted jointly by the Pennsylvania Railroad and the Westinghouse Air Brake Company.

Central Electric Railway Association

As stated in the ELECTRIC RAILWAY JOURNAL of Jan. 31, 1914, the annual meeting of the Central Electric Railway Association will be held at the Hollenden Hotel, Cleveland, Ohio, on Feb. 26 and 27, 1914. The address of welcome will be delivered by Newton D. Baker, Mayor of Cleveland, on Feb. 26, at 9 a. m. At the session on Feb. 26 the committee report "The Joint Weight and Inspection Bureau" will be opened for discussion by J. H. Crall, general freight and passenger agent of the Terre Haute, Indianapolis & Eastern Traction Company, for the committee. The committee report "The Claim Index Bureau" will be opened for discussion by William Tichenor, claim agent of the Terre Haute, Indianapolis & Eastern Traction Company, chairman of the personal injury claims committee. In addition the following papers will be presented on Feb. 26:

Paper, "Repairs and Welds of Track and Rolling Stock by Electricity," by E. G. Price, vice-president and secretary of the Indianapolis Switch & Frog Company, Springfield, Ohio.

Paper, "Track Construction and Maintenance," by L. A. Mitchell, superintendent of track and roadway of the Union Traction Company of Indiana, Anderson, Ind.

At the session of the association on Feb. 27 the following papers will be presented:

Paper, "Taxation," by Peter Witt, city street railway commissioner of Cleveland, Ohio.

Paper, "Railway Motors," by J. F. Layng, railway engineer of the General Electric Company, Schenectady, N. Y.

At this session on Feb. 27 the annual report of the secretary-treasurer and the annual address of the president will be presented. Officers will also be elected. The new executive committee will meet immediately after the adjournment of the association.

Financial and Corporate

Stock and Money Markets

Feb. 4, 1914.

In the early trading on the New York Stock Exchange today considerable strength was displayed among the industrial specialties and among some of the standard issues, but stocks were in plentiful supply. Later in the day the market receded, with a net loss in the general average of quotations. The bond market was particularly strong. Rates in the money market to-day were: Call, 1½@2 per cent; sixty days, 2¼@3¼ per cent; four months, 3@3¼ per cent; six months, 3¼@3¾ per cent.

In the Philadelphia market to-day the local transit issues were weak. Philadelphia Rapid Transit recovered to 18½ on light trading, and Lehigh Valley Transit preferred changed hands at 27½ and at 34.

The Chicago market was broad to-day and the demand for stocks was good. The sales of Chicago Surface Lines bonds alone totaled \$46,000, par value.

The Boston market was unusually broad to-day. Profits were taken, but the market absorbed the selling.

The stock market in Baltimore was broad to-day, but the volume of transactions was small.

Quotations of traction and manufacturing securities as compared with last week follow:

	Jan. 28	Feb. 4
American Brake Shoe & Foundry (com.)	93	95
American Brake Shoe & Foundry (pref.)	139	142
American Cities Company (com.)	36	36
American Cities Company (pref.)	68	65¾
American Light & Traction Company (com.)	350	350
American Light & Traction Company (pref.)	106	106
American Railways Company	39¾	38¾
Aurora, Elgin & Chicago Railroad (com.)	81½	80
Aurora, Elgin & Chicago Railroad (pref.)	*80	104¾
Boston Elevated Railway	84½	84
Boston Suburban Electric Companies (com.)	7	7
Boston Suburban Electric Companies (pref.)	60	60
Boston & Worcester Electric Companies (com.)	*6¼	*6¼
Boston & Worcester Electric Companies (pref.)	39	39
Brooklyn Rapid Transit Company	91	91¾
Capital Traction Company, Washington	112	112
Chicago City Railway	160	170
Chicago Elevated Railways (com.)	20	20
Chicago Elevated Railways (pref.)	70	65
Chicago Railways, pteptg., ctf. 1	32½	32
Chicago Railways, pteptg., ctf. 2	33	33¾
Chicago Railways, pteptg., ctf. 3	7¾	8
Chicago Railways, pteptg., ctf. 4	2¼	3
Cincinnati Street Railway	107½	107
Cleveland Railway	105½	105½
Cleveland, Southwestern & Columbus Ry. (com.)	*5	*5
Cleveland, Southwestern & Columbus Ry. (pref.)	*26	*26
Columbus Railway & Light Company	13	13
Columbus Railway (com.)	75	75
Columbus Railway (pref.)	90	82½
Denver & Northern Railway	70	*70
Detroit United Railways	71	71
General Electric Company	147	148
Georgia Railway & Electric Company (com.)	120¾	119
Georgia Railway & Electric Company (pref.)	83½	84¾
Interborough Metropolitan Company (com.)	15¾	15¾
Interborough Metropolitan Company (pref.)	61½	61½
International Traction Company (com.)	*3	*3
International Traction Company (pref.)	*90	*90
Kansas City Railway & Light Company (com.)	*15	15
Kansas City Railway & Light Company (pref.)	*30	30
Lake Shore Electric Railway (com.)	*6	6
Lake Shore Electric Railway (1st pref.)	*92	92
Lake Shore Electric Railway (2d pref.)	*24	24
Manhattan Railway	132	131
Massachusetts Electric Companies (com.)	12½	12
Massachusetts Electric Companies (pref.)	65	63
Milwaukee Electric Ry. & Light Co. (pref.)	95	95
Norfolk Railway & Light Company	24¾	24¾
North American Company	72	72
Northern Ohio Light & Traction Co. (com.)	62	62
Northern Ohio Light & Traction Co. (pref.)	98½	98½
Philadelphia Company, Pittsburgh (com.)	41½	43½
Philadelphia Company, Pittsburgh (pref.)	42½	42
Philadelphia Rapid Transit Company	18¾	18½
Portland Railway, Light & Power Company	48	48
Public Service Corporation	107	109
Third Avenue Railway, New York	42¾	42½
Toledo Traction, Light & Power Co. (com.)	30	20
Toledo Traction, Light & Power Co. (pref.)	80	80
Twin City Rapid Transit Co., Minneapolis (com.)	107	107
Union Traction Company of Indiana (com.)	11½	11½
Union Traction Company of Indiana (1st pref.)	80	80
Union Traction Company of Indiana (2d pref.)	14	14
United Rys. & Electric Company (Baltimore)	26½	26
United Rys. Inv. Company (com.)	21½	22
United Rys. Inv. Company (pref.)	43	44¾
Virginia Railway & Power Company (com.)	52½	52½
Virginia Railway & Power Company (pref.)	95	95
Washington Ry. & Electric Company (com.)	89¾	90
Washington Ry. & Electric Company (pref.)	89¾	89¾
West End Street Railway, Boston (com.)	72½	73
West End Street Railway, Boston (pref.)	91	92
Westinghouse Elec. & Mfg. Company	70	71½
Westinghouse Elec. & Mfg. Co. (1st pref.)	116	119

*Last sale.

ANNUAL REPORTS

Northern Ohio Traction & Light Company

The statement of income, profit and loss of the Northern Ohio Traction & Light Company, Akron, Ohio, for the year ended Dec. 31, 1913, as compared with the previous fiscal period, follows:

	1912	1913
Earnings:		
Passenger	\$2,502,937	\$2,686,606
Light and power	316,558	418,093
Car mileage	5,096	5,742
Freight, etc.	80,723	94,516
Parks	74,555	59,733
Interest and discount	5,688	8,072
Miscellaneous	10,479	11,865
Total earnings.....	\$2,996,037	\$3,284,537
Expenses:		
Maintenance way and structure.....	\$233,696	\$307,439
Maintenance equipment	243,431	304,612
Operation power plants	375,307	416,416
Conducting transportation	473,222	546,724
General	377,109	444,462
Total expenses.....	\$1,702,765	\$2,019,653
Net earnings	\$1,293,271	\$1,264,883
Interest	523,068	561,815
Net income—profit and loss.....	\$770,203	\$703,068
Profit and loss surplus—previous years.....	1,157,912	1,405,036
Profit and loss—gross surplus.....	\$1,928,115	\$2,108,104
Profit and loss charges:		
Dividends, preferred stock.....	\$49,929	\$152,738
Dividends, common stock.....	382,501	450,000
Depreciation		100,000
Refinancing costs, including discount on bonds		167,724
Extraordinary expenses of flood, etc.		59,639
Reconstruction and replacement expenses		109,602
Taxes and expenses applicable to prior years	90,649	27,076
Total	\$523,079	\$1,066,779
Profit and loss surplus—end of year.....	\$1,405,036	\$1,041,325

The gross revenue for the year ended Dec. 31, 1913, was \$3,284,537, as compared with \$2,996,037 for 1912, an increase of 9.6 per cent. The average mileage in operation increased from 216.47 to 233.22 and the gross earnings per mile from \$12,378 to \$12,291. The net earnings per mile decreased from \$5,153 to \$4,457, and the operating ratio rose from 56.83 per cent to 61.49 per cent. The total expenditure during the year for additions and improvements amounted to \$1,811,155.

H. A. Everett, president of the company, says in part: "The mileage of the system has been increased 16.75 miles, as follows: New double-track high-speed line on private right-of-way known as the Northfield cut-off, tracks at the new carhouses and shops in South Akron, and substitution of double for single track in Akron and Massillon, making the total mileage 233.22 miles. The Northfield cut-off right-of-way averages 75 ft. in width. The track construction consists of 80-lb. T-rails with oak ties, ballasted with cinders. The overhead line is of catenary type with towers. A maximum grade of four-tenths of 1 per cent, with practically no curves, materially reduces the running time. An addition of thirty-five passenger cars has been made to the service, ten interurban coaches, fifteen semi-convertible cars and ten convertible cars for city use. Equipment has been provided on the interurban cars of the company for the control of trains, which are now in successful operation. Three electric motor trucks for use in extensions and maintenance of lines were purchased.

"Modern carhouses and shops in South Akron were completed and placed in operation in September. The South Main Street shop was then permanently closed. The new carhouses will meet storage requirements for some time.

"The Gorge power station completed during the year gradually assumed the load of the entire Northern division, and the Beech Street, Silver Lake Junction and Bedford power stations were permanently closed. Until this was fully accomplished there was necessarily a duplication of expense. The more economical production of power is now apparent and the hydroelectric plant of the Gorge development placed in service on Jan. 6, 1914, will make for further economy.

"In the commercial division 2600 new consumers of light and power have been added during the year, the power installations representing a total of 8400 hp. Under contracts already secured large additions will be made to these

figures early during the current year. A majority of the large Akron rubber factories have entered into contracts for power service.

"Incident to the changing of circuits to the three-phase system and transfer of lines from the old Beech Street station to No. 4 substation, 594½ miles of wire was installed and 2400 new poles set. In connection with required and necessary changes and extensions in Akron, 95,400 ft. of underground cables and 154,700 ft. of fiber conduit were installed.

"The past year brought severe burdens of unusual character. An unparalleled labor disturbance in Akron rubber factories occurred in February and continued for six weeks. The March flood caused considerable property loss and excessive operating charges in addition to the suspension of traffic for several days. On Nov. 9 a snowstorm caused a complete cessation of operation for nearly twenty-four hours, and created a heavy expense in clearing tracks and repairing overhead lines and electrical and car equipment.

"Employees during the year participated in the administering of the pension department, which to date has distributed a total of \$15,566. In addition to \$2,199 on hand Dec. 31, the pension fund owns 100 shares of the company's preferred stock. Seventeen employees have retired on pension since the inception of the department.

"Reorganization in the claim department has been made to include a vigorous and permanent work along safety lines, particularly among the car men. A marked interest on their part is a certain indication of productive results to be accomplished.

"The operation of interurban limited cars has become an established branch of the service, the volume of traffic increasing steadily. Gross earnings from this service for the year 1913 were \$315,616."

Combined Stone & Webster Statement

The combined statement of the electric railway, electric lighting, gas and water power companies under the management of the Stone & Webster Management Association for the year ended Dec. 31, 1913, follows:

CAPITALIZATION	
Bonds and coupon notes outstanding.....	\$86,512,100
Preferred stocks outstanding.....	38,092,100
Common stocks outstanding	61,911,200
Total	\$186,515,400
EARNINGS AND EXPENSES	
Gross earnings	\$26,688,521
Operating expenses and taxes.....	15,583,757
Net earnings	\$11,104,764
Income from other sources.....	93,071
Balance	\$11,197,835
Interest charges	4,432,105
Balance	\$6,765,731
Bond sinking and mortgage improvement funds.....	570,390
Balance	\$6,195,341
Dividends paid	4,184,476
Balance for reserves and depreciation.....	\$2,010,863
Total disbursements for the year 1913, for interest on bonds and notes and for dividends.....	\$8,616,582
Miles of track owned, measured as single track.....	1,299
Passengers carried (including transfers).....	341,255,000
Total connected electric lighting load, equivalent to 16-cp lamps	2,414,820
Total commercial power load (hp).....	179,880
Total combined power station capacity (hp).....	289,640
Of which water power is (hp).....	109,500
Total gas output (cu. ft.).....	1,754,158,300

Tramways and Light Railways in the United Kingdom

According to a report recently presented to the House of Commons, the route length of tramways and light railways on the public roads open for traffic in the United Kingdom has increased from 269 miles to 2662 miles since 1878. The capital expenditure has increased from £4,207,350 to £79,359,758, the number of passengers carried from 146,000,000 to 3,220,000,000 and the net receipts from £230,956 to £5,558,121. For the calendar year ended March 31, 1913, the number of tramways and light railways belonging to local authorities was 171, having 1817 miles open for traffic and involving a total expenditure and capital account of £54,499,784. The number of tramways and light railways belonging to companies and private individuals for the year ended Dec. 31, 1912, was 115, having 844 miles open for

traffic and involving a capital expenditure of £24,859,974. Of the total route mileage of 2661 miles represented by these companies, the amount worked by electric traction was 2518, the balance of 4.4 per cent being operated by steam, cable, horse, petrol and gas motor lines. The total number of passengers carried increased from 3,127,318,732 in 1911-1912 to 3,219,857,293 in 1912-1913, and the number of car miles increased from 323,354,389 in 1911-1912 to 334,777,515 in 1912-1913. The percentage of net receipts to total capital outlay decreased from 7.5 per cent in 1911-1912 to 7.04 per cent in 1912-1913, while the operating ratio increased from 60.6 per cent to 62.68 per cent. Passengers carried per car mile decreased from 9.67 per cent to 9.62 per cent, and the average receipts per passenger from 1.079d. to 1.065d. In the case of four local authorities and seven companies the returns for tramways showed an excess of working expenditure over gross receipts. Two trackless trolley systems were also included among the list of companies which showed a deficiency.

American Light & Traction Company, New York, N. Y.—For the year ended Dec. 31, 1913, the American Light & Traction Company earned 25.08 per cent on its common stock after paying all expenses and preferred dividends. Gross earnings from all sources aggregated \$4,466,234, an increase of \$209,373 over 1912. Expenses of administration of the holding company were \$123,107, leaving net earnings applicable to dividends of \$4,343,126. Total dividend disbursements were \$3,536,507, leaving an accumulated surplus Jan. 1, 1914, of \$9,495,832, an increase of \$806,590 over the surplus of the previous year.

Binghamton (N. Y.) Railway.—The application of the Scranton & Binghamton Railway for permission to purchase the capital stock of the Binghamton Railway was to come before the Public Service Commission of the Second District of New York on Feb. 4, 1914. As noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 17, 1914, R. W. Day, general manager, and W. L. Connell, treasurer of the Scranton & Binghamton Railway, have been elected directors of the Binghamton Railway.

Birmingham-Tuscaloosa Railway & Utilities Company, Tuscaloosa, Ala.—The Birmingham-Tuscaloosa Railway & Utilities Company has sold \$600,000 of 6 per cent three-year notes to bankers, the proceeds of which are to be used to electrify, equip and extend the present Tuscaloosa Belt Railway, now operating with steam; to erect a power generating station, and to complete an artificial gas system. With this work completed the company will have 18 miles of electric line and 14 miles of gas mains under its management.

Boston (Mass.) Elevated Railway.—A hearing was held on Jan. 21, 1914, before the Public Service Commission of Massachusetts for the approval of \$600,000 of negotiable bonds, 7000 additional shares of capital stock at \$50 a share and a \$24,888 premium on an issue of bonds dated Feb. 13, 1913, of the West End Street Railway. The commission has taken the case under advisement. The request of the West End Street Railway Company to issue \$2,000,000 of thirty-year bonds, noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 17, 1914, has been approved by the Massachusetts Public Service Commission. The proceeds are to be used for refunding outstanding bonds of like amount coming due March 1, 1914.

British Columbia Electric Railway, Ltd., Vancouver, B. C.—The stockholders of the British Columbia Electric Railway, Ltd., have authorized an increase in the capital stock of £400,000 to £5,000,000, in three classes. In addition there is authority to put out £280,000 previously granted, making the total new addition £680,000.

Centerville Light & Traction Company, Centerville, Ia.—W. A. Boland, president of the Southern Iowa Traction Company, with offices in New York, confirms the sale of the property of that company to the Centerville Light & Traction Company. The Southern Iowa Traction Company operates 25 miles of standard gage steam railroad, which it is proposed to electrify.

Chicago (Ill.) City Railway.—The Chicago Stock Exchange has listed an additional \$250,000 of the first mortgage 5's of the Chicago City Railway, making a total of \$28,950,000.

Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio.—At the annual meeting of the Cleveland, Southwestern & Columbus Railway the board was increased from fourteen to sixteen members, and E. W. Moore and Levi Meacham were elected to the new places. Other directors were re-elected, and F. H. Ginn was made first vice-president to succeed A. E. Atkins, deceased.

Columbus Railway, Power & Light Company, Columbus, Ohio.—The Columbus Railway, Power & Light Company recently filed notice of an increase in its capital stock from \$1,000,000 to \$11,550,000.

Columbus, Urbana & Western Railway, Columbus, Ohio.—On Jan. 29 Emery W. Lattanner, state superintendent of banks, sold the property of the Columbus, Urbana & Western Railway to J. T. Adams and G. W. Meeker, Columbus, for \$38,000. It is said these gentlemen represent Columbus capitalists. The sale has been confirmed by Judge Kinkead. On the purchase \$1,000 in cash was paid and the remainder is to be paid by Feb. 14. The property was listed among the assets of the defunct Columbus Savings & Trust Company. The total outstanding indebtedness of the company is about \$400,000.

Commonwealth Power, Railway & Light Company, Saginaw, Mich.—The annual report of the Commonwealth Power, Railway & Light Company for the period ended Dec., 31, 1913, shows total gross earnings of \$2,403,689, an increase of \$1,101,228 over the previous year. Net income after all charges was \$1,913,425, a gain of \$744,375. The balance for the common stock, after \$760,000 was paid on the preferred, was \$1,153,425, an increase of \$344,375.

Federal Utilities Company, New York, N. Y.—The board of directors of the Federal Utilities Company, Inc., on Feb. 5, declared the tenth and eleventh quarterly dividends of 1½ per cent each on the preferred stock, payable Feb. 28, 1914, to stockholders of record at the close of business Feb. 14, 1914.

Galveston-Houston Electric Company, Galveston, Tex.—The directors of the Galveston-Houston Electric Company on Jan. 22 declared a regular semi-annual dividend of 3½ per cent on the preferred stock and also a dividend of 3½ per cent (an increase of one-half of 1 per cent) on the common stock, both payable March 16, 1914, to stockholders of record of March 5, 1914.

Georgia Railway & Power Company, Atlanta, Ga.—The Georgia Railway & Electric Company has sold \$541,600 of treasury common stock, subject to being first offered pro rata to shareholders. This brings the outstanding common stock up to the authorized amount, \$8,514,600. The property of the Georgia Railway & Electric Company is leased to the Georgia Railway & Power Company.

International Traction Company, Buffalo, N. Y.—The regular semi-annual dividend of 2 per cent, together with an accumulated dividend of 2 per cent for arrears, was recently declared on the \$5,000,000 of 4 per cent cumulative preferred stock of the International Traction Company, payable on Feb. 1, 1914, to holders of record of Jan. 24, 1914. The amount due after payment of this dividend on account of accumulations is 42 per cent.

Maryland Electric Railways, Baltimore, Md.—The Maryland Public Service Commission has authorized the issue of \$153,000 car trust one to ten-year 6 per cent bonds by the Maryland Electric Railways for the purchase of new rolling stock.

New York Consolidated Railroad, Brooklyn, N. Y.—The New York Consolidated Railroad has made its report of Centre Street loop operation to the Public Service Commission for the First District of New York for November, 1913. The loop was placed in operation on Aug. 4, 1913, and the report covers the period since that date as well as for the month. The gross receipts of the system, the earnings of which are pooled under the dual system contract with those of the loop subway, were \$661,251. They fell \$55,373 below the amount needed to pay rentals, taxes, operating expenses, maintenance and depreciation, the preferential due the company and the interest on its investment. This is about the same as the record for October, which showed \$54,426 short of the amount required to pay the charges previously mentioned. During August and September, when the summer

Traffic and Transportation

Portland Municipal Fare Ordinance Declared Void

The Daly ordinance, providing that the Portland Railway, Light & Power Company, Portland, Ore., should sell six fares for 25 cents within the city limits, was declared illegal by Robert S. Bean, judge of the United States District Court, in an oral ruling rendered on Jan. 12. The ruling came on the motion of L. E. Latourette, assistant city attorney, to dismiss the suit brought by the company to restrain the enforcement of the ordinance on the ground that the United States District Court was without jurisdiction in the matter.

Judge Bean ruled that his court has the requisite jurisdiction, for four of the contentions made in the company's bill of complaint, if sustained, would make the enforcement of the ordinance unconstitutional. These contentions were that the ordinance would be "confiscatory" in its action, an "impairment of contract by legislation," an "excessive penalty" and the "taking of property without due process of law."

The point designated by Judge Bean as the vital one was that Section 81 of the city charter, under which the six-for-a-quarter-fare ordinance was passed, in so far as it gave the city commission power to regulate rates of public utilities in Portland was void, for that section of the charter and the ordinance itself are in conflict with the Oregon public utilities act, giving to the State Railroad Commission power to regulate public service rates in the State, including those within municipal corporations.

Judge Bean said that the public utilities act had been passed by the Legislature and approved by the people, and that the city could not, by the adoption of any ordinance, or in any manner, assume the governmental power already exercised by the State as a whole. Only such ordinances as are strictly municipal in their character, not including the regulation of rates, may be enacted by cities. Otherwise, Judge Bean said, the people of a community or section could declare void the general laws of the State.

Judge Bean pointed out that if the state law were obeyed, it would be in violation of the city ordinance, while if the ordinance were obeyed the state law would be violated. Under its rate schedule, filed with the State Railway Commission, the company's rates are 5 cents for a single fare, or \$2.25 for a ticket-book of fifty fares. Hence the company could not obey the six-for-a-quarter-fare ordinance and alter these rates without being in violation of the law which was passed creating the State Railroad Commission and defining its powers.

Judge Bean suggested that if the people of Portland desired to make a complaint against the rates charged by any public service corporation, the same should be taken before the State Railroad Commission in accordance with the public utilities act, in which event the complaint would be heard by a body having power to investigate the justice of the complaint and to regulate the rates which were in question.

Judge Bean's ruling was on the preliminary injunction when suit to dismiss the ordinance was first brought by the company, but this will stand indefinitely if the city does not decide to carry the case further. Should the city make no answer to the complaint it is expected that attorneys for the Portland Railway, Light & Power Company will go into the federal court and ask an order granting a permanent injunction against the enforcement of the Daly ordinance.

The six-for-a-quarter ordinance was passed by the city commission Nov. 5, 1912, and would have been effective thirty days later but for the filing of the suit by the company.

Before the ordinance was passed the State Railroad Commission had begun an investigation, conducted by experts, to determine the physical valuation of the properties of the Portland Railway, Light & Power Company as the only scientific means for arriving at a proper basis for fixing rates. The city, however, has not taken any interest in the investigation, or made any representation, legal or otherwise, before the commission.

Accident Faker Arrested in New Jersey

Julius Cohen, of New York, charged by George L. Walsh, claim agent of the Passaic division of the Public Service Corporation, Newark, N. J., with obtaining money under false pretenses, was arrested recently in Jersey City. Almost simultaneously Cohen's brother, Frank, was arrested for violation of the laws in Jersey City in much the same manner. On Nov. 22 of last year Cohen ran down Washington Street to the corner of Broadway and jumped aboard a Riverside car which had just started toward Church Street. As he got on the car he fell, and, with the assistance of the conductor, reached a seat inside the car, where he complained of injuries to his left side and left leg. Subsequently Cohen appeared before Claim Agent Walsh and asked for compensation for his injuries. He had with him a certificate from a doctor to the effect that he was being treated for a bruised side and leg. He also produced a witness who declared that the conductor had pulled the bell while Cohen was getting on. At that time Cohen gave the name of Harold Miller and his address as New York City, his occupation being that of a wood carver. Cohen said that he had allowed a lady to step on the car ahead of him and that the conductor, who was standing on the platform, had given the motorman the signal to go ahead just as he (Cohen) had one foot on the first step and the other on the ground. The starting of the car threw him to platform. Cohen said that he could produce three other witnesses if the case went before the courts to prove that his injuries were caused by the conductor's hurry to pull the bell rope.

Investigation proved that four days before this incident Cohen had a similar accident in Elizabeth, where he had given his name as David Weller and his occupation as a jeweler. He was then connected with pretended accidents of the same kind in other cities, where he gave various aliases. Before trying a fake accident of any kind the Cohens would take out an accident policy with one of the large insurance companies, and the man pretending to be injured would, after presenting his claim to the railway, make one with the insurance company, stating that he had been laid up for a period of anywhere from four to six weeks, and collecting accordingly. The trail of Julius Cohen was then taken up at Elizabeth, when he appeared on Nov. 18 at the Public Service Railway claim department under the name of David Weller. The trail took the detectives to Philadelphia. While under surveillance he collected a sum of money from the Philadelphia Rapid Transit Company, and also presented a claim to the Ætna Accident Insurance Company at its Philadelphia office for the accident he had met with in Elizabeth. In all, evidence has been gathered against the two men extending as far back as July 19, 1912. Proofs have been obtained that these men made at least seventeen fraudulent claims against street railway companies, including, besides the Public Service Railway, the Brooklyn Rapid Transit Company, the Third Avenue Railway, the Union Railway, the Interborough Rapid Transit Company, the Philadelphia Rapid Transit Company, the United Traction Company of Albany and the Long Island Electric Railway.

Fatal Accidents in New York in 1913

The National Highways Protective Society reports that 580 persons were killed by vehicles in New York City in 1913. Of these deaths 302 were due to automobiles. Electric railway cars killed 108 persons and wagons killed 170. The street fatalities in New York City for the last three years follow:

	1911	1912	1913
Automobiles	142	221	302
Trolleys	100	134	108
Wagons	172	177	170
Total.....	423	532	580

The comparative statement of highway killings for the last three years in the rest of the State as made public by the Highways Society follows:

	1911	1912	1913
Automobiles	132	127	149
Trolleys	67	79	79
Wagons	31	28	32
Total.....	230	234	260

Reward for Apprehension of Car Seat Vandals in Detroit.—The Detroit (Mich.) United Railway has offered a reward of \$25 for the apprehension and conviction of anyone found cutting seats or straps in cars.

Rear Entrance Order in Los Angeles.—The Pacific Electric Railway, Los Angeles, Cal., put an order into effect on Feb. 1, 1914, closing the front entrance of all its interurban cars and requiring passengers to board and leave by the rear entrance.

Crusade Against Spitting in Louisville.—The health department of Louisville, Ky., plans to enforce the ordinance prohibiting spitting in street cars. Plain-clothes men will be assigned to the cars, and those who violate the ordinance will be arrested.

Safety at Grade Crossings Discussed in Memphis.—The Memphis (Tenn.) Street Railway was represented at a conference on Jan. 31 at which the city commissioners and representatives of all the railways in the city discussed safety plans for grade crossings.

Increase in Wages by Pennsylvania Road.—The Lehigh Valley Transit Company, Allentown, Pa., has granted a voluntary wage increase of 1 cent an hour to motormen and conductors. Under the new scale first-year men will receive 23 cents an hour, and the rates will range from that to a maximum of 27 cents for the fifth and subsequent years.

"Safety First" Cards in Louisville.—E. O. Holland, superintendent of the Louisville (Ky.) Board of Education, has distributed among the 25,000 school children of the city "safety first" cards, in which the children are warned of the dangers of street traffic and instructed in care in crossing streets and getting on and off street cars.

New Haven Fare Increase Sustained by Court.—The Supreme Court of New York, Appellate Division, third department, in a decision by Justice Kellogg has annulled the order of the Public Service Commission of the Second District of New York issued in January, 1913, ordering a reduction in passenger fares on the New York, New Haven & Hartford Railroad between New York City and the stations on the company's main line within the State of New York.

Public Relations in Kingston.—In an advertisement in the *British Whig*, in which the Kingston, Portsmouth & Cataraqui Electric Railway, Kingston, Ont., wished its patrons a merry Christmas and a happy new year, views were shown of a horse car and an electric car, with the following legend, "What You Had" and "What You Have." To drive home the story of progress a line was added as follows: "You can't grow if you knock. Complaints cheerfully received and dealt with at the office."

Low Step Order in Connecticut.—The Public Utility Commission of Connecticut has ordered the Shore Line Electric Railway, Norwich, Conn., to equip with easy folding steps of the same or practically the same type as are used by the Connecticut Company seventeen of forty-three cars, the first or bottom step to be not more than 16 in. above the top of the rail, the second to be not more than 13 in. above the first and not more than 13 in. below the floor of the car. The cars must be so equipped on or before June 1.

"Go to Church" Placards in Cars.—The management of the Brooklyn (N. Y.) Rapid Transit Company fell in heartily with the movement to have everybody in Brooklyn attend church on Feb. 1. The company donated advertising space in all of its cars and divided with the Brooklyn *Daily Eagle* the cost of printing large placards which carried the following appeal to all riders to attend church on Feb. 1: "Next Sunday is 'Go-to-Church' Sunday for all Brooklyn. This national movement includes everybody. The 'City of Churches' should lead all other American cities in large attendance."

Coney Island Fare Changes.—Under a new agreement which has been entered into between the Public Service Commission for the First District of New York and the Brooklyn Rapid Transit Company, the round trip rates from Manhattan to Coney Island will be 10 cents from 5 a. m. to 9 a. m. instead of from 6 a. m. to 9 a. m., and in the afternoon the round-trip rates will be 10 cents from 2 p. m. to 8 p. m. instead of from 3 p. m. to 8 p. m. All commutation books will contain twelve round-trip tickets for sale at \$1.20 per book,

and all unused tickets not detached from books will be redeemable. The new agreement will apply on all new books sold hereafter.

Oregon Electric Railway Answers Fare Complaint.—Answer to the complaint made against the passenger rates charged by the Oregon Electric Railway from Portland, Ore., to Tualatin and intermediate points has been filed with the Railroad Commission by the company. The complaint stated that the Oregon Electric Railway and the United Railways were owned by the same interests and the fare between Portland and Linnton, 8.6 miles over the United Railways, was 5 cents, while it was much higher over the Oregon Electric Railway for the same or less distances. The answer says the fares on the United Railways, fixed by the franchise given the company by the county, are unremunerative and no criterion of what the fares should be on the Oregon Electric Railway.

Petition for Rate Reduction.—The attack of the Los Angeles Rate Association on the tariffs maintained by the Pacific Electric Railway, Los Angeles, Cal., failed recently when an effort was made to submit the association's petition to the State Railroad Commission without sufficient evidence. The association sought a 50 per cent reduction to all interurban points. Attorney Oscar L. Horn, representing the association, explained that lack of co-operation among members of the association impelled him to appear without sufficient data to prosecute the case. Commissioner Edger-ton said that he did not believe it fair for the commission not to be notified of the true situation. Attorney Frank Karr, representing the company, moved to have the commission dismiss the case. Attorney Horn then withdrew the association's application. The members of the committee appeared before the commission as individuals in an effort to secure a 25-cent limited round-trip fare to and from Los Angeles and Bay points.

Former Employees Arrested for Depredations.—Two former employees of the Cincinnati, Milford & Loveland Traction Company, Cincinnati, Ohio, have been arrested and other arrests are likely as the result of strike troubles last fall. The men are charged with placing obstructions on the tracks of the company and tampering with the electrical appliances on the night of Oct. 16. C. C. Harris, general superintendent of the company, issued a reward notice as follows: "One hundred dollars reward will be paid for information leading to the arrest and conviction of the person or persons who, on Oct. 16 or 17, 1913, connected the trolley wire to the rail at the Milford Y. or on Nov. 16, 1913, hung iron bars on the trolley wire at Manilla station and a chain on the trolley wire at Smysors Road. The above reward will also be paid for information leading to the arrest and conviction of any person or persons throwing stones at cars, damaging property or interfering in any manner with the safe operation of this company's properties."

Order for Ticket Sale on Seattle Cars Voided.—Judge John R. Mitchell, of the Thurston County Superior Court, on Jan. 23, set aside the order of the State Public Service Commission, directing the Puget Sound Traction, Light & Power Company, Seattle, Wash., to sell tickets on street cars at twenty-five for \$1, or six for 25 cents. The company under its franchise is compelled to sell tickets at these rates at certain designated places in Seattle, but the commission ordered the tickets sold on the cars, upon the theory that a question of service and not of rates was involved. Judge Mitchell, however, held otherwise, and said that the order violated the company's franchise. The city of Seattle had previously attempted to force the sale of tickets on cars by ordinance, but was enjoined from enforcing the enactment by the federal courts, which held that the matter was one for the Public Service Commission and not the City Council to handle. R. S. Pierce, assistant corporation counsel, has announced that an appeal will be taken to the Supreme Court.

Scattering Sunshine Along the Way.—In concluding an editorial, "The Kindly Spirit," in which it referred to the general spirit of kindness manifested in Delaware, Ohio, by one person toward another, a local paper said recently: "If you look around you a little in life as you go along you can readily pick out the kindly people. They are not all men by any means. We have often observed women minis-

tering unto members of their own sex and could see the same manifestation of appreciation on the countenance of the person receiving the attention. Particularly are these facts true on the Columbus, Delaware & Marion Railway. We hear the remark, 'There's a good fellow,' when referring to an employee of this railway. Why is he a good fellow? Because, perhaps, he has caught up the spirit of geniality from his superior officer or perhaps the superior officer picked him out of a large class of applicants and placed him where he is. So you see it pays. We say pays from the standpoint of one's own satisfaction and enjoyment in life. This same spirit has caught hold all along the Columbus, Delaware & Marion Railway and that is one of the reasons that people like to travel. The boys and officials are cordial, genial and helpful to the traveler in many ways. It's a good spirit to get hold of a person. It's this spirit that the brotherhoods, the churches, the clubs, the lodges are fighting for."

Terms Governing the Use of School Tickets in Jackson.—The Jackson Light & Traction Company, Jackson, Miss., is distributing, through the superintendent of schools, teachers' certificates which every pupil wishing to purchase school tickets must fill out before books can be purchased at the office of the company. Each teacher in the public schools will be supplied with a number of these certificates, and pupils must apply to their teacher for one of these. The certificate states that the pupil is in regular attendance at the school and is entitled to the use of school tickets, which will bear the signature of both pupil and teacher. These certificates may be presented at the office of the company between 8.30 a. m. and 5.30 p. m., and will entitle the bearer to a book of thirty-three rides for \$1. The books are to be issued exclusively for pupils attending public schools where no tuition fee is made, and coupons will be accepted for fare only between the hours of 8 a. m. and 9.30 a. m. and 1 p. m. and 3 p. m., when the holder is going to and from school, on school days only. Coupons will not be good if detached from cover and book will be forfeited if presented by one other than original purchaser. If book is lost it will not be replaced or any allowance made thereon. The person to whom the books are sold must affix his or her signature in ink. Misuse of the book will subject the pupil to forfeiture of school rate privilege, and the holder agrees for the purpose of identification to write his or her signature upon request of the conductor and to comply with all regulations which may be issued from time to time to prevent misuse of school ticket privilege. Tickets will be accepted on the cars of the company between 8 a. m. and 9.30 a. m. and 1 p. m. and 3 p. m.

Prepayment Operation in London.—The London (Ont.) Street Railway recently added a number of pay-as-you-enter cars to its equipment. In order to secure the co-operation of the public, advertisements were placed in the London papers giving various views of the cars. The following reading notice was also carried: "To secure maximum convenience and comfort of passengers and to minimize the possibility of accidents, patrons are respectfully requested to co-operate toward making the cars a success, viz.: by being prepared to enter and leave the car promptly. Enter at the rear door only. When boarding the car be careful that the conductor is not closing the door at the time you take hold of the handles. Please have the exact fare ready, if possible, so that it may be dropped into the box without your having to stop in the vestibule. Transfers should be requested when the fare is paid. Move toward the front of the car. Safety and convenience were the first considerations in designing these cars; therefore the doors must be closed and the steps folded whenever the car is in motion. Exits are provided at both the rear of car and the front. Use the front exit if it is at all possible to do so. Please do not stand in the vestibule or smoke on these cars. When leaving the car and carrying parcels have the left hand free for use in holding on to the handles. The company is endeavoring to provide a safe and pleasant means of transportation. If passengers will assist by refraining from blocking the passageway at the rear of the car, the success of the P. A. Y. E. car is assured. As the company and the passengers are equally interested in improving the service, your co-operation is earnestly requested."

Chicago Surface Lines Engineering Departmental Organizations

Since President L. A. Busby appointed the heads of the different departments of the Chicago Surface Lines, these department heads in turn have been busily engaged in reorganizing the combined departments of the Chicago Railways, the Chicago City Railway and the Calumet & South Chicago Railroad. The departmental heads were announced in the *ELECTRIC RAILWAY JOURNAL* for Jan. 24, and the assistants in the department other than engineering were announced in the *ELECTRIC RAILWAY JOURNAL* of Jan. 31, 1914. The two engineering departments under H. B. Fleming and J. Z. Murphy have since been reorganized. The departments under Mr. Fleming, which include supervision over track and roadway, shops and equipment, buildings, material, supplies and wreck wagon service of the Chicago Surface Lines, are organized as follows: Department of track and roadway, superintendent, J. F. Rodgers; office engineer, C. G. Powers; assistant engineer of estimates, H. P. Amet; chief clerk, W. F. Pratt; division superintendent of track, Northern, C. Chambers; Western, E. Johnson; Central, H. T. Kelly; Southern, O. G. Talmadge. Department of shops and equipment organization is as follows: Superintendent of shops and equipment, H. H. Adams; assistant superintendent of shops and equipment, Donald McGill; general foreman West Side shop, T. H. Shaughnessy; general foreman South Side shop, Howard Alton; general foreman of carhouses, E. W. Anger, Jr.; assistant general foreman of carhouses, B. Phillips. The organization of the department of buildings and drafting is as follows: Superintendent, Hugo Schmidt; assistant superintendent, W. H. Figg; chief draftsman, F. J. Koza. The department of materials and supplies is under the charge of Superintendent J. F. Henning, whose chief clerk is F. B. Mitchell. Argess M. Evans has been appointed chief clerk and secretary to Mr. Fleming.

The electrical engineering department under J. Z. Murphy, electrical engineer, has been reorganized as follows: Department of electrolysis and electrical distribution is under the charge of H. M. Wheeler, engineer in charge of electrical distribution; the testing department is under the charge of V. E. Thelin, with L. O. Mellor, assistant engineer; William Jones has been appointed superintendent of the department of substations and power houses, with M. Callahan as assistant superintendent; H. Richter has been appointed superintendent of the department of electrical installation of equipment of substations, and William Wurth has been appointed engineer of this department. The head of the department of tunnels remains unchanged, with J. W. Harris engineer in charge. A. A. Thurlby has been appointed superintendent in charge of the line and transmission department of the Chicago Surface Lines with R. M. Patterson as assistant superintendent.

J. F. Rodgers, formerly superintendent of track of the Chicago City Railway, has been appointed superintendent of track and roadway of the Chicago Surface Lines. A biography of Mr. Rodgers was published in the *ELECTRIC RAILWAY JOURNAL* of July 12, 1913.

H. H. Adams, formerly superintendent of equipment of the Chicago Railways, has been appointed superintendent of shops and equipment of the Chicago Surface Lines. A biography and a portrait of Mr. Adams were published in the *ELECTRIC RAILWAY JOURNAL* of Jan. 27, 1912.

Donald McGill, formerly superintendent of shops of the Chicago City Railway, has been appointed assistant superintendent of shops and equipment of the Chicago Surface Lines. He was born in Knoxville, Ill., in 1872, and after completing the high school course he began work as a wireman with the Electric Light & Power Company, Kearney, Neb. In 1893 he became a wireman with the Harter Construction Company, Chicago, Ill., electrical engineer and contractor. Mr. McGill entered the service of the Chicago City Railway in 1895 as a car wireman, and three years later was made foreman of the electrical department. In 1905 he was made general shop foreman, and after four years' service in that position he was appointed superintendent of the shops of the company.

E. W. Anger, Jr., who for the last five years has been assistant superintendent of shops of the Chicago City Railway, has been appointed superintendent in charge of carhouses of the Chicago Surface Lines. He was born in Chicago in

1880, and after completing a course in electrical engineering at Lewis Institute accepted a position as electrician in the shops of the Chicago City Railway in 1898. He was subsequently made chief electrician of Sans Souci Park, then owned by the railway company. During the rehabilitation, between 1907 and 1909, Mr. Anger was superintendent of construction in charge of substations.

T. H. Shaughnessy has been appointed general foreman of the West Side shops of the Chicago Surface Lines, his former position as assistant superintendent of equipment of the Chicago Railways having been abolished. A biography of Mr. Shaughnessy was published in the *ELECTRIC RAILWAY JOURNAL* for June 7, 1913.

Howard Alton, general foreman of the shops of the Chicago City Railway, has been retained as general foreman of those shops for the Chicago Surface Lines. He entered electric railway work with the mechanical department of The Milwaukee Electric Railway & Light Company in 1893, and became connected with the Chicago City Railway in 1904. After two years' service he was placed in charge of the repair shop in one of the carhouses, and in 1902 was made assistant to M. O'Brien, then master mechanic of the Chicago City Railway. In 1907 he resigned to accept the position of general superintendent of the People's Traction, Galesburg, Ill., where he remained until 1909, at which time he re-entered the service of the Chicago City Railway as general foreman of shops.

Hugo Schmidt, who has been superintendent of buildings of the Chicago City Railway for the last four years, has been appointed superintendent of buildings and drafting of the Chicago Surface Lines. He was born in Chicago in 1876. Shortly after he completed his common school education his father died. After a brief experience with a structural iron contractor, he obtained a position in the architect's office of the Chicago Board of Education. In 1898 he resigned to become connected with the Mexican Central Railroad in the City of Mexico. Mr. Schmidt returned to Chicago in 1900, and was appointed resident engineer in charge of the Illinois Central extension to the Thebes bridge across the Mississippi River. In 1901 he entered the University of Illinois and in 1905 was graduated in civil engineering. In the year that he was graduated from the university he entered the service of the Chicago City Railway as a draftsman. He was appointed chief draftsman in 1907 and superintendent of buildings in 1910.

J. F. Henning, formerly assistant superintendent of shops of the Chicago City Railway, has been appointed superintendent of materials and supplies of the Chicago Surface Lines. He was born in Buffalo, N. Y., in 1877, and after completing his education in the Buffalo Business University in 1894, he began work as a timekeeper on public work in Buffalo. In 1900 Mr. Henning was appointed general storekeeper of the St. Louis, Kansas City & Colorado Railroad at Union, Mo., and in 1904 he became an accountant with the East St. Louis & Suburban Railway, where he remained until 1906. During the period between 1906 and 1908 he held the position of assistant secretary and auditor of the Michigan United Railway, and was later appointed assistant to the general manager. In 1908 he accepted a position as chief clerk in the track and roadway, wires and cable department of the Chicago City Railway, and after three years' service was appointed general storekeeper of that company. In 1913 Mr. Henning was appointed assistant superintendent of the Chicago City Railway's shops and placed in charge of all stores and shop accounting, in addition to the engineering department payrolls and distribution.

Herbert M. Wheeler, who for the last five years has been assistant chief engineer of the Chicago Railways, has been appointed engineer in charge of electrolysis and electrical distribution of the Chicago Surface Lines. He was born in Shawano, Wis., in 1876, and following his graduation in electrical engineering at the University of Minnesota in 1896 he began work with the Fort Wayne (Ind.) Electric Corporation. Mr. Wheeler began street railway work in 1899 with the North Chicago Street Railroad as assistant engineer. After four years' service he resigned to become an instructor in mathematics and engineering at Lewis Institute, Chicago. In 1907 he was appointed electrical engineer of the Chicago Railways, and was made assistant chief engineer of that company in 1909. Mr. Wheeler served as the Chicago Railways representative on the electrolysis committee which

reported to the gas, oil and light committee of the Chicago City Council for Chicago's surface and elevated lines.

Victor E. Thelin, formerly engineer in charge of tests for the Chicago City Railway, has been appointed engineer in charge of the testing department of the Chicago Surface Lines. He was born in Chicago in 1885, and after completing an academic and electrical engineering course at Lewis Institute, Chicago, began work as engineer in the operating department and testing laboratories of the Commonwealth Edison Company, Chicago. In 1907 he accepted a position with the Chicago City Railway in charge of coal, cement, car and meter testing. As head of the testing department of the Chicago Surface Lines he will have charge of miscellaneous testing, substation, metering and power statistics for the company.

William Jones, formerly assistant to the chief engineer of the Chicago Railways, has been appointed superintendent of the department of substations and power houses of the Chicago Surface Lines. He was born in Sweden and came to this country in 1884, where he was employed in lake boat service. He began street railway service installing machinery for the West Chicago Street Railway, then a cable line. When this line was electrified, he continued to work in the mechanical department, and in 1908 was appointed assistant to the chief engineer.

William Wurth, formerly division engineer of substations and power for the Chicago City Railway, has been appointed engineer of the installation of substations of the Chicago Surface Lines. He was born in Switzerland in 1877, and obtained his early electrical education with Brown, Boveri & Company, Baden, Switzerland, as a draftsman and an apprentice in the shops. He completed an electrical and mechanical engineering course at the technical college in Mittweida, Germany, in 1901, and came to America the same year. After two years' service in the designing department of the General Electric Company, Schenectady, N. Y., and the Bullock Electric Manufacturing Company, Cincinnati, he joined the electrical department at the 1903 World's Fair in St. Louis. In 1905 he began work with the Chicago City Railway in electrical design, following which he was successively promoted to chief draftsman and then to division engineer of substations and power, which position he held at the time of his recent appointment.

J. W. Harris, engineer in charge of tunnels, will continue in that position with the Chicago Surface Lines. He was born in Beloit, Wis., in 1863. He completed a preparatory course at the Lawrence Academy, Groton, Mass., and was graduated from the University of Illinois in 1886 with the degree of B. S. in C. E. He engaged in various lines of steam railroad construction and maintenance work with the Chicago & Northwestern Railroad and the Père Marquette Railroad. During the period between 1903 and 1905 he was division engineer with the latter road with headquarters in Canada. In 1909 he joined the engineering staff of the Chicago Railways as tunnel engineer, and was placed in charge of the completion of the Van Buren Street tunnel under the Chicago River. Later had charge of the tunnels built under the Chicago River at Washington and La Salle Streets, Chicago.

A. A. Thurlby, formerly superintendent of wires and cables of the Chicago City Railway, has been appointed superintendent of overhead and underground of the Chicago Surface Lines. He was born in Nottingham, England, in 1860, and came to America in 1868. He began work in 1877 with the Brush Electric Company, Cleveland, Ohio, where he became an erecting engineer. In 1891 he resigned that position to become manager of the Battle Creek (Mich.) Street Railway. The following year he accepted the position of engineer for inside wireman with the Chicago Edison Company. In 1893 he accepted a position with the People's Light, Power & Motor Company, Chicago, as assistant superintendent in charge of overhead lines. He remained with that company when it was absorbed by the Commonwealth Edison Company, but resigned in 1899 to accept the position of manager of the Manistee (Mich.) Electric Railway. In 1902 he became associated with John R. Walsh in his electrical projects, and resigned in 1907 to return to the Commonwealth Edison Company. In 1907 Mr. Thurlby was appointed superintendent of underground and overhead wires and cables of the Chicago City Railway, which position he has held until his new appointment.

Personal Mention

Mr. H. Warner has resigned as chief engineer of the Edmonton (Alberta) Interurban Railway.

Mr. D. C. Clough has been appointed master mechanic of the Oregon Electric Railway and the United Railways, Portland, Ore., vice Mr. G. H. Hopkins, resigned.

Mr. F. H. Ginn has been elected first vice-president of the Cleveland, Southwestern & Columbus Railway, Cleveland, Ohio, to succeed A. E. Atkins, deceased.

Mr. C. N. Wilcoxon, who has been general manager of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., has also been elected vice-president of the company.

Mr. H. C. Lang, of Mandelbaum, Wolf & Lang, Cleveland, Ohio, has been elected secretary and treasurer of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., to succeed Mr. A. R. Horr.

Mr. F. H. Goff, Cleveland, Ohio, has resigned as president of the Chicago, Lake Shore & South Bend Railway, Michigan City, Ind., owing to the fact that the Indiana laws require the president of Indiana corporations to reside in that State. His successor has not yet been elected.

Mr. A. T. Davidson has been appointed superintendent in charge of the Oregon Electric Railway, United Railways and Astoria division of the Spokane, Portland & Seattle Railway, Portland, Ore., merged into one operating division, to be known as the Portland division.

Mr. H. H. Vreeland, vice-president of the Interborough-Metropolitan Company, New York, N. Y., will have the title of director of welfare work and chairman of the welfare committee. The welfare committee will be made up of the heads of the departments, and will serve as the adviser of the head of the welfare department.

Mr. W. E. Boileau has resigned as general manager of the Chattanooga Railway & Light Company, Chattanooga, Tenn. Mr. Boileau was appointed manager of the Chattanooga Electric Company in 1907, and following the consolidation of the company with the corporation operating the street railway system he was made general manager of the Chattanooga Railway & Light Company.

Mr. Howard Patten, who has been superintendent of the Topeka (Kan.) Street Railway for the last year, has been transferred to the Oskaloosa Traction & Light Company, Oskaloosa, Ia., another McKinley interest, where he will manage the street railway and the electric light and gas plants. Mr. W. G. Miller, operating engineer in Topeka, and Mr. Albert M. Patten, assistant general manager, will divide the former duties of Mr. Howard Patten.

Mr. Henry Clay Hall has been nominated by President Wilson for appointment to the Interstate Commerce Commission. Mr. Hall is president of the Bar Association of Colorado. He was born in New York in 1860. After practising in New York for two years he went to Paris in 1885, where he continued his law practice and was counsel to the United States Legation. In 1892 he left France for Colorado Springs on account of his health. He has been an active practising lawyer in Colorado and has been counsel for railroads and many corporations.

Mr. Winthrop More Daniels has been nominated by President Wilson for appointment to the Interstate Commerce Commission. Mr. Daniels is chairman of the Board of Public Utilities Commissioners of New Jersey. He was serving as professor of political economy at Princeton University in 1911 when President Wilson, then Governor, appointed him to the Board of Public Utility Commissioners of New Jersey for a term of six years. He had held the chair of political economy at Princeton since 1892. Mr. Daniels was born in Dayton, Ohio, in 1867.

Mr. William R. Frederick has resigned as auditor of the Oklahoma Railway, Oklahoma City, Okla., to accept a position as examiner with the Interstate Commerce Commission with headquarters at Chicago, Ill. Mr. Frederick began his railway career as a clerk in the accounting department of the Atchison, Topeka & Santa Fé Railway, Topeka, Kan. He was appointed traveling auditor on sta-

tion accounts by the company on March 1, 1901, and later was advanced to traveling accountant on joint facility accounts, from which position he resigned in March, 1910, to become connected with the Oklahoma Railway.

Mr. W. H. Bancroft, president of the Utah Light & Railway Company, Salt Lake City, Utah, vice-president and general manager of the Oregon Short Line Railroad and vice-president of the Salt Lake Route, has been relieved of his duties as general manager of the Oregon Short Line, at his own request. He will still continue as president of the Utah Light & Railway Company and vice-president of the Salt Lake Route. Mr. Bancroft is seventy-four years of age. He entered the railroad service in 1856 as telegraph operator and ticket clerk for the Michigan Southern Railroad, and has been continually in that service to the present time, rising through the various grades to be executive head of all the Harriman interests in the intermountain territory. When the Harriman interests acquired control of the Utah Light & Railway Company in November, 1906, Mr. Bancroft was elected president of the company.

Mr. M. S. Sloan has been appointed manager of the railway and electric departments of the New Orleans Railway & Light Company, New Orleans, La., to succeed Mr. D. A.



M. S. Sloan

Hegarty, resigned. Prior to 1906 Mr. Sloan was connected with the General Electric Company. On July 1, 1906, he was made chief engineer of the Birmingham Railway, Light & Power Company, Birmingham, Ala. Later he was made assistant superintendent of the lighting and power departments of that company and in 1907 he was appointed superintendent of power of the company. In 1908 he was appointed superintendent of the electric department of the Birmingham Railway, Light & Power Company with jurisdiction

over the operation and commercial sales of that department. In 1910 he was made assistant to the president of the company, in which capacity he had supervision over all departments of the company with full executive power. He continued in that capacity until his recent appointment as manager of the railway and electric department of the New Orleans Railway & Light Company.

OBITUARY

Walter Ambrose Pearson, brother of Dr. F. S. Pearson and for many years associated with his brother in his electrical work, died in New York on Jan. 25, 1914. W. A. Pearson was born in Putnam, Conn., in July, 1869. He was educated at Tufts College, Mass., and was graduated with the degree of B. A. in the class of 1890. Immediately upon his graduation he entered the employ of the West End Street Railway, Boston, Mass. In 1893 he became electrical engineer in charge of the electric installation of the Brooklyn Heights Railroad, Brooklyn, N. Y. In 1896 he was appointed electrical engineer for the Metropolitan Street Railway, New York, and was particularly active in the development of the Lenox Avenue underground electric system, the first system of the kind to be developed in this country. Mr. Pearson remained with the Metropolitan Street Railway until 1906. He then took charge of the electrical installation and construction of the power house of the Electric Development Company of Ontario at Niagara Falls. In 1910 he went to Rio de Janeiro, Brazil, where he remained for two years as assistant general manager of the Rio de Janeiro Tramway, Light & Power Company. He returned to the United States in 1912, owing to poor health in the tropics, and became associated as consulting electrical engineer with Bertron, Griscom & Company, bankers, with whom he was connected at the time of his death. Mr. Pearson was a member of the American Society of Mechanical Engineers, the American Institute of Electrical Engineers, the New York Railroad Club and the Engineers' Club of New York.

Construction News

Construction News Notes are classified under each heading alphabetically by States.

An asterisk (*) indicates a project not previously reported.

RECENT INCORPORATIONS

West Helena Consolidated Railway, Helena, Ark.—Incorporated in Arkansas to build an electric railway in West Helena. Capital stock, \$650,000. Officers: E. C. Horner, president; R. B. Macon, vice-president, and John C. Horner, secretary.

***Norfolk & Elgin Railway, Port Burwell, Ont.**—Application for a charter has been made by this company to build a railway to be operated by electricity, steam or other motive power from Simcoe, via Bayham, to Port Burwell, Ont., with branches. Price, Garvey & Company, Toronto, are solicitors for the applicants.

Erie & Ontario Railway, Port Maitland, Ont.—Application for a charter has been made by this company to the Parliament of Canada to build a railway, to be operated by electricity, steam or any other motive power, from Port Maitland, on Lake Erie, to Smithville, in Lincoln County, Ont., and from Port Maitland to Port Colborne, Welland County, Ont., with branch lines. Power is also asked to operate vessels in connection with the railway. W. T. Henderson, Brantford, Ont., is solicitor for the applicants.

***Shefford, Bagot & Missisquoi Railway, Montreal, Que.**—Application has been made for a charter by this company to the Quebec Legislature to build an electric or steam railway through the counties of Missisquoi, Shefford and Bagot from a point on the Quebec and Vermont line in the parish of St. George to a point on the Intercolonial Railway between Bagot and St. Eugene. Capital stock, \$1,000,000.

Dallas (Tex.) Northwestern Traction Company.—Application for a charter has been made by this company to build an electric railway between Dallas and Wichita Falls. Capital stock, \$500,000. Incorporators: E. P. Turner, B. B. Cain, L. S. Thorne, John T. Witt, E. L. Sargent, R. Fenby, Otto H. Lang, Samuel P. Cochran and others. [E. R. J., Dec. 13, '13.]

***Weston & Glenville Electric Railway, Weston, W. Va.**—Chartered in West Virginia to build an electric railway in Weston and Glenville. Capital stock, \$500,000.

FRANCHISES

Clovis, Cal.—The Fresno & Clovis Interurban Railway has purchased a franchise from the Council in Clovis. This is part of a plan to build a 24-mile electric line to connect Clovis, Fresno and Academy. F. S. Granger, Clovis, president. [E. R. J., Jan. 24, '14.]

Stockton, Cal.—The Stockton Electric Railway has received a franchise from the Board of Supervisors to extend its line on El Dorado Street in Stockton north to Castle Street, and west along Castle Street and through Tuxedo Park in Central Court to the western boundary of the park.

Guelph, Ont.—The Guelph Radial Railway has asked the Ontario Legislature for an extension of time within which it may complete a number of authorized branch lines and for authority to build extensions in Guelph.

Morrisburg, Ont.—The Ottawa & Morrisburg Electric Railway has asked the Council for a franchise in Morrisburg. This 47-mile line will connect Ottawa and Morrisburg via Leitrim, South Gloucester, Ormond, Winchester, Greely, Metcalfe, Williamsburg and Glen Becker. J. G. Kilt, Citizens' Building, Ottawa, president. [E. R. J., Jan. 10, '14.]

Sudbury, Ont.—The Sudbury-Copper Cliff Suburban Electric Railway has received a franchise from the Council in Sudbury. This company plans to build an electric line from Sudbury westerly to Copper Cliff, also from Sudbury easterly to Coneston. L. L. Forest, Sudbury, is interested. [E. R. J., Sept. 20, '13.]

Welland, Ont.—The Dunnville, Wellandport & Beamsville Electric Railway has received a year's extension of time on its franchise from the Council in which to build its North Main Street line in Welland.

Pottsville, Pa.—The Eastern Pennsylvania Railway, Pottsville, will ask the Council for a franchise for an extension on Mahantongo Street in Pottsville to connect with the Yorkville line at Dolan's Park at Nineteenth Street in Pottsville.

TRACK AND ROADWAY

Birmingham Railway, Light & Power Company, Birmingham, Ala.—This company has awarded a contract to Ledwidge & Cammack to grade the proposed extension to Biddle.

British Columbia Electric Railway, Vancouver, B. C.—A 2-mile extension to Kerrisdale has been completed by this company.

Northern Electric Railway, Chico, Cal.—A branch line through Orangevale is being contemplated by this company.

Fresno (Cal.) Traction Company.—The State Railroad Commission has granted this company a certificate of public convenience and necessity to extend its line a distance of 9½ miles to a point along the San Joaquin River and to construct its tracks across highways at grade in Fresno.

Fresno, Hanford & Summit Lake Interurban Railway, Fresno, Cal.—Authority from the Railroad Commission has been received by this company to build the first section of its line to Selma, a distance of 20 miles.

Monterey & Pacific Grove Railway, Monterey, Cal.—It is planned to lay new rails on this company's line from Lighthouse Avenue on Nineteenth Street to the depot in Pacific Grove.

San Francisco-Oakland Terminal Railways, Oakland, Cal.—This company is asked to consider plans to extend its lines to Richmond and to connect with all of the waterfront towns and industries as far east as Martinez.

Crescent City Railway, Riverside, Cal.—This company has completed its extension from Bloomington to Rialto.

Shore Line Electric Railway, Norwich, Conn.—This company is asked to consider plans to build an extension from Chester to Middletown.

Southern Illinois & St. Louis Railway, Harrisburg, Ill.—This company has recently filed a mortgage to the Fort Dearborn Trust & Savings Bank of Chicago as trustee, to secure an authorized issue of \$2,500,000 of first mortgage thirty-year 5 per cent gold bonds. This company plans to build an electric railway between Marion and Harrisburg, with branch lines to Benton and to Johnston City and Herrin. William Rothman, Chicago, is interested. [E. R. J., Jan. 24, '14.]

Bluffton, Geneva & Celina Traction Company, Bluffton, Ind.—Construction on a line to Celina will soon be begun.

Evansville, Chrisney & Eastern Railway, Evansville, Ind.—Plans are being made to begin construction of this line in the spring. James Hemenway, Boonville, president. [E. R. J., Dec. 14, '13.]

Evansville (Ind.) Railways.—This company is said to have abandoned the project to build a bridge over the Ohio River at Rockport. It is planned to build an extension of its Henderson line, but to use a ferry to cross the Ohio River instead of a bridge.

Public Utilities Company, Evansville, Ind.—The Northeast Side Development Club, Evansville, plans to give a bonus to this company to secure the construction of an extension of the Bell street line to Woodmere, a suburb of Evansville.

Gary, Hobart & Eastern Traction Company, Gary, Ind.—Work will be resumed by this company on the completion of the line between Gary and Hobart.

Waterloo, Cedar Falls & Northern Railway, Waterloo, Ia.—Surveys are being made for a line between Charles City and Mason City.

Hutchinson & Northern Railway, Hutchinson, Kan.—Preliminary arrangements are being made by this company to build its 14-mile line from Hutchinson to Burrton. W. S. Thompson, Hutchinson, is interested. [E. R. J., June 28, '13.]

Union Traction Company, Independence, Kan.—It is reported that this company is interested in the plans to build an electric line from Vevay to Aurora and Madison.

Manhattan City & Interurban Railway, Manhattan, Kan.—During the year the line from Manhattan to Fort Riley will be finished.

***Hopkinsville, Ky.**—The Business Men's Association has taken up the project to build an interurban line to connect Hopkinsville with neighboring towns. R. E. Cooper is president of the association.

Kentucky Southwestern Electric Railway, Light & Power Company, Paducah, Ky.—Arrangements are being made to finance the construction of the section of this railway between Paducah and Hickman. F. M. Smith, general manager.

Metropolitan Street Railway, Kansas City, Mo.—This company will shortly place in operation a new line to be known as the Argentine-Minnesota division. It will extend from the Western extremity of Argentine, in Kansas City, Kan., across the Kaw River, through Armourdale to Tenth Street, north to the business section of Kansas City, Kan., through the packing house district and over the James Street viaduct to the stockyards.

Moberly, Huntsville & Randolph Springs Railway, Moberly, Mo.—Plans are being made by this company to resume work in the spring on the construction of this 12-mile line to connect Randolph Springs, Moberly and Huntsville. Charles H. Dameron, Huntsville, president. [E. R. J., July 19, '13.]

Public Service Railway, Newark, N. J.—This company is asked to consider plans to extend its Mount Prospect Avenue line along Union Avenue in Belleville and into Nutley.

New York State Railways, Rochester, N. Y.—This company will be asked to consider plans to build an extension of the Midler Avenue line through James Street in Syracuse.

Carolina Power & Light Company, Raleigh, N. C.—An extension into Boylan Heights is being contemplated by this company.

Chardon, Jefferson & Meadville Interurban Railway, Cleveland, Ohio.—Application was made on Jan. 29 by this company for permission from the State Public Utilities Commission to issue \$140,000 common stock, increasing the capital from \$10,000 to \$150,000, and also \$700,000 5 per cent bonds, both to be sold at not less than 75 and the proceeds used in the construction of a railway between Chardon and Jefferson. C. H. Felton, 735 Williamson Building, Cleveland, secretary. [E. R. J., Nov. 1, '13.]

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—An extension will be built in the spring by this company for a line from New Castle to West Pittsburgh, Wampum, Ellwood City and Beaver Falls.

***Guelph, Ont.**—Plans are being considered by the Council and representatives from various municipalities to build an electric line from Berlin to New Dundee, Plattsville and Woodstock. Another line from Waterloo to Woolwich and Wellesley is being contemplated and one from Guelph to Owen Sound.

Hamilton (Ont.) Street Railway.—Plans are being made to lay new tracks on several of this company's lines in Hamilton. Work will be begun in the spring.

***London, Ont.**—Surveys are being made to build a line between London, St. Mary's and Stratford. The route which it is believed will be selected for the main line from London to Windsor is to join the London & Port Stanley Railway 9 miles south of London. From that point to Windsor, by way of Glencoe and Chatham, the distance is 104 miles. The intention is to reach Petrolia and Sarnia, by means of a branch line from Glencoe. These radials, together with that from St. Mary's, will enter London over the London & Port Stanley Railway and will have access to the city's terminals.

Niagara, Welland & Lake Erie Railway, Niagara Falls, Ont.—Construction will be begun within the next few months on a line from Welland to Port Colborne, along the shore of Lake Erie to Fort Erie, and thence along the Niagara River to Niagara Falls. C. J. Laughlin, vice-president. [E. R. J., June 21, '13.]

Bruce Peninsula Railway, Owen Sound, Ont.—Application is being made to the Canadian Parliament to incor-

porate this company to build a railway, to be operated by electricity, steam or other motive power, from Warton northerly to Tobermory, Bruce County, Ont., with branch lines. Power is also asked to operate steamboats and car ferries. E. C. Spearman, Owen Sound, Ont., is solicitor for the applicants.

Sarnia, Ont.—A new railway through Petrolia to Corunna with radials to Courtright, Bridges, Arkona and Sarnia is being projected by London and Petrolia capitalists, in conjunction with the Merchants' Mutual line and other lake package transportation companies. Rights-of-way have been secured in Moore. Hydro-Electric power will be used.

Sarnia (Ont.) Street Railway.—An extension in the southern section of Sarnia will be made by this company.

Toronto (Ont.) Railway.—This company is asked to consider plans to extend its line along Queen Street in Toronto.

Portland Railway, Light & Power Company, Portland, Ore.—Plans are being made to extend the Broadway line east on Broadway to East Thirty-third Street and north to Fremont Street in Portland. This company plans to build about 2 miles of new track during the year.

United Railways, Portland, Ore.—This company is asked to consider plans to extend its line from Wilkesboro, its present terminus, to Banks, a distance of 2 miles.

Lehigh Valley Transit Company, Allentown, Pa.—The new extension of the Liberty Bell Route from Allentown to Philadelphia is nearing completion. All but one of the new cut-offs are in use.

West Side Electric Street Railway, Charleroi, Pa.—About 5 miles of new track will be laid by this company during the year.

Hershey (Pa.) Transit Company.—It is planned to build 11 miles of new track between Hershey and Elizabethtown during the year.

South Fork-Portage Railway, Johnstown, Pa.—A 7.5 line will be built between South Fork and Portage during the year.

York (Pa.) Railways.—About 1 mile of new track will be built by this company during the year.

Montreal & Southern Counties Railway, Montreal, Que.—An extension to Youville Square in Montreal will soon be built.

Rhode Island Company, Providence, R. I.—During 1914 this company plans to build about 12 miles of new track in Providence and vicinity.

Chattanooga Railway & Light Company, Chattanooga, Tenn.—It is planned to build about 5 miles of new track to complete the line to Fort Oglethorpe during the year.

East Tennessee Traction Company, Nashville, Tenn.—Financial backing has been secured and contracts will be awarded in the near future by this company to build the 30-mile line between Chattanooga and Cleveland. J. W. Adams, Chattanooga, is interested. [E. R. J., Oct. 25, '13.]

Nashville (Tenn.) Traction Company.—Work has been begun by this company on its 34-mile line out of the city of Nashville. W. O. Parmer, Nashville, president. [E. R. J., Jan. 24, '14.]

Corpus Christi Street & Interurban Railway, Corpus Christi, Tex.—About 2 miles of new track will be built by this company during the year.

Houston (Tex.) Electric Company.—It is planned to build 6.18 miles of new track in Houston during the year.

San Antonio & Austin Interurban Railway, San Antonio, Tex.—This company, which plans to build a 27-mile electric railway to connect Austin, San Antonio, Kille, Manchaca, Hunter and New Braunfels, elected the following officers at the first annual stockholders' meeting: Vories P. Brown, president; W. B. Tuttle, vice-president; Samuel C. Bell, secretary, and Jesse D. Oppenheimer, treasurer. [E. R. J., Oct. 11, '13.]

Temple, Tex.—Preliminary arrangements are being made for the 30-mile electric railway to connect Temple, Lott and Marlin. No names have been made public of those interested. [E. R. J., Jan. 24, '14.]

Port Arthur (Tex.) Traction Company.—It is planned to build about 1 mile of new track in Port Arthur this year.

Texas City (Tex.) Street Railway.—During the year this company plans to build about 3 miles of new track in Texas City.

Uvalde & Leona Valley Interurban Railway, Uvalde, Tex.—About 22 miles of new track will be built by this company between Uvalde and Batesville during the year.

Ogden (Utah) Rapid Transit Company.—During the year this company plans to build between 2 and 3 miles of new track in Ogden and 65 miles of new interurban line from Bingham City to Logan, Utah, and from Smithfield, Utah, to Preston, Idaho.

Utah Light & Railway, Salt Lake City, Utah.—During the year this company plans to build 4.5 miles of new track from Holliday to Cattonwood Canyon and from Centerville to Farmington, 4 miles.

Virginia Railway & Power Company, Richmond, Va.—It is planned to build 1.306 miles of new track in Richmond during the year.

Yakima Valley Transportation Company, North Yakima, Wash.—During the year this company plans to build 12½ miles of new track between North Yakima and Moxee City, also an extension of its present interurban line for freight business.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—About 5 miles of new track will be constructed by this company during the year.

Seattle (Wash.) Municipal Railway.—The contract to furnish about 57,096 lb. of weatherproof feeder cable for this municipal line has been awarded by the Board of Public Works to the Pierson-Roeding Company.

Grafton (W. Va.) Traction Company.—Plans are being considered to build an extension from Grafton to Fairmont or Clarksburg.

Shenandoah Valley Railway, Martinsburg, W. Va.—Preliminary arrangements are being made by this company to build its electric line to connect Harrisonburg and Winchester, Harper's Ferry, W. Va., and Frederick, Md., via the Shenandoah Valley. A deed of trust, for a bond issue of \$5,000,000 in favor of the Safe Deposit & Trust Company, Baltimore, has been filed at Martinsburg. Power will be supplied by an enlargement of the plant of the Martinsburg Power Company. Clarence E. Martin, Martinsburg, is interested. [E. R. J., April 12, '13.]

Badger Railway & Light Company, Milwaukee, Wis.—This company has awarded a contract to the Raulf Company, Milwaukee, to build its 22-mile line from Lake Geneva to Whitewater. Work will soon be begun.

SHOPS AND BUILDINGS

Pacific Electric Railway, Los Angeles, Cal.—Plans are being made by this company to build two new passenger stations on its line between San Bernardino and Riverside. One station will be built at Mount Vernon Avenue and Colton Avenue in San Bernardino and the other at Colton Avenue and Center Street in Riverside.

Montreal (Que.) Tramways.—This company has acquired a block of land containing 411,200 sq. ft. on the Lachine Canal in Montreal on which it is proposed to build new carhouses. Work will be begun in the spring.

Dallas Consolidated Electric Street Railway, Dallas, Tex.—Among the improvements planned by this company in the near future will be extensions to its carhouses and repair shops in Dallas.

POWER HOUSES AND SUBSTATIONS

Brooklyn (N. Y.) Rapid Transit Company.—This company has placed an order with the General Electric Company for three 3000-kw rotary converters, nine 1100-kva air-blast transformers and switchboard apparatus to be installed at its substations in Brooklyn.

Mahoning & Shenango Railway & Light Company, Youngstown, Ohio.—This company has purchased a 500-kw, 600-volt rotary converter and switchboard from the General Electric Company.

Nashville (Tenn.) Traction Company.—Plans are being considered by this company to build a new power house in Nashville.

Manufactures and Supplies

ROLLING STOCK

Scranton (Pa.) Railway has issued specifications for ten passenger cars.

El Paso (Tex.) Electric Railway expects to purchase six closed 32-ft. 4-in. city cars.

Maryland Electric Railways, Baltimore, Md., is contemplating the purchase of new cars.

Saskatoon (Sask.) Municipal Railway expects to purchase an automobile and service wagon.

Manhattan Bridge Three-Cent Fare Line, Brooklyn, N. Y., is contemplating the purchase of six closed passenger cars.

Electric Short Line Railway, Minneapolis, Minn., has ordered a 50-ft. gas-electric motor car from the General Electric Company.

St. Louis Southwestern Railway, St. Louis, Mo., has ordered eight 70-ft. gas-electric motor cars from the General Electric Company.

London County Council Tramways, London, England, is receiving propositions on 150 trail cars, and on couplers for about 200 cars.

Jamestown, Westfield & Northwestern Railway, Jamestown, N. Y., has ordered two baggage cars from the Niles Car & Manufacturing Company.

Minnesota Northwestern Electric Railway, Thief River Falls, Minn., has ordered a 70-ft. gas-electric motor car from the General Electric Company.

Michigan Central Railroad, Detroit, Mich., has purchased for the Detroit River Tunnel four 120-ton, type 404, 600-volt electric locomotives from the General Electric Company.

Port Arthur (Ont.) Street Railway has ordered three double-end, single-truck, double-end control, pay-as-you-enter cars from the Preston Car & Coach Company, for delivery in seventy-five days.

Washington, Baltimore & Annapolis Electric Railroad, Baltimore, Md., has purchased three 51-ft. all-steel combination baggage and smoking interurban cars from the Cincinnati Car Company.

Cumberland & Westernport Electric Railway, Cumberland, Md., expects to purchase within a week four double-truck, double-end, combination baggage and passenger cars, with four-motor equipments.

Detroit United Railway, Detroit, Mich., owing to a misunderstanding was erroneously noted in the *ELECTRIC RAILWAY JOURNAL* of Jan. 24, 1913, as being in the market for fifty single-truck cars. This company is not contemplating the purchase of additional cars.

Niagara, St. Catharines & Toronto Railway, St. Catharines, Ont., has ordered six interurban cars from the Preston Car & Coach Company. Three of these will be equipped with baggage compartments and the other three will be entirely first class. Delivery is called for in April and May.

Companhia Linha Circular, Bahia, Brazil, is contemplating the purchase, through Guinle & Company, New York, N. Y., exporters, of thirty double-truck, ten-bench open cars, to be equipped with General Electric motors. The cars are expected to cost approximately \$3,000 per car, including equipment.

Michigan United Traction Company, Jackson, Mich., has purchased four all-steel interurban passenger cars from the St. Louis Car Company. This item corrects one which appeared in the *ELECTRIC RAILWAY JOURNAL* of Jan. 31, 1914, and which stated erroneously that the cars ordered by this railway company were ten city cars.

TRADE NOTES

International Steam Pump Company, New York, N. Y., has appointed Stuart H. Patterson a director. Mr. Patterson is associated with the Guaranty Trust Company.

Williams, Dunbar & Coleman, New York, N. Y., have formed a partnership and will continue the business heretofore conducted under the firm name of Williams, McConnell & Coleman, transacting a general brokerage and investment business in stocks and bonds, with particular attention to public utility securities.

Champion Recording Machine Company, Chicago, Ill., has received an order from the United Railways of St. Louis for transfer-issuing machines to be installed on all the cars of its Park Avenue line. This company has recently equipped a plant at Grand Rapids, Mich., where it is now manufacturing the transfer-issuing machines.

Hugh L. Cooper, New York, N. Y., announces that he has completed the water power development of the Mississippi River Power Company at Keokuk, Ia., and that he has opened offices at 101 Park Avenue, where he will engage in the practice of general hydraulic engineering, including the design, construction and management of hydroelectric power plants.

Jesse Coogan Engineering Company, Milwaukee, Wis., has opened up a large establishment in Salt Lake City, Utah, for designing, engineering and contracting for heating and ventilating apparatus exclusively. This company will continue its Milwaukee office in the Engineering Building at 133 Second Street, but Mr. Coogan will devote his entire attention to the Salt Lake City establishment.

Harold Almert, Chicago, Ill., consulting engineer, and for the past five years manager of the department of examinations and reports of H. M. Byllesby & Company, Chicago, Ill., has severed his connection with that firm to engage in consulting engineering practice, with offices in The Rookery, 209 South La Salle Street. Mr. Almert had just completed his twentieth year of active work in the organization, financing, design, construction, operation and management of public utilities.

W. R. Grace & Company, New York, N. Y., have received orders to export to La Paz, Bolivia, six center-entrance cars, built by The J. G. Brill Company and equipped with General Electric motor and controller equipment, and with track brakes in combination with hand and air brakes, necessitated by the 13 per cent grades of this city line. This export company has also recently shipped several double-truck interurban cars, built by The J. G. Brill Company and with General Electric equipment, to Lima, Peru, for use on an extension of the present service of that city.

Esterline Company, Indianapolis, Ind., has recently shipped seventy-five "Golden Glow" headlights to Detroit, Mich. These headlights have been specified for the 100 cars which are being built for the Geary Street Municipal Railway, San Francisco, Cal., by the Jewett Car Company and the six cars being built for the Ogden (Utah) Rapid Transit Company by the American Car Company. Other electric railways which have recently received headlights are the Nevada Water, Light & Traction Company, Pennsylvania & Ohio Railway, Clinton Street Railway, Tulsa Street Railway and Pine Bluff Company.

Duff Manufacturing Company, Pittsburgh, Pa., builder of lifting jacks, has opened an office in the People's Gas Building, Chicago, Ill. Backed by a Chicago warehouse, it will be in a position to give Western customers increased service and prompt deliveries of "Barrett" track and car jacks, Duff ball-bearing screw jacks, Duff-Bethlehem hydraulic jacks and the numerous variations of these main types of lifting jacks manufactured by it. The company has appointed G. W. Parsons district sales agent with offices in the Pioneer Building, St. Paul, Minn. By mutual agreement the Fairbanks-Morse Company has discontinued acting as exclusive steam railway agent for the above company.

Standard Paint Company, New York, N. Y., after a convention of its Eastern sales force and office staff, lasting for several days, held a banquet in New York on Dec. 29, 1913. Ralph L. Shainwold, president of the company, gave an address in which he related some interesting incidents of his early experience. Talks were also given by Herbert Abraham and H. A. Gillespie, assistant managers; J. H. Thomas, manager railroad department; C. E. Smith, manager paint and electrical department; H. A. Collins, Eastern sales manager; W. F. Fairbrother, manager advertising department, and others. The Western division of salesmen convened in Chicago on Jan. 3. At the banquet William F. Pitts, Western sales manager, made an address, the keynote of which was optimism. W. F. Fairbrother, manager advertising department, also addressed the meeting

on advertising and salesmanship. Speeches were also made by C. W. Dohm, superintendent Chicago Heights plant; Harry E. Smart, W. H. Mullen, and others.

ADVERTISING LITERATURE

Watson-Stillman Company, Aldene, N. J., has issued a catalog describing its heating, chilling and die presses.

Ohio Brass Company, Mansfield, Ohio, has issued a folder which describes diagrammatically its type C "No Wire Bend" trolley wire splicer.

Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa., has issued Catalog No. 18, describing various types of small electric motors and their applications.

National Tube Company, Pittsburgh, Pa., has issued Bulletin No. 18A describing its reamed and drifted pipe and containing information relative to the various accessories necessary for the drilling and pumping of wells.

Simplex Wire & Cable Company, Boston, Mass., has issued through Walter B. Snow, publicity engineer, a ninety-two-page booklet, which describes the wires and cables of this company for all voltages, a.c. and d.c., for inside, aerial, underground and submarine work. The manual contains in addition tables and data for the ready reference of electrical engineers, contractors and wiremen. An unusually complete index is supplied at the end.

Carnegie Steel Company, Pittsburgh, Pa., has issued the sixteenth edition of its well-known pocket book on structural steel shapes and other materials used in construction work. The book has been rewritten throughout and the matter contained in it has been brought up to date so that it is conformable to the present standard practice. Like the previous edition, which was dated in 1903, the book is profusely illustrated and the list of tables in the original edition has been extended, making the work as a whole of inestimable value to the engineer, the architect and the builder.

NEW PUBLICATIONS

Proceedings of the American Electric Railway Association and of Its Affiliated Associations for 1913. Published by the association, 29 West Thirty-ninth Street, New York. 6 vols.

A few sample volumes of the *Proceedings* were on exhibition at the midyear meeting of the American Electric Railway Association, and the regular edition is being sent to members this week. The entire set consists of six volumes, one for each of the existing associations and one which is called a "year book." This, a new feature this year, contains general information about the association of interest to the members, such as an outline of the work and scope of each, history of the organization, lists of committees, list of members, etc. Altogether there are 2375 pages in the six volumes.

Electrical and Lighting Engineering. By Henry W. Spang. New York, 1913. Paper, 77 pages.

In his preface the author states that "the object of this work is to explain why electric light, power and railway engineering is now in its most destructive state." Further on the reader will find that "our college professors and electricians are neither thinkers nor investigators." Still, they seem to be not much worse off than others who have achieved fame in the electrical industry, because in the opinion of the author "neither can the employees of the General Electric, Westinghouse nor other electric manufacturing companies who design and develop electrical apparatus be regarded as expert electrical engineers." The theories of the author, so far as we have been able to understand them from the pamphlet under review, are based upon the discovery of "the great aversion of low-potential electricity for a metallic circuit." This discovery explains many remarkable phenomena. For instance, to quote again from the book, "the great electric heat generated in the New York subway is mainly due to the aversion of the power currents to flow in metallic circuits, and especially while starting the long and heavy-laden trains." But enough has been said to indicate the unreliability of any conclusions based upon such postulates. The book does not contain the imprint of any publisher.