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REDUCTION OF THE PASS EVIL

A reform accomplished during the past ten years but not always realized by the public is a reduction in the "pass" evil. Steam railroads used to suffer from this tax on their resources to a greater extent perhaps than street railways, but the latter were subject to a great deal of petty graft of this kind. City, county and even state officials expected, if they did not actually ask for, annual passes on the local transportation lines, and to these requests were added those of local politicians, high and low, daily newspaper men and others who were thought to have, or claimed to have, the power to help or harass the railway. Even at the present day the idea that the common carriers ought to carry certain classes of individuals without charge is far too prevalent. Demands for free railway transportation are made in a great many cities for firemen, policemen, letter carriers and others, and the idea that the railways should be required to transport elected officials of the city or state without charge has not entirely disappeared. We are glad to learn in this connection that the Pennsylvania Railroad intends to secure the highest judicial determination of the right of the New Jersey Legislature to force it to carry specified officers of that State free of charge. The case will come in the form of a charge for the value of the transportation furnished under the present law, since records have been kept by the company of the extent to which these orders for transportation, issued by the Secretary of State, have been used. The action by the railway company seems to have come as a surprise in some quarters, although the Interstate Commerce Commission has always discountenanced the practice of issuing passes and only last week announced that it intends to consider how far the railroads dissipate their revenues by the issue of passes when it is considering complaints concerning their rates.

POLITICIANS AS GRAFTERS

It is not surprising to find that an evil so widespread and of such long standing as this should be difficult completely to eradicate. Nevertheless, it is somewhat of a coincidence to find in another report of the Interstate Commerce Commission just issued examples of the pressure to issue passes put by politicians upon common carriers in Montana, Colorado and Illinois. The cases in Montana and Illinois seem to involve a misuse on the part of the carriers of practices permitted to them by law, while in the New Jersey case mentioned above the practice was forced upon the companies by the State itself. In referring to the Illi-

nois case the commission makes public some correspondence which was alleged to have passed between the Chicago, Burlington & Quincy Railroad and a member of the Illinois Legislature. The name signed to the letter quoted below is that of a man who at that time was a member of the upper house of the Illinois Legislature and apparently chairman of what was then known as the Illinois Legislative Public Utilities Commission, a different body from the present Public Utilities Commission of Illinois. The letter in part follows: "I regret exceedingly to acknowledge receipt of your letter in which you refuse me annual transportation over your lines in Illinois. As I am chairman of the Public Utilities Commission, you can look for legislation that will work hardship to your company, and I wish to assure you when our commission gets through with you that you will find your road in the hands of a receiver." When the authenticity of this correspondence is so well attested that the commission "deems it a duty to make a record of the matter," it is easily conceivable that there may be many steam railroads and electric railways desirous of knowing how long they must furnish undeserved free transportation to public officials.

MERITS AND DEFECTS OF A. I. E. E. PROGRAM

The second midwinter convention of the American Institute of Electrical Engineers was held under the auspices of the electric power committee. This committee divided and subdivided the field among its sub-committees and the members of these sub-committees, all of whom had been carefully selected to represent the many specialties composing electric power engineering. The program was made up of numerous papers which, when assembled, were intended to produce a harmonious mosaic. The plan followed by the committee in making up the program has conspicuous merits and demerits, as shown by the result. It was systematic and hence, *per se*, was better than the hit-and-miss scheme sometimes followed when society programs are made up. The men selected to write papers are leaders in their respective lines and hence are in positions to detect the signs of the times. A thorough survey of the field, such as that planned, is sure to bring to the surface the significant aspects of important current tendencies. All of these facts are illustrated in the program, which brought out most instructive material in regard to outdoor substations, novelties in control apparatus and other topics. The demerits of the committee's plan are conspicuously these: The very attempt to cover a whole field sys-

tematically involves the reiteration of many statements of standard practice which are the stock in trade of the well-informed engineer. These statements were put into the papers in an obviously conscientious attempt to execute the commissions assigned. In some parts of the field covered there were really no conspicuous developments to report, and it would really have been better to have left these parts uncovered and to have concentrated for the time being on the more interesting and significant parts. We like the idea of a program systematically planned and realize that the primary purpose of this one was to stimulate discussion. We would urge, however, that discussion will be stimulated more by a few carefully selected, significant statements than by a mass of generalizations from which the important facts must be laboriously sifted. Experience proves that often the best discussion is provoked by seemingly insignificant but really important statements, sometimes not those directly in line with the speaker's main purpose.

REMARKABLE IMPROVEMENT IN CAR PAINTING

From time to time new ideas are advanced and new methods are devised that are radical departures from the beaten path of progress, yet they are so simple and so logical that one cannot but wonder why they were not conceived years before. This thought is especially applicable to the new method of reducing the time required in painting the cars of the Cincinnati Traction Company. By using a portable paint-drying oven, as described on another page in this issue, instead of permitting the paint to dry in the usual way, this company has reduced the time ordinarily required by 80 per cent. The delay in general adoption of this method by other companies cannot be attributed to the prohibitive expense of the plant necessary to accomplish the work; because the baking oven described cost only \$300. Moreover, the principle is not new because every painter knows that paint dries more quickly in summer than in winter, and he also knows that many an excellent job of varnishing has been spoiled by insects and dust particles.

The new process not only reduces the time required to paint a car, but at the same time it makes the finished job as nearly perfect as it is practicable to make it. This increased efficiency is remarkable when one considers how few improvements have been introduced in car painting since the old horse car days. Indeed, when the manufacturers introduced the six-day process it represented an epoch, and now to decrease this time more than 80 per cent is certainly a revolutionary act in the history of car painting.

The process used by the Cincinnati Traction Company, it should be said, is by no means the same as that introduced a year ago by the Hudson & Manhattan Railroad because in the former the ordinary air-drying paints and varnishes are used in the customary manner, the portable oven being used merely to accelerate the rate of drying by keeping the car in an atmosphere of hot, dry air.

OUTDOOR SUBSTATIONS

One of the most interesting and timely subjects discussed at the second annual midwinter convention of the American Institute of Electrical Engineers was the outdoor substation. It is true that there is nothing radically new or unique in such substations, because electrical transforming apparatus of the a.c. type, has been placed out of doors for nearly thirty years. In lighting systems, also, the larger part of the customers are served from outdoor transformers, usually installed, with their fuse cut-outs, on poles. But the papers at the A. I. E. E. meeting, which are abstracted in this issue, describe the great improvements made during the past two or three years in placing the larger apparatus out of doors.

Railway substations have usually been of the indoor type because buildings are necessary to protect rotary converters and motor-generator sets, as well as the low-tension switches and the measuring instruments. With so much of the equipment under cover it was quite natural for the railway company to place the transformers and the high-tension switches under the same roof, as they do not increase the size of the building greatly when they are connected to transmission lines of moderate voltage, say up to 33,000. There are advantages, also, in having everything about the plant within easy reach and convenient for inspection.

The change in design of substation which is now taking place and which is sure to extend in railway work is due to the increase in transmission line voltage. One hundred thousand volts for a transmission line emf does not involve any serious difficulties now, and 150,000 volts may soon be in considerable use. Apparatus for use on such voltages is bulky. The conductors must be widely separated, and switches, lightning arresters, choke coils, buses, etc., all take up a great deal of space. While, in moderate-voltage plants, this apparatus can be tucked away in out-of-the-way corners, in high-voltage plants the same equipment may easily require more space than the rotary converters and switchboards. Where land is cheap, therefore, it would seem to be a rational procedure for the constructing engineer to place out of doors every part of the equipment which can be made weatherproof without too great expense.

It is true that the outdoor substation movement is being pushed more at present by the power transmission companies. For their purposes many customers can be supplied with power at reasonable rates through an outdoor substation when an indoor one would be out of the question. With this condition impelling the manufacturing companies to produce satisfactory outdoor transformers, switches, etc., the electric railway companies can continue the work, whereas it is quite unlikely that they alone would have been in a position to start it, not having so much to gain. At present, however, the saving, even for railway plants, is apt to be considerable.

While this development is going on, it must be pushed still farther, namely, to the power plant itself. The

machinery section of a modern power house is becoming proportionately smaller year by year as compared with the transformer and switching sections. The cost of power houses is large compared with that of substations, and a proportional saving aggregates a much greater sum of money. If 10 per cent in the cost of a power plant can be saved by placing all possible apparatus outside the building, the economics of the situation dictate that it should be so placed. In all of this we are assuming that the engineering problems of the outdoor substation are solved or sure to be solved in the near future. The opinion of the speakers at the A. I. E. E. meeting indicates that this is the case, and these speakers are well qualified to express such an opinion.

EFFECT OF BIENNIAL BITUMINOUS COAL STRIKE

Biennially the bituminous coal consumers of the Central States district must store a sufficient quantity of coal to tide them over the period when the operators and miners are negotiating a new wage contract. The present contract expires on April 1 of this year, so that those desiring surplus coal for storage purposes must purchase it in advance of that date. In case the miner and the coal consumer are able accurately to anticipate the time required to complete these negotiations, the one does not suffer, because he has worked constantly for the few months prior to April 1 to supply the surplus quantity of fuel, but the latter, unless he is properly prepared to store surplus coal, will suffer a loss due to the slacking. A general survey of the Central States district demonstrates, all too plainly, the unpreparedness of most consumers. Most of them are storing coal in the open on unused property, instead of in subaqueous coal storage pits, which would reduce slacking to a minimum.

Many central station and railway generating station operators have seen the advantage of the submerged coal storage pits, not only to tide them over these strike periods but to make it possible to purchase and store large quantities of fuel when the market is low or the quality of the fuel is better for the price than can be obtained at any other time. On the other hand, many operators have not provided themselves with storage pits, either because they have failed to realize their economic value or because they do not realize the value of a uniform fuel cost regardless of market conditions or these biennial strike periods.

If the negotiations last longer this year than is anticipated, the consumer must purchase higher-priced coal from fields unaffected by the strike, the miner must suffer because he has spent his surplus earnings, and the operator will lose because the fuel he should be furnishing is purchased from his more fortunate competitors. It is unfortunate that those engaged in coal mining, employers and employees, cannot settle their disputes in some other way. But as there appears to be no immediate relief, the bituminous coal consumer should so prepare himself that fuel waste through open storage is reduced to a minimum.

JOINT POLE USE IN PRACTICE

At the meeting of the joint committee on the joint use of poles, held at the midyear conference of the American Electric Railway Association, Chairman Harvie reported that several points had been raised with regard to certain clauses in the proposed specification. Among the matters which were suggested to the committee for consideration was the substitution of a cross-arm rental system for the proposed attachment rental system. This change was suggested by the Virginia Railway & Power Company, and it is based upon the company's experience with both methods. The company believes that the diversity in the size and character of the attachments makes it impossible justly to charge a rental for them on a purely unit basis and that even if some compromise average price were agreed upon the bookkeeping necessarily would be more complicated than if the rentals were figured on a simple cross-arm basis. By virtue of an agreement between the Virginia Railway & Power Company and the city of Richmond to arbitrate the matter of joint use of poles, an award was recently made by the arbitrator selected by both parties, a judge of one of the city courts and formerly chairman of the State Corporation Commission. This award was to the effect that an annual rental of \$1 should entitle the licensee to the use of one pole for the space of one standard eight-pin cross-arm not to exceed 10 ft. in length and that the cross-arm and attachment should not occupy more than 26 in. of the pole. The award also states that additional space should be provided for at the rate of 40 cents for each 13 in., and additional cross-arms at the rate of 80 cents a year. This award, which was acquiesced in by the city without objection, is considered by the railway company as important in view of the experience of the arbitrator in such matters.

Regardless of the rental rates, which must always be a local matter, it is evident that the bookkeeping of cross-arm charges is simplicity itself. From an engineering standpoint also, it is far better to work with the agreed minimum spacing between cross-arms than to face the risk of crowding on one arm a lot of wires which bear circuits of different characters. Another objection to the attachment basis is the difficulty of checking the installation of thousands of parts. The executives of the companies at interest may make an agreement in perfect good faith, but it does not follow that the linemen will adhere absolutely to the conditions of the agreement. The gang will naturally take the easiest way when putting in connections, provided the variations from the practice prescribed are not too glaring. It is practically impossible for a company to require line inspectors to climb every pole to look for improperly placed and possibly dangerous fixtures. But any disobedience to joint pole agreements would be quickly detected if each user was rigorously limited to certain cross-arms rather than to parts of cross-arms.

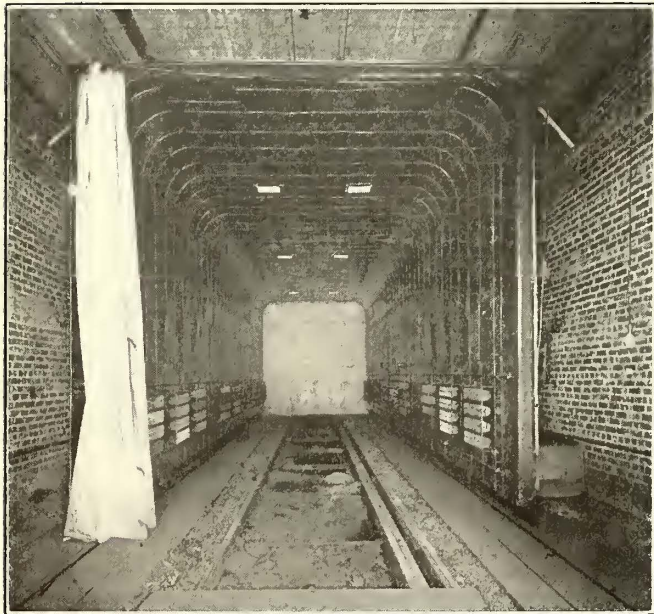
Several other points could be urged in favor of the cross-arm basis, but those noted serve to show that the method is simple and practicable.

Expediting Car Painting by Use of Portable Drying Oven

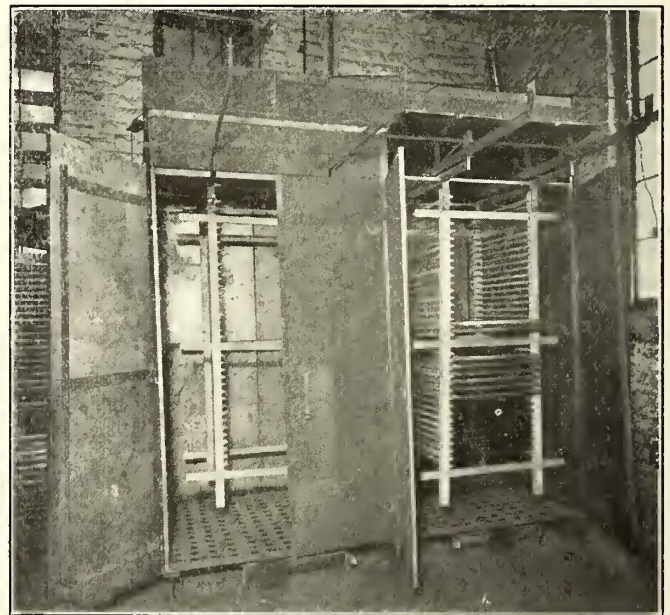
Material Economies Have Been Made Possible by the Successful Introduction of This New Method in the Shops of the Cincinnati Traction Company—The Oven Is Used with Ordinary Air-Drying Paints and Varnishes

The mechanical department of the Cincinnati Traction Company, Cincinnati, Ohio, no doubt taking advantage of the suggestion offered by the comparatively recent introduction of baking enamel for painting cars, has now adopted the principle of the drying oven, but is using it in connection with ordinary paint and varnish of the air-drying type. The oven was built at a small first cost, and the painting and drying of a car, which formerly required 186 hours, now requires but thirty-three hours. Moreover, this new method of hastening the drying process has made it possible to complete what is known as a touch-up and varnish job in twenty-four hours. This remarkable saving in time not

and 50 ft. in length. It is open at both ends and is lined and covered with wood and tin applied on a wooden frame, the ends being closed by canvas curtains. The oven is made portable by mounting it on six flanged wheels which run on two T-rails laid on a 12-ft. gage and spaced at equal distances outside the track rails in the paint shop. Temperatures up to 135 deg. are maintained by twenty ordinary electric heaters mounted on the walls of the oven and connected in circuits of 5 amp each. All wiring is installed in ½-in. conduit. The circuits are controlled by a thermostat, which may be adjusted for three temperatures: 135 deg., 120 deg. or 115 deg. This instrument is placed in



Cincinnati Traction Company—Interior of Car Paint-Baking Oven



Cincinnati Traction Company—Sash and Door Paint-Baking Oven

only reduces the quantity of rolling stock required to operate the system but permits also a reduction in the paint-shop force as well as the shop floor space required to accomplish the work.

An important feature included in this departure from ordinary car painting is the use of a portable instead of a stationary oven. The portable oven was adopted principally because it could be moved about the shop, thus making unnecessary the switching of cars. In fact, a car need not be moved from the time it is set for the cleaning and priming coat until the last coat of varnish has dried and the car is ready to be returned to service. While it might appear impossible to construct an oven light enough to be moved about the shop readily, the mechanical department of the Cincinnati Traction Company has constructed one which is giving satisfactory service and at the same time may be moved by two men. The sashes and doors of the cars, however, are baked in a separate stationary oven.

The oven is a rectangular housing with interior clearances of 13 ft. 8 in. in height, 11 ft. 8 in. in width

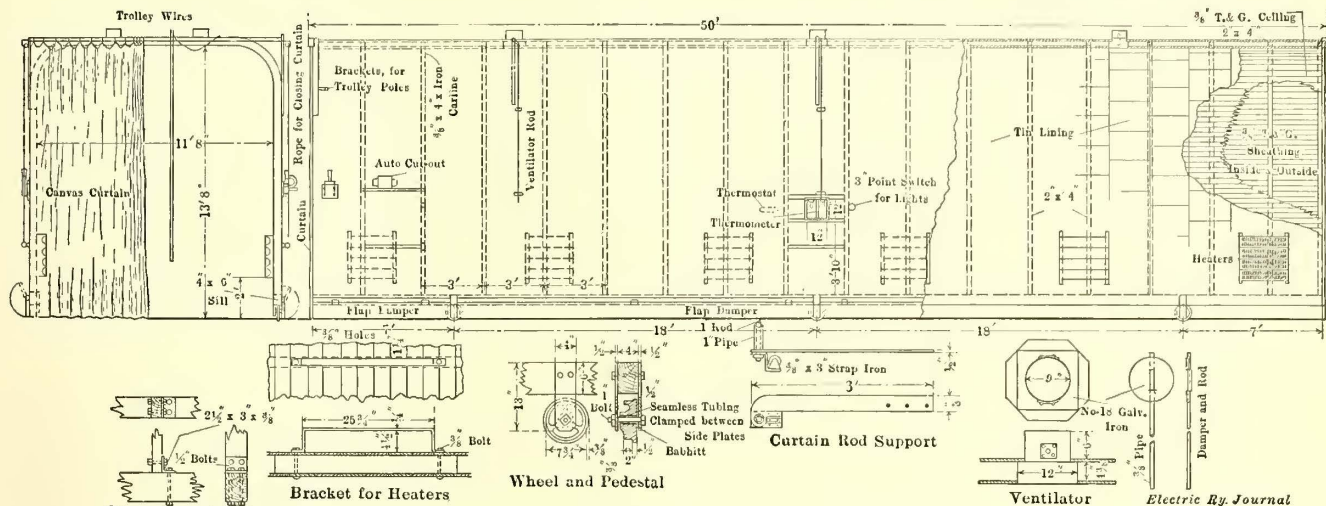
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the oven, just inside a small double-glass window, at the center of one side. The snap switches that open and close the heater circuits are mounted on each side of the oven wall beside this window. Energy is supplied to the heaters through a pole and flexible cord connection to the trolley wire, the main circuit passing through a two-pole knife switch before it reaches the controller switch in the thermostat circuit. An auxiliary circuit with individual control permits two heaters to be kept in service during periods of low outside temperature when the oven is not being used to serve in conjunction with the heating system installed in the paint shop. The detailed construction of the oven includes a frame built of 2-in. x 4-in. studding spaced on 3-ft. centers, set on 4-in. x 6-in. sills in the side walls. The studs are bolted to 4-in. x ¾-in. iron carlines at the wall plate level to form the arched roof. The frame is stiffened lengthwise by two 2-in. x 4-in. diagonals which extend from the lower corner at one end to the center of each wall plate, and it is sheathed and lined with ¾-in. tongued-and-grooved pine, an ordinary tin covering be-

ing applied over this in the same manner as it is on a tin-clad door made in accordance with the underwriters' specification.

Ventilation, which is very essential in hastening the drying process as well as in making the finished job equal to that obtained by the ordinary drying method, is accomplished by installing 9-in. flaps at the base of the oven sides together with six 9-in. openings in the ceiling. The latter are regulated by transom lifts connected to ordinary dampers. The flaps at the base are operated by hand and when in the closed position cover

articles or insects have been embedded in the paint or varnish during the drying period. The oven also insures that every coat is thoroughly hardened before the next one is applied, because the time required is uniform regardless of the atmospheric conditions. Moreover, the fact that a car is never moved from the time it is set in the shop for painting until it is finished reduces the lost motion in the paint shop to a minimum. It has been found by an actual check that the current consumption required for drying during the summer months is only 70 amp at 550 volts. At the time that

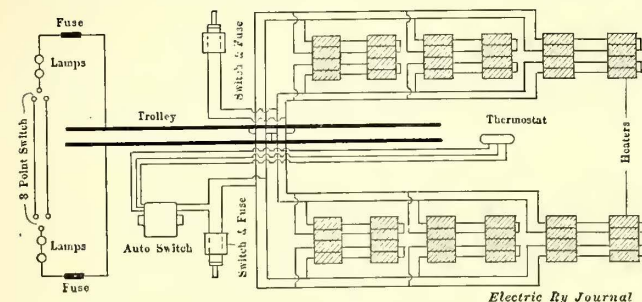


Cincinnati Traction Company—Details of Paint-Baking Oven for Cars

the opening between the base of the oven and the paint shop floor. They are made of 10-in. x 7/8-in. pine boards hinged to the base of the oven sides and arranged in four sections. The curtains which inclose the ends of the oven are heavy duck, arranged on rings to slide on a rod. A rope attached to one of the rings passes over pulleys at each side of the oven and permits the curtain to be pulled across the opening. Three grab handles, mounted on each side of the oven, one at each end and one at the center, are used in moving the oven about the shop. The special car wheels on which the oven is supported are 7 3/4 in. in diameter with 3/8-in. flanges and

this article was written the company had not had an opportunity to obtain similar data for extremely cold weather, but, inasmuch as the inside temperature variations for the year are slight, the current consumption will not be much more. In either case, however, the cost of current is largely offset by the other advantages gained by the introduction of the new process.

The following is the car paint-baking schedule for a complete job of painting, and from this the time required for a touch-up and re-varnish job may be ascertained:



Cincinnati Traction Company—Wiring Diagram of Oven

Paint	Air Drying Hours	Oven Drying Hours	Degrees of Heat
First coat primer	48	5	135
Second coat primer	12	3	120
Glaze	8	3	115
Rough stuff	12	3	115
Second coat rough stuff	12	3	115
Drying moisture from rough stuff	10	1	115
Stripe:			
First coat yellow	6	1	115
Second coat yellow	6	1	115
Color varnish	24	3	120
First coat varnish	24	5	120
Second coat varnish	24	5	120
Total	186	33	

SASH AND DOOR OVEN

2-in. treads. These are mounted on a 1-in. bolt between two sections of bar iron, 4 in. x 13 in. x 1/2 in. thick, which are securely bolted to the 4-in. x 6-in. sills which form the base of the oven. To reduce the bearing friction in the wheels to a minimum, the bolts are provided with seamless tubing sleeves and the wheels are babbitt-lined.

OPERATING RESULTS

In actual service the baking oven has been found to produce a much better quality of finish than that obtained when the paint is dried in the ordinary manner. Not only is less time required for the work but the finished job is free from hair cracks, and no dust par-

in conjunction with the baking oven for car bodies the Cincinnati Traction Company also has built another for sash and door varnishing. This is installed permanently in the paint shop building. It consists of a sheet-metal housing 10 ft. long by 8 ft. 1 in. high by 5 ft. wide, inside dimensions, and is shown in one of the illustrations. The oven is built with a lean-to roof and a perforated floor supported on 7-in. I-beams. It is inclosed with 1/16-in. sheet iron riveted together and insulated on the outside by 3/4-in. pressed cork. The sides are stiffened by turning the laps of the sheet metal in at right angles to the oven walls. The brackets supporting the runways and rack are made of 1/4-in. bar iron. Electric heaters are installed under the floor in the space between the beams, and one side of the

oven is equipped with four swinging doors. The interior is filled with adjustable wooden racks swung from overhead runways which project 4 ft. beyond the front of the oven. When the four doors are open these racks may be pulled from the interior and the dried sashes removed and replaced with others freshly varnished. These racks are so supported on the oven runways that the vertical members may be adjusted both longitudinally and transversely to accommodate different sizes of sash.

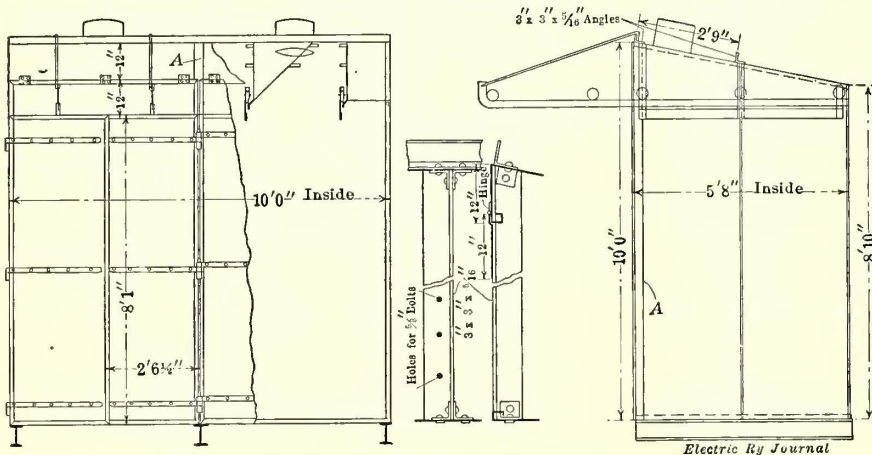
Ventilation is as essential to the proper finishing of sashes and doors as car bodies, and it is provided by two 12-in. ventilators installed in the top and the perforations in the floor. The ventilators are opened and closed by dampers connected to transom lifts. The air enters the oven at the floor level and passes up through the electric heaters and the perforations in the floor. The baking schedule for the sash and door oven is three hours for rubbing varnish and six hours for finishing varnish, making a total of nine hours in all for either

required by the railroads, and it is the province of the latter to determine which are best in any case.

The speaker gave an interesting demonstration of the properties of different lenses by mounting a group of three, representing the most important types, optical, wide-angle and Spreadlite, upon a rotating table with standard "long-time" burners behind them. The same apparatus, with the lenses removed, was used to demonstrate the different standards and possible colors of several tints used for signal lenses.

The discussion following the lecture brought out the situation regarding light signals for daylight use on electrified steam roads. The New Haven road has had difficulty with the semaphore signals in the electrified zone, as the overhead structure interferes with the lines of sight. As a result its signal engineers are studying light signals as a possible means of assistance in eliminating this trouble and further insuring reliability. The Pennsylvania Railroad is also considering the same type of signal for the electric zone. The

Brooklyn Rapid Transit Company has adopted these signals for the new construction now under way. In reply to questions as to the details of lenses for light signals for daylight use, Dr. Churchill refused to express any opinion in view of the newness of the development. He stated that lenses of large size, possibly 10-in., will undoubtedly be required, and probably modifications of the present standard colors may be necessary. The problems involved in designing lenses for this purpose are complicated by the variations in sunlight from hour to hour in intensity, quality and direction. In another year the speaker hopes to be able to give the results



Cincinnati Traction Company—Details of Oven

metal or wood sashes. The oven temperature for metal sashes is 170 deg. and 130 deg. for wood.

GLASS FOR SIGNAL LENSES

On Friday, Feb. 20, Dr. William Churchill addressed the New York Railroad Club on the subject of signal glass, or more properly signal lenses. He outlined the optical principles involved in the development of signal lenses from the days of the old "bull's-eye" lantern to the present, when the highly efficient "optical" lens is standard. At present more than a hundred designs of signal lenses are available, differing in focal length, size and type. There are two main classes of lens, the ordinary round form with concentric rings, with corrugations inside or outside, and the "Fresnel," with horizontal corrugation suited more particularly for ship lights. The manufacture of glass for signal lenses requires unusual care, as the color is very sensitive to chemical composition, and the refractive index must be as designed in magnitude and uniformity.

The matter of "spread" of beam is one on which unanimity of opinion is desired, as it is possible to produce high candle power and small spread or the reverse, or any compromise design can be made. Small spread gives great carrying power but small range, and on sharp railroad curves the visible range may not be sufficient to give the desired protection. The latest development consists in the addition of vertical corrugations on the lens face, resulting in a spreading out of the rays in a horizontal plane. The name "Spreadlite" has been given to this type. The lens manufacturers can now provide lenses of practically any characteristics

of a scientific study of the whole matter.

An interesting and natural feature of the discussion was the respect paid by the practical engineers and business men for the contributions made to the art by analytical and experimental study of the subject. As Dr. Churchill pointed out, the lamp and the lens manufacturers, with the aid of the signal association and its members, have co-operated to bring about the present satisfactory status of this branch of railway signal engineering.

ELECTRIFICATION PLANS IN BOMBAY

A report on the proposed electrification of the Bombay suburban railways is now under consideration by the boards of the Great Indian Peninsula and the Bombay, Baroda and Central India Railway Companies and the Bombay Port Trust.

The report expresses the opinion that electrification would be remunerative, and advantageous for the public. The suburban traffic must continue to increase, and it is estimated that by the time the work of electrification can be completed the increase over the present figures will be 79 per cent. The speed will be 20 per cent higher than that of steam-driven trains. The cost of equipping all the suburban and Port Trust lines on the overhead d.c. system is estimated at \$3,803,333, while the gain by electrification is put at \$341,426 per annum, equivalent to 8.98 per cent on the capital expenditure. It is proposed to use trains of three coaches, coupled permanently, and with motor equipment in one coach. It is suggested that a large power station be erected at Thana.

Midwinter Convention of the American Institute of Electrical Engineers

The Three-Day Convention, Held Feb. 25 to 27, Was Under the Auspices of the Electric Power Committee—The Topics Discussed Included Outdoor Substations, Transmission Lines, Reactances in Power Plants, Distribution, Etc.—Abstracts Are Published of the Principal Papers of Railway Interest Presented During the First Two Days

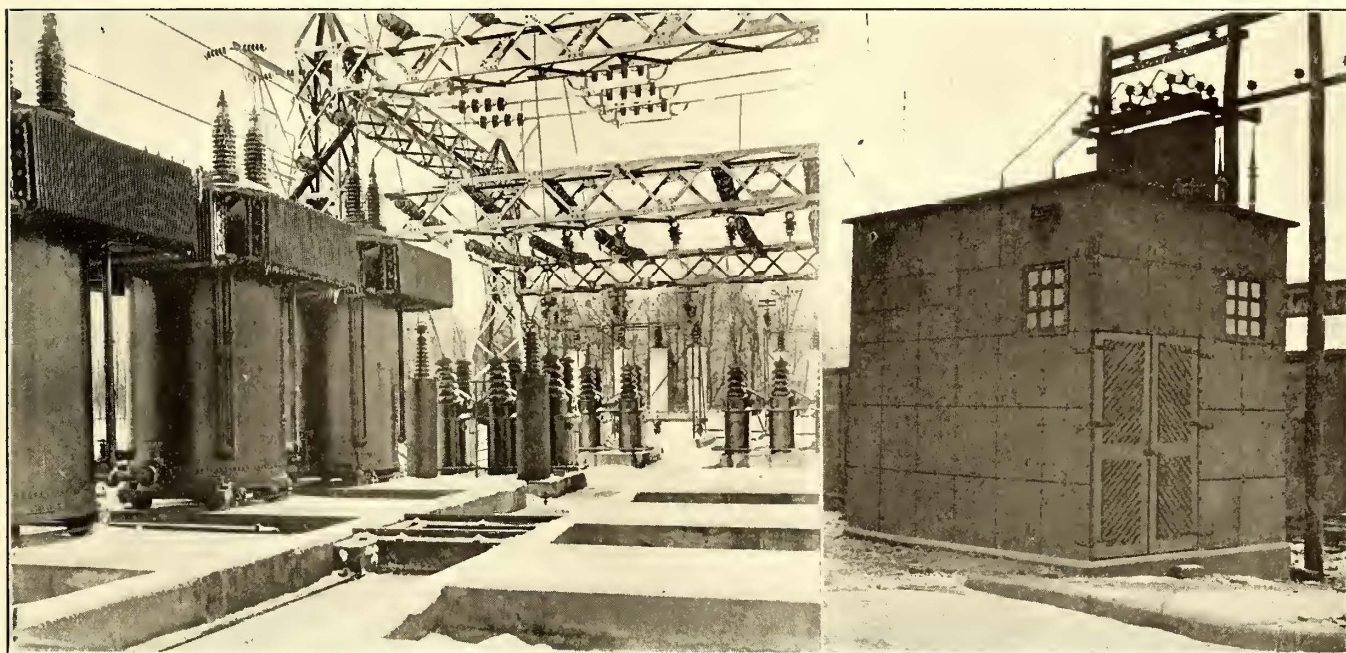
The second annual midwinter meeting of the American Institute of Electrical Engineers was held at the Engineering Societies Building from Feb. 25 to Feb. 27. The convention was under the auspices of the electric power committee, which comprises sub-committees devoted to the following specialties: Power stations, D. C. Jackson, chairman; power generation, H. W. Buck, chairman; protective apparatus, C. P. Steinmetz, chairman; transmission, P. W. Sothman, chairman; distribution, P. Junkersfeld, chairman; economics, William McClellan, chairman, and engineering data, P. H. Thomas, chairman. Each of the six technical sessions was assigned to one or more

for doing this on a large scale presented itself. P. H. Thomas and H. Pender, chairmen respectively of the committees on engineering data and the A. I. E. E. handbook, have this important problem in hand.

POWER STATION SESSION

PROTECTIVE REACTANCES IN LARGER POWER STATIONS

Under this title James Lyman, A. M. Rossman and L. L. Perry give the results of a theoretical analysis of the results of locating reactance coils in genera-



Substations—Chicopee Substation After Sleet Storm—Simple Concrete Slab Substation

of the sub-committees and sixteen papers and reports were presented.

In opening the convention President C. O. Mailloux referred to the beneficial results of last year's meeting in the rating of electrical machinery. The present administration hopes to secure equally satisfactory results through the new arrangement of committees in operation this year. He then turned the meeting over to D. B. Rushmore, who outlined, with the aid of numerous lantern slides, the recent developments in all important fields of electrical applications.

The rest of the preliminary session was taken up with a discussion of the feasibility of the Institute's publishing reference data, either in loose-leaf form, in bound volumes of papers on special subjects or in compilations of the handbook order. The consensus of opinion seemed to be in favor of some assistance from the Institute in reducing the amount of labor required of the members in looking up data on a given topic. At the same time no feasible scheme

tor leads, between busbar sections and in feeders. The concentration of large generating capacity in alternators and power plants may result in very destructive effects from short-circuits. Such accidents as feeder grounds, failure of current transformers, hanging of arcs across fuses and throwing in generators out of phase have resulted in the destruction of generator and transformer windings, oil switches and even masonry. The means for preventing severe disruptive effects is to limit the short-circuit currents by means of reactance (a) in generator leads, (b) in tie lines between power stations, (c) between different sections of station busbars, (d) in station busbars between adjacent generator connections, (e) combinations of any of the above, and (f) in feeder circuits.

Generators having inherent reactance are to some extent automatically protected and this protection can be increased by adding external reactance. There are disadvantages in this, however, in that the coils

must be large enough to carry the entire generator output and that a short-circuit on any section of the busbars causes the same drop in voltage at all points in them. The important function of such coils is, therefore, mainly to protect the generator windings.

Advantages	Disadvantages
Lower first cost	Repairs
Ease of extensions	Operating risks
Reduction of fire hazard	Danger to public
Simplicity of layout	Appearance

TABLE SHOWING EFFECTS OF DIFFERENT ARRANGEMENTS OF REACTANCE COILS

System of Arranging Reactances	Maximum Short Circuit Current Possible on Busbars; Based on Normal Rated Current of One Generator Equals 1	Number of Sets of Three-Phase Reactance Units Required	Per Cent Reactance Volts of Each Set of Coils Based on Normal Rated Current of One Generator	Current Carrying Capacity of Each Reactance; Based on Normal Rated Current of One Generator Equals 1	Total per Cent Kva Rating of Reactance Based on Rating of One Generator Equals 100 per Cent	Total Kva Reactance Assuming Nine 25,000 Kva Generators	Maximum Percentage Voltage Difference Along Busbars
Reactances in generator leads	30	9	20	1	180	45,000	0
Reactances in busbars—straight bus							
Between groups of 3 generators per group (single bus)	30	2	8	2	8	8	Not computed
Between groups of 3 generators per group (double bus)	30	4	8	1	8	8	
Between groups of 2 generators per group (single bus) f 10	30	4	16	2.4	368	92,000	
Between groups of 2 generators per group (double bus) generators	30	8	32	1.2	368	92,000	
Between adjacent generators (single bus)	30	8	5	2.22	197	49,250	
Between adjacent generators (double bus)	30	16	10	1.11	197	49,250	
Reactances in busbars, between adjacent generators—ring bus							
Generator connections direct (single bus)	30	9	5	1.11	55.5	13,888	9.9
Generator connections direct (double bus)	30	18	10	.555	55.5	13,888	9.9
Generator connections crossed (single bus)	30	9	5	.666	20	5,000	4.2
Generator connections crossed (double bus)	30	18	10	.333	20	5,000	4.2
Ring and transfer bus, reactances in ring bus only, generator connections direct	30.8	9	12	.555	33.3	8,333	5

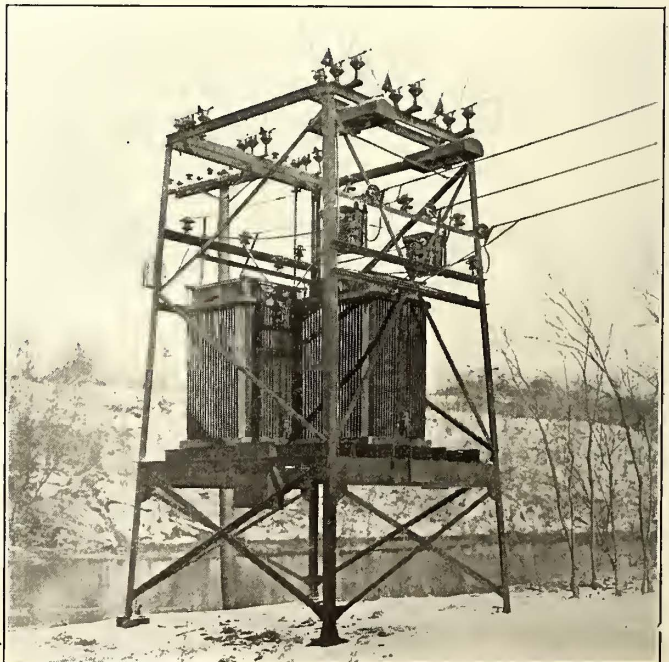
Sectionalizing reactances, in tie lines and between large and small busbar sections, are more useful than the above and need not be so large. These, as well as the other reactances, cause voltage drop and their magnitude is a compromise between the conflicting requirements of good voltage regulation, on the one hand, and protection against short-circuit effects, on the other.

The authors consider six different typical busbar arrangements and analyze the effects of the application of reactance coils in each. The cases are (a) single straight bus, (b) double straight bus, (c) single ring bus, (d) double ring bus, (e) single straight bus and direct feed and (f) single ring and single straight bus. To make their study definite they assume a station containing nine 25,000-kva generators having 10 per cent internal reactance. They then proceed to calculate the short-circuit current, voltage variation and power factor for a number of different arrangements of reactance coils of varying percentages of reactance. The results are presented in the form of curves and the method of calculation is appended. They include in their study the short-circuiting of reactances to eliminate voltage drop when protection is not needed. The accompanying table shows the general results that were arrived at by means of the calculations.

OUTDOOR SUBSTATIONS

The importance of the outdoor substation at the present time is indicated by the fact that four out of the six papers presented in the power station section were devoted to this subject. Alexander Macomber sums up in a brief and practical manner the salient general features of the development of this type of substation which is due to the demand for power in moderately small quantities from high-tension transmission lines. He summarizes the advantages and disadvantages of the outdoor substation in the following manner:

As the table indicates, the primary reason for the use of these substations is low cost. Used necessarily first for the purpose indicated above, their use is extending to other fields. Even where all of the apparatus cannot be placed outdoors, part of it can be so located, and whether it will pay to do so in a given case depends upon the comparative costs of



Substations—Typical 750-kva Outdoor Substation

erecting buildings and of constructing transformers, switches and lightning arresters to withstand cold and dampness. Where attendance is required in the substation some building is necessary and in other cases it may pay to put part of the plant indoors.

The question which naturally interests the prospective builder of a substation is as to the practicability of operating transformers, and protective and control equipment out of doors. Mr. Macomber claimed that all such apparatus can be constructed so to operate in a satisfactory manner. The electrolytic lightning arrester will function properly in absorbing lightning disturbance and surges at low temperature. Fortunately the most serious disturbances

The discussion was continued by L. H. Fullerton, who took up more particularly the design and construction of substations for operation on voltages up to 20,000. A distinction is made between those fed from the regular distribution systems and those fed from transmission systems. He took up various types of substation from the simplest, comprising a small transformer mounted upon a pole, to more elaborate ones in which complicated switching and pro-



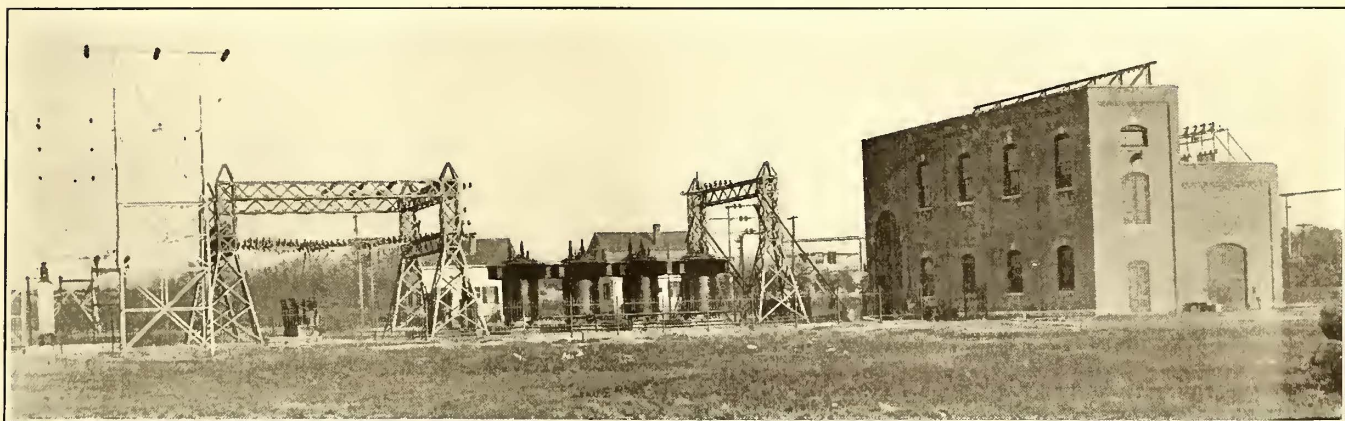
Substations—Indoor-Outdoor Substation at Agawam—Framework for Bus Structure

do not occur, as a rule, in winter. Outdoor transformers are beyond the experimental stage, there being approximately 300,000 kva in aggregate capacity either in use now or in process of installation. Both self-cooled and water-cooled types are satisfactory, but certain precautions are required with them to prevent freezing of oil and water. The use of oils having low freezing points is desirable and the natural heat from the windings and cores can be supplemented by that from special coils installed in the tops of the cases. Air-blast transformers have not been used much as yet, but there should be a field for them as the troubles incident to low temperature are absent, but provision must be made to prevent the entrance of moisture. Outdoor switching apparatus

protective apparatus is employed. In all cases, however, the element of economy in construction is kept clearly in mind and no unnecessary elaboration is recommended.

COMPARISON OF OUTDOOR AND INDOOR SUBSTATIONS

In comparing outdoor and indoor substations, the author points out the following advantages of the outdoor type; (1) less cost for making installation, (2) usual greater accessibility for company's employees in case of trouble, (3) less difficulty in connecting to company's lines, (4) absence of requirement of transformer vault and (5) better ventilation. On the other hand, indoor installations are superior in the following particulars: (1) Apparatus is more accessible for



Substations—Indoor-Outdoor Substation at Chicopee

is well developed and can be operated even in severe sleet and wind storms. The more delicate parts can be enclosed.

The author discusses the application of the outdoor substation (a) for small isolated loads, (b) for large capacity loads and, (c) for apparatus auxiliary to large central stations. He concludes that the experience of the few years past shows no serious operating difficulties and that the same ideas may be applied to central stations with good results.

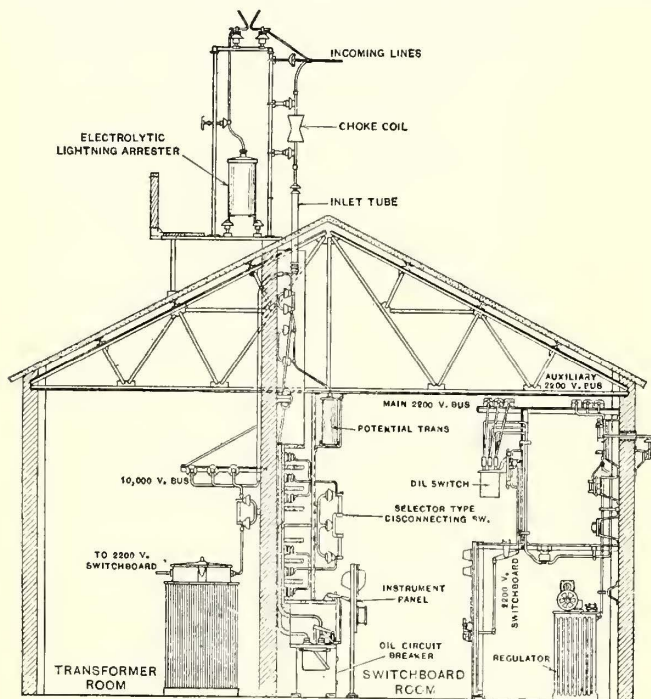
inspection or repairs, (2) there is less danger of unauthorized persons interfering with it, (3) customers have control of the installation on the primary side, by means of oil switches, if desired, and (4) apparatus is protected from weather. This comparison is made for small substations in which power is taken from the distribution systems. The same arguments apply still more forcibly in the case of power taken from transmission lines. Mr. Fullerton does not consider high-tension outdoor switching apparatus very satis-

factory. He points out that, in company substations, the field for the outdoor installations seems to be with the small town where the load can be picked up along the route of the transmission system without considerable line extension.

Where large municipalities are to be supplied with power, it is usually desirable to install emergency service which requires more or less high-tension switching, and an indoor substation is usually desirable.

USES OF CONCRETE IN SUBSTATION CONSTRUCTION

Mr. Fullerton's paper was well illustrated with photographs of typical substations of various types and with diagrams showing approved layouts of equipment. He recommended the use of concrete slabs for the construction of small and moderate-sized substations, as these slabs can be molded in the shop and erected with great rapidity. He describes a method for constructing concrete cells, busbars and switches. The usual method of building these cell structures is by erecting forms and pouring the concrete, using



Substations—Typical Substation Arrangement

reinforcing rods where necessary. Mr. Fullerton has found difficulty in securing a uniform and smooth job by this method and has digressed by building expanded-metal framework, plastering the concrete body upon it. The thickest portions are plastered three inches thick. The scratch coat contains a small quantity of hair, the remaining coats being pure cement and sand. The finishing coat is of keen cement, which gives a hard, white, smooth surface. In the finishing coat, a small quantity of lime is used to make the cement work smoother. In the construction of the expanded-metal framework, angles are used in the heavy barriers and small channels are riveted or tied to these, the expanded metal being wired to this skeleton framework.

TWO RECENT SEMI-OUTDOOR SUBSTATIONS

Under the title "Outdoor Substations in New England," Fred L. Hunt describes two substations which have been built and put into operation by the Amherst Power Company, one at Chicopee and the other at Agawam. These are supplied from the company's double-

circuit, sixty-cycle, three-phase, 66,000-volt transmission line extending from Turner's Falls to Springfield. The substations are of a semi-outdoor type, in which all of the 66,000-volt equipment, including the step-down transformers, is placed outdoors, as are also the aluminum lightning arresters on the 13,200-volt outgoing line. The 13,200-volt buses and switch apparatus, the control switchboard, the 2300-volt distributing switchboard and the railway apparatus are placed inside.

In deciding upon which pieces of apparatus should be placed outdoors and which indoors, the matters of practicability and cost were both considered. The 66,000-volt apparatus was the most bulky and the greatest saving in building space could be made by putting it outdoors. On the other hand, the control switchboard, with motors, instruments and storage batteries, and the railway motor-generator sets practically had to be placed indoors. Between these two extremes lay the apparatus designed for moderate voltage, 13,200 and 2300, which could have been placed either indoors or outdoors. This equipment was placed indoors because it would have been more difficult and expensive to handle in an outdoor installation.

In estimating the saving due to placing equipment outdoors the assumption was made that the first cost of the building is in direct proportion to its cubic contents. In the present cases, buildings to house the entire equipment would have cost considerably more than twice as much as did the buildings actually erected. After allowing for the extra cost of outdoor apparatus and of foundations and steel structures for it, the saving was found to amount to 11 per cent of the cost of the complete station and equipment as built.

DETAILS OF THE CHICOPEE SUBSTATION

The general arrangement of the Chicopee substation is as follows: "A tap circuit is brought in from each of the two transmission lines through choke coils, disconnecting switches and solenoid-operated non-automatic oil switches to a transfer bus, from which the transformers are supplied through disconnecting switches and solenoid-operated automatic oil switches, one set for each bank. An aluminum lightning arrester is installed on each incoming line. At present there is one bank of three 1500-kw, oil-cooled transformers of the radiator type in use, with one spare unit, and foundations and conduits are installed for a second bank. This type of transformer construction brings the cost of oil-cooled transformers for outdoor work down to a point where their increased cost over water-cooled transformers is so little that it does not pay to add the complication of water cooling for the small saving in first cost that can be accomplished, especially where the water would have to be pumped, as in this case, and where, as in all outdoor stations in the northern part of this country, special precaution must be taken to prevent the freezing of water pipes. From the transformer bank one circuit is carried underground into the building to the 13,200-volt double bus in a concrete bus structure."

Mr. Hunt calls attention to a number of interesting features in the design and operation of outdoor substations. To prevent the oil in the spare transformer from freezing it is connected to the low-tension bus, while 200-watt heating units located in the covers of all transformers are used to prevent precipitation of moisture. Such precipitation is liable to occur when cold air, taken in from outside, comes in contact with the air above the transformer. The transformer and oil switches are connected by a complete piping system underground to a two-compartment oil tank buried

in the ground. Oil can be drained from any transformer or oil switch into its respective compartment of the oil tank and from there can be pumped through a portable oil filter press back into the transformers or switches. To call attention to undue heating in the transformers, alarm thermometers connected to bells in the station indicate excessive temperature. When it becomes necessary to repair a transformer it is rolled onto a transfer truck which is run into a compartment at one end of the station.

Among incidental features may be mentioned the switch hooks used for operating the outdoor disconnecting switches. Each of these is provided with a copper cone at about the middle of the handle, and the cone is grounded when the hook is in use. The outdoor aluminum lightning arrester cans are painted white to prevent the absorption of the sun's rays. Two coats of white paint on the cans have been sufficient to keep the temperature of the arresters below the danger point. The same treatment can be applied to transformers.

The author states that the substations are now under test and that so far the results have been satisfactory. Each outdoor station is surrounded by an iron picket fence and all of the equipment is set on concrete foundations extending below the frost line. Some difficulty was experienced at first in keeping the joints of the cooling radiators on the transformer oil-tight. New radiators have been installed and thus far have stood the test of wide temperature changes without developing leaks. Self-cooling transformers were used in preference to the water-cooled type on account of the greater simplicity. The author believes that practically all substations of the same general arrangement as those described can be built with considerable saving in cost over outdoor substations unless land is very expensive. There is no good reason for using outdoor apparatus except where a saving in first cost can be shown.

OUTDOOR SUBSTATIONS IN MIDDLE WEST

L. H. Perry shows, in his paper, that in the Middle West the outdoor substation is in many cases practically necessary if service is to be supplied at a practicable rate. In many cases of small installations indoor space in existing buildings is not available. It is often cheaper to erect outdoor substations in these cases than to provide additional buildings for them or to enlarge existing buildings.

In the supply of power to the small rural station the chief requisites are: (1) Economy of design, (2) protection to the main line and (3) reliability of service in as far as the elements of the outdoor station itself are concerned. In the class of stations covered by the paper, the absence of better devices of reasonable cost has necessitated the use of the plain wire fuse and horn gap or the liquid high-tension fuse, with or without horn gap, for the purpose of protecting the line. Reliance is placed on the low-tension devices for protection against overload on the substation itself. Choke coils are, in general, used in the transformer leads. In designing these substations it must be remembered that they are often in the hands of inexperienced operators, and the simplest possible arrangement of disconnecting and other switches must, therefore, be employed.

The author states that sufficient success has been attained to demonstrate that by using these small outdoor stations good electric service can be supplied to many rural communities at rates within their reach and a class of customers otherwise inaccessible can be thus secured.

TRANSMISSION SESSION

P. W. Sothman, chairman of the sub-committee on transmission, presented a report outlining the present status of the various divisions of the transmission field. His report was based on data furnished by members of his sub-committee and it contained several appendices which appeared under the names of their respective writers. Under the head of "right-of-way" the most important topic to which attention was called was the protection of lines at crossings. There is need for an intelligent agreement as to rules or specifications upon the subject, preferably bearing the sanction of the Institute. Such specifications should allow a certain latitude in the construction so as not to inflict unnecessary hardships upon small power companies operating at comparatively low voltages, or those located in unsettled districts.

TOWERS

In tower construction it is generally agreed that the square or four-legged tower is more efficient in the use of material than the three-legged type, and the latter is now seldom seen. A flexible tower has been used to some extent with good results, but rigid towers must be placed at frequent intervals along the line. It is too early to say what success will attend the use of the flexible tower in connection with long suspension insulator strings, and until more data are available it is advisable to proceed with caution when considering the adoption of this construction. In lines supported on suspension insulators, two or more conductors are not placed in a vertical plane, especially where snow and ice are liable to collect upon them. If they were so placed there would be danger that when a load of ice and sleet broke away it would not do so uniformly and the cables would be liable to come into contact. In the East the ice seems to collect to a greater extent at the centers of the spans than near the towers, which fact should be taken into consideration. There is a need of standardizing the methods of calculation used in tower design, and the constants for such materials as copper, aluminum and steel used for conductors should be taken at some acceptable figure such as 13,000 lb. per sq. in. for copper and 14,000 lb. for aluminum, as representing the elastic limits. Ordinarily tower dimensions should not be calculated but specifications should call for ability to stand certain loading and towers should be tested for these values.

Foundations for rigid towers should have their tops within one-tenth of an inch of the same height. No material less than $\frac{3}{16}$ in. in thickness should be used in tower construction and it is recommended that the minimum number of bolts in any connection be not less than two. Towers should be strong enough to permit men to climb them without danger of bending the angles. Wire spacing should be such as to allow an angle of deflection of 55 or 60 degrees from the vertical under the worst wind conditions, instead of the customary figure of 45 degrees. In designing towers the structure should be arranged to permit the loading of one span with ice and sleet with the two adjacent spans not loaded, and still leave sufficient distance between all wires so that there would be no probable contact due to wind conditions. In the northeastern part of the United States and the eastern part of Canada not less than $\frac{3}{4}$ in. of sleet or ice should be allowed for. It should be remembered also that the wind load is heaviest at times of sleet. As the section of ice is more or less elliptical, this fact should be considered in estimating the wind pressure.

Fifteen pounds pressure per square foot from wind should be allowed in these parts of the country.

There is danger of injury to towers in erecting them on the ground and tilting them into place. A careful inspection after erection is therefore necessary. Special attention should be given to the support of ground wires, which, as sometimes erected, are liable to come in contact with the power conductors. In general galvanizing seems to be preferred to painting for towers and good galvanizing can be relied upon for twelve or fifteen years. Painting cannot be depended upon for more than two or three years, especially where the atmosphere contains sulphur or other fumes. Footings can be galvanized with good success in most soils, although there are earths where paint coating is more durable. Where extreme acidity or electrolytic action is expected in the soil, it is more economical to provide concrete footings.

CONDUCTORS

The report does not open up the question of the relative advantages of copper and aluminum for power conductors. It states that there are conditions where one or the other can be used to best advantage. Hard-drawn copper cables should not have hemp centers. Steel-core aluminum cables have been made which the makers claim to be as durable as ordinary aluminum cables and free from electrolytic corrosion. Proof upon this point is lacking but it is understood that this type of cable has not been considered satisfactory by English cable manufacturers. Copper-clad steel wire gives good results for long spans where great strength is required, but these wires are still too expensive to be generally used for power conductors. They are coming into use, however, to a certain extent for telephone and telegraph lines. The committee calls attention to the fact that the formulas in existence for the calculation of cable sags are quite complicated, although they give sufficiently accurate results as long as the spans and sags are moderate. A simple method employing the catenary, upon which a set of curves can be based, is recommended. In the matter of ground wires it is generally agreed that such overhead wires are beneficial as a protection against lightning. However, the extent to which such protection is actually afforded is still a matter of some doubt.

INSULATORS

From the committee's report the insulator seems to be the feature of the transmission line with which the greatest difficulty is now being experienced. Suspension insulators are all right when new, but they seem to be subject to an aging process, so that, after a year or two of service, failures begin to develop. To insure steady service the insulators must be inspected at frequent intervals. The trouble is not confined to any make of insulator nor to any section of the country. At voltages of 110,000 and even somewhat higher there seems to be no reason for providing protection for the end units of suspension insulator strings to equalize the voltage gradient over the whole. This may be necessary when voltages go to still higher values. These protecting shields act simply as electrodes for equalizing the electrostatic field in the region occupied by the insulators. Shields should present only rounded surfaces and edges and need be no greater than 12 to 14 in. in diameter to produce good results. With these shields may be mounted arcing rings or tips to keep arcs away from the insulators. The clamps used in securing line conductors to suspension and pin-type insulators are satisfactory as far as the performance of their primary function is concerned.

They do not allow the conductors to slip but they sometimes mash the cables and unfit them for taking strain if the sag ever has to be readjusted, which is by no means an uncommon occurrence. Practically none of the clamps are designed with smooth outline or with an idea of avoiding more or less sharp projections which cause static discharges at the higher voltages and which concentrate the electrostatic field in the vicinity.

STATION APPARATUS

The committee's report contained some notes on station apparatus. Particular attention is directed to the necessity for the mechanical bracing of transformer windings as the forces which are developed by short circuits are very great. An important problem of distribution companies serving sparsely settled districts is to secure small, high-voltage transformers which will stand up under the stresses of line switching, surges, etc., which occur in ordinary operation of a large high-tension system. Another vital matter is the status of the lightning arrester. The electrolytic arresters are believed to be the best available at present, but it is still difficult to make any definite quantitative statement as to the protection which they actually afford against lightning or other disturbances. At the same time no one would care to take the responsibility of operating stations without arresters as they are a form of insurance against trouble. Much more information along this line is desirable. Oil circuit-breakers are becoming more reliable for high potentials and heavy service, but it is still unwise to attempt to rupture short circuits close to the generator when their combined normal capacity is much greater than 50,000 kw.

INTERFERENCE WITH TELEPHONE LINES

Interference of high-tension transmission lines with telephone and telegraph circuits is a subject to which but little attention has as yet been given, although the problem is a very important one. Much of the trouble with telephone service is due to poor insulation. With good insulation and with the transmission line well balanced, trouble is not experienced as a rule except at times of disturbance or interruption on the transmission system. In a recent case of protection from interference cited by the committee it was found that there was no protective apparatus on the market capable of handling the large induced currents which were expected. In this case the basic principle worked upon was carefully to insulate and balance the telephone line with respect to the transmission circuit. Transpositions were made at frequent intervals and no twigs or other objects were allowed to come into contact with the wire. Special grounding coils and heavy fuses were used with discharge gaps in vacuum. Condensers and choke coils were provided for absorbing the smaller disturbances. No one remedy is sufficient for all cases and, to insure a quiet working line, each case must be studied by itself and methods adopted to meet the condition.

MORE ABOUT INSULATORS

The report of the transmission sub-committee contained several signed appendices in which some of the following important points are brought out. J. A. Brundige called attention to the deterioration of porcelain insulators in service, of which mention has already been made. A good porcelain for high-voltage insulators must combine high dielectric strength and mechanical toughness. These two qualities are somewhat opposed to each other, for when the former is

obtained the porcelain is apt to be brittle like glass. Some of the so-called high-voltage porcelains appear to be lacking in both desirable properties. The porcelain mixtures used by different manufacturers vary greatly in the proportion of ingredients employed. For example, one uses twice as much flint as another. Some standard of proportion seems highly desirable. While the porcelain body is important, the design of the insulator is still more so. An insulator consists of porcelain, cement and iron assembled together, the coefficients of temperature expansion of the three being quite dissimilar. The porcelain is the least able to withstand the forces due to temperature changes and it is, consequently, the part that suffers and cracks, with the attendant electrical punctures ensuing.

Mr. Brundige describes the method of failure of a suspension insulator with metal cap and pin as follows: Cracks develop at some point inside of cap, and when the current leakage through them is sufficient a path is fused through the porcelain by the intense heat generated. If the heating takes place relatively slowly, a hole is apt to be fused through the cap, through which gases and melted porcelain are forcibly expelled, but the insulator usually holds together and continues to support the cable. With a large amount of power back of the break, which may act in the nature of a short circuit inside the insulator, caps have been known actually to explode, in which case the line conductor is allowed to fall. Before the burning of the caps can take place, it is necessary that several of the units of an insulator string be bad, and instances have been observed where all the caps of a ten-unit insulator have been so affected. Modern methods of locating faults, however, are resulting in the reduction of the number of pyrotechnic displays produced by such failures. The megger, an instrument successfully used for measuring high-resistance, is very useful in this kind of work. In a recent experiment, a batch of insulators were immersed in water at ordinary temperature and this was slowly brought up to the boiling point. Many insulators, some two or three years old, were tested in this manner and every one was found to be ruined by the time the boiling point was reached. Similar tests made on new insulators of the same design did not produce failures except in a few units. The probable explanation of this is that in the new insulators the cement had not yet obtained its ultimate hardness, and allowed the expansion to take place in the pan without cracking the porcelain.

TROUBLES FROM LIGHTNING

In another appendix L. C. Nicholson discusses briefly the subject of the influence of a direct lightning stroke on a transmission line. While the whole subject is somewhat intangible, observation and inquiry lead to certain general conclusions. It is doubtful if any degree of insulation in use at present, with or without the ordinary protective measures, will withstand the effect of a direct stroke of lightning on the line. The electro-mechanical forces acting on the insulators in such a case are very great, usually causing them to explode. A direct stroke usually envelops all of the conductors of a line and sometimes several lines located relatively close together. This indicates that the area of the stroke is large, or that it has numerous prongs. Burn marks on conductors which were struck when there was no power on the line indicate a diameter of stroke of approximately 20 ft. This has an important bearing on the protection of line by overhead ground wires. Induced effects from strokes at some distance from a line may, on medium voltage lines, be great enough to show

flashover or puncture of insulators. Mr. Nicholson's observations on the operation of 60,000-volt lines on pin-type insulators, unprotected by overhead wires, have led him to estimate the radial influence of direct strokes to be limited to 2000 ft. and in some cases to less than 100 ft. The range of the disturbance depends upon the severity of the strokes. In highly insulated lines the danger zone decreases substantially and in the most highly insulated ones at present it is probable that the large majority of induced effects are insulated and protected against, leaving only direct strokes on the line itself. The direct strokes constitute approximately 10 per cent of all lightning disturbances on the 60,000-volt pin-type circuits in New York State.

TRANSMISSION LINES IN THE FAR WEST

In outlining the subject of transmission-line problems in the West, P. N. Downing calls attention to the favorable climatic conditions of the Pacific Coast and particularly of California for high-tension power transmission. Except in the higher mountain districts there is practically no snow to contend with and there are but few places where lightning causes trouble. It is not common practice to install lightning-arrester equipment although some companies have done so. The horn-gap arrester with one side connected directly to the ground without resistance has, in many instances, been used to advantage more as a voltage-limiting device than as a lightning arrester. Ground wires are sometimes used but as there is so little trouble from lightning, engineers have not been able to decide whether or not there is any advantage in using them. Very seldom is an insulator punctured by lightning. This is possibly due to the fact that the high voltage dissipates itself over the surface of the insulators.

The greatest trouble on lines using the ordinary four-part, 14-in. pin-type insulators at voltages around 60,000 is due to leakage over the insulator. During the dry season, which lasts for about six months, dust and salt fogs accumulate on the insulators, particularly near the coast. The resulting leakage may eventually burn off the pole and sometimes the line wire without damaging the insulator. Nothing but cleaning the insulators seems to improve this condition. After the first heavy rain of the early winter the insulators are washed off and little trouble is experienced until they have again become covered with dirt. The best remedy for the trouble seems to be to tie the pins together electrically, but not to ground them. Grounding has produced unsatisfactory results because arcs are established between line wire and ground and these hold until the voltage drops sufficiently for them to be extinguished. In regulating the voltages on high-tension network, synchronous condensers are being used in a number of insulations with entire satisfaction.

The first high-voltage oil switches used on 60,000 volts were put into operation on the transmission lines in California. The same general type with slight modification is now used for 110,000-volt lines. In this switch the circuit is opened at two or four points, depending on the voltage and load carried. The contacts are made by rotating blades moving in horizontal planes. The separate oil containers for each leg of the circuit are insulated from each other and from the ground by means of porcelain bushings. In another successful design of switch a pantograph arrangement of links carrying a contact, and operating by a vertical movement of one corner of the pantograph, is used. This gives a break in a vertical plane. The principal weakness in these switches, which is common to all oil switches, is that under a heavy short circuit they will

at times throw oil out of the container. Outdoor oil switches, either automatic or non-automatic, are being used very generally for branch lines, or for sectionalizing trunk lines. These are often operated by means of solenoids placed directly in the main lines. Such an arrangement does away with the use of current transformers, but the connection from movable plunger to relay must stand the entire voltage from line to ground. It is important to keep down the weight of the moving parts so as to insure the desired sensitiveness of the trip. Well-treated wooden rods have been used to make the connection from plunger to trip or relay, but they have caused some trouble from burning.

Mr. Downing confirms the statement made in other parts of the report in regard to the importance of supporting transformer windings so as to prevent injury and distortion from mechanical strain set up when short circuits occur. Some manufacturers have failed to give proper attention to this feature. Transformer designs have, however, more than kept pace with the art of long-distance transmission at high voltages.

OSCILLATIONS IN TRANSMISSION LINES

In another appendix G. Faccioli discusses the oscillations set up in transmission lines by switching. He calls attention to two kinds of oscillation which may occur. In one case inductance may be massed at one point of the circuit and capacity at another, when a dead line which acts practically as a condenser is connected to a generator which acts practically as an inductance, or when a line connected at one end to a step-down transformer is disconnected from the generating system. The other case is that of the distributed inductance and capacity of part of a circuit, when a line is disconnected from a generator and the energy stored in it gradually dies out, changing from the electromagnetic form in the distributed inductance of the line to the electrostatic form in the distributed capacity of the line and vice versa. Such oscillations occur when an unloaded step-down transformer is disconnected from the line, its windings acting similarly to a line.

The oscillations described do not, in general, constitute a great danger to the circuit if the contact in the switch is made once, positively, for every switching operation. The case is different, however, if each switching operation is accompanied by an arc, so that the circuit is repeatedly closed and opened. Under this condition the pressure rises may become dangerous, and destructive cumulative oscillations may be set up in the apparatus.

In view of the danger of starting oscillations it is evident that high-tension switching, which has lately gained so much importance in the art, should be done very judiciously and only when necessary, unless special precautions are taken to avoid the disturbances resulting therefrom. As a rule, low-tension switching is preferable, as this avoids high-tension phenomena. In energizing a line, it is preferable to connect the line to the step-up transformer and then to connect, by low-tension switches, the line and transformer to the generator, rather than to connect the transformer to the generator and then to switch the line onto the high-tension winding of the transformer. It would be still better to connect the line and the step-up transformer and the generator together while the whole system is dead and then to bring it up gradually to full potential by the excitation of the generator. In causing disturbances fuses act similarly to switches, except that the former open under load, while switches are, as a rule, operated at approximately no load. The sudden interruption of large currents results in considerable over-tension, and this is the danger that usually accompanies the blowing of fuses.

PUBLIC SERVICE STICKER INVOICE

In his paper on storekeeping methods read before the Public Service section of the American Electric Railway Association, as noted elsewhere in this issue, Robert S. Inglehart made brief reference to the invoice used by the Public Service Railway. As this invoice differs from the "standard billhead" practice of other large companies, some details are given here.

Prior to 1903, the North Jersey Street Railway and the Consolidated Traction Company, now merged with the Public Service Railway, requested that all invoices be made out on their standard billheads. With the consolidation of this and other properties, however, a sticker for attachment to the supply company's invoice was adopted. This sticker contains spaces for the necessary checking notations, distribution of charges, etc., thus securing the uniform location which is one of the chief advantages of the standard billhead form. A short time ago, however, a committee of the Public Service Railway made a general inquiry as to the advisability of adopting a standard billhead form. The analyses of replies received from thirty-one correspondents showed the following arguments for and against the use of such a form:

ARGUMENTS FOR USE OF STANDARD FORM

- (1) Permits greater neatness and uniformity in vouchering and filing, and economy of filing space.
- (2) Facilitates checking, as the information required is furnished in the same location on every bill. Omissions in checking may thus be readily noted.
- (3) Assures the appearance of requisition and order numbers on each invoice.
- (4) Secures sufficient copies for all departments interested, thus saving the time and labor otherwise required in making copies.

ARGUMENTS AGAINST USE OF STANDARD FORM

- (1) Cost of printing and mailing is prohibitive in large companies.
- (2) Blanks are mislaid by shippers, causing delay in rendering bills.
- (3) Some shippers refuse to use them on the ground of unsuitability. This refers particularly to dealers in standard commodities such as iron and steel, lumber, sand and gravel, where individual bill forms contain special rulings for use with various billing systems.
- (4) Confusion may be caused in vouchering, on account of the similarity of forms. This may lead to the inclusion of bills from different parties in one voucher.
- (5) Better notation will be given on individual forms regarding discounts, f.o.b. points, etc., and better-made bills will be received.
- (6) Where bills are transferred from individual to standard form in the purchasing department, errors in copying are likely to occur.
- (7) The point of origin cannot always be determined, namely, whether the bill has been prepared by the shipper or the purchasing department.
- (8) Uniformity in location of notation, checking spaces, etc., may be had by the use of a rubber stamp.
- (9) State, county and municipal offices, as well as public utility companies, insist on rendering bills on their own forms.
- (10) If shippers give necessary information upon their own forms, no one has a right to ask them to depart from established practice.

DECISION

Upon a review of all the conditions the committee recommended that the practice of sticker invoices be retained.

Cleveland Center-Entrance Motor Cars

This Article Describes One of the Cleveland Railway's Fifty New Center-Entrance Cars, Which Embody Novel Features in Underframe Design, Door Operation, Seating Arrangement and Lighting

Recently the Cleveland (Ohio) Railway added fifty new center-entrance motor cars to its equipment. Although these are not the first cars of the center-entrance type in Cleveland, they represent a marked departure from the center-entrance trail cars put in operation by this company in the fall of 1912. While the same effort was not made in designing these new cars to obtain a low floor in the seating space, attention was directed to the height of the first step from the pavement, which, as a result, was reduced from 15 in. to 12 11/16 in. The over-all length of these new cars is 2 ft. more than that of the trail cars, which additional length was not enough to provide for the motorman's cab in one end of the body, consequently the seating capacity was reduced from sixty-five passengers in the trail car to fifty-nine in the motor car. This reduction in seating may be accounted for by the additional width required in the entrance well because of the new arrangement of entrance and exit doors. The low step height from the top of the rail to the

the angle which forms the side sill by 3/16-in. gusset plates and to each other by a pair of 4-in., 5 1/4-lb. channels placed 12 in. out to out of flanges, and extend from the buffer to the point of offsetting the 5-in. x 3 1/2-in. side sill. At this point the box girder center sill is replaced by eight 4-in., 5 1/4-lb. channels which are riveted to transverse channels. This construction in turn terminates at the edge of the entrance well in a 12-in., 20 1/2-lb. transverse channel. The two 12-in. channels which form the edges of the entrance well are connected under the well floor by four 3-in., 4-lb. channels. Diagonal braces consisting of 2-in. x 2-in. x 3/16-in. angles set flange downward are riveted between the 4-in. transverse I-beams at the corner posts and the center sill at the next transverse floor beam. Four diagonal braces were also included in the two panels each side of the car-body bolster. These are formed of 3/16-in. x 4 3/4-in. plates fastened at one end to the transom 4-in. I-beams, and at the other to the center sill where it connects to the next transverse



Cleveland Center-Entrance Car—Side View

entrance well also made it necessary to provide two steps from the well to the car-floor level. These motor cars are to be operated either singly or in two-car trains, as they are provided with four motors of sufficient capacity to pull trailers. The principal dimensions of the new cars follow:

Length over all.....	51 ft.
Length of body	50 ft.
Truck centers	26 ft.
Wheelbase	5 ft. 6 in.
Step heights.....	12 1/16 in.; 12 in.; 7 5/16 in.
Floor to top rail.....	2 ft. 8 in.
Width over side plates.....	8 ft. 2 in.
Width over sash rail.....	8 ft. 4 3/4 in.
Height inside.....	8 ft.
Height at entrance.....	9 ft. 7 5/16 in.
Passengers seated, summer.....	59
Passengers seated, winter.....	58
Passengers standing	65
Standing room in entrance well.....	20
Wheel diameter	26 in.
Total weight of complete car.....	44,280 lb.

SIDE AND UNDERFRAME

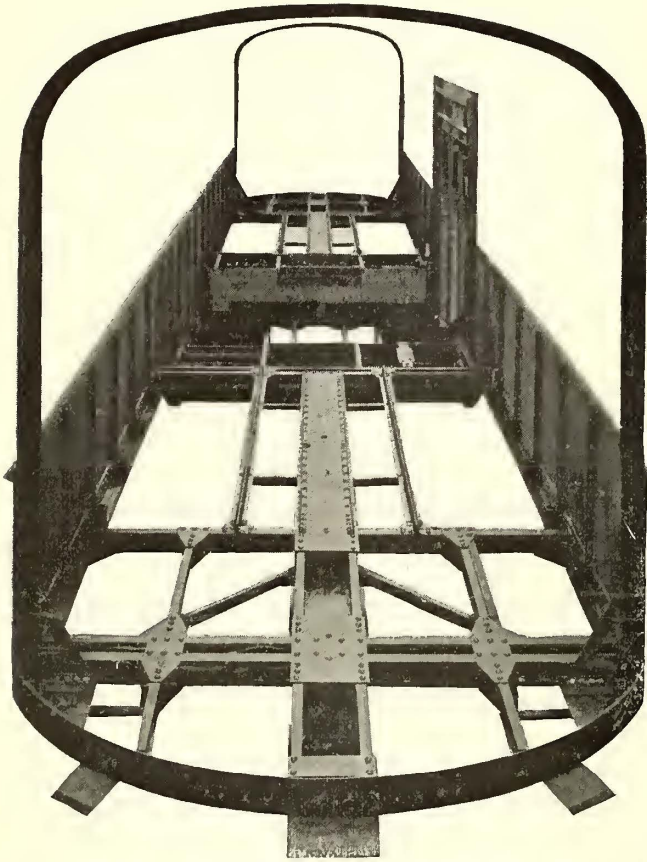
The design provides for a single-end, center-entrance, low-step, arched-roof car body, built with an all-steel underframe and side girders, and a composite body and roof framing. The bottom framing is composed of two 5-in. x 3 1/2-in. x 5/16-in. angles extending on both sides from corner post to corner post. The 3 1/2-in. base of this angle supports fourteen transverse floor beams. These floor beams are riveted to

floor beam. These diagonals are bored for screws to fasten them securely to the wooden flooring. A valuable maintenance feature is the accessible arrangement of the power conduits.

The side framing up to the sash rail is formed of a plate girder extending around the entire car body from one side of the center-entrance doors to the other. The lower member of this girder is formed of the 5-in. x 3 1/2-in. x 5/16-in. angle side sill, and the upper member is formed by a dropper bar weighing 5.4 lb. per foot, riveted to the outside of the plate girder. The web of this side girder is formed of 34-in. plate, re-rolled, double-pickled 1/8-in. sheet steel between corner posts, and that at the ends is formed of 34-in. No. 14 sheet steel. Forged steel pockets are provided along the base of the side girders as points to secure the body posts, which in turn are bolted to the legs of the stiffener angles.

Two built-up posts at the center-entrance end of the side girders form the framing around the doors. These are connected above the doors by a 1/8-in. plate reinforced by a 3-in., 5 1/2-lb. I-beam, a 2 1/2-in. x 1 1/2-in. x 3/16-in. angle, and a 1 1/4-in. x 1 1/2-in. x 1/8-in. angle. This plate is punched out over each door opening to form the sign pocket. The two door openings are provided with posts built up of two 3-in. x 2-in. x 1/4-in. angles and 1/8-in. x 6 1/4-in. web plate riveted to the 2-in. legs. This web plate extends from the top of the bottom angle to the lower edge of the 1/8-in. plate

over the doors. The post of the door pocket which is formed in the panel between the two door openings is built of two $1\frac{1}{4}$ -in. x $1\frac{1}{4}$ -in. x $\frac{1}{8}$ -in. angles riveted to a $\frac{1}{8}$ -in. steel web plate. This web plate extends from the top of the 5-in. leg of the lower angle of the girder to the $\frac{1}{8}$ -in. plate over the doors.



Cleveland Center-Entrance Car—Steel Under and Side Frame Without Body Bolsters in Place

BOLSTER AND BODY CONSTRUCTION

The body bolsters of these new cars are of special design, and are built up of two pressed-steel plate channels to form the web members to which the top and bottom cover plates are securely riveted. The channels are formed of $\frac{1}{2}$ -in. steel plates with holes punched from the webs to reduce the weight. The top and bottom plates are $\frac{3}{8}$ in. thick and 9 in. wide. To facilitate the removal of the bolster in case repairs are necessary it is attached to the 5-in. x $3\frac{1}{2}$ -in. x $\frac{5}{16}$ -in. angles forming the side sill by means of a bracket forged from a $\frac{3}{4}$ -in. x 9-in. steel plate. This is riveted to the bolster proper and bolted to the side girder angles with two $\frac{3}{4}$ -in. machine bolts. The top plate of the center sill is made continuous over the bolster and bolted to it, and the bottom plate is bent to conform to the forged bracket, and the $\frac{3}{4}$ -in. bolts at the side girder also pass through it. The top member of this bolster is fitted with wide side-bearing segments formed of $\frac{1}{2}$ -in. x 4-in. plates bent to an inner edge radius of 25 in. and a chord distance of 23 in. Braces formed of $\frac{1}{2}$ -in. x 2-in. steel plates extend from the upper flange of the bolster to points near the end of the side bearing plates, being bolted thereto and riveted to the bolster proper.

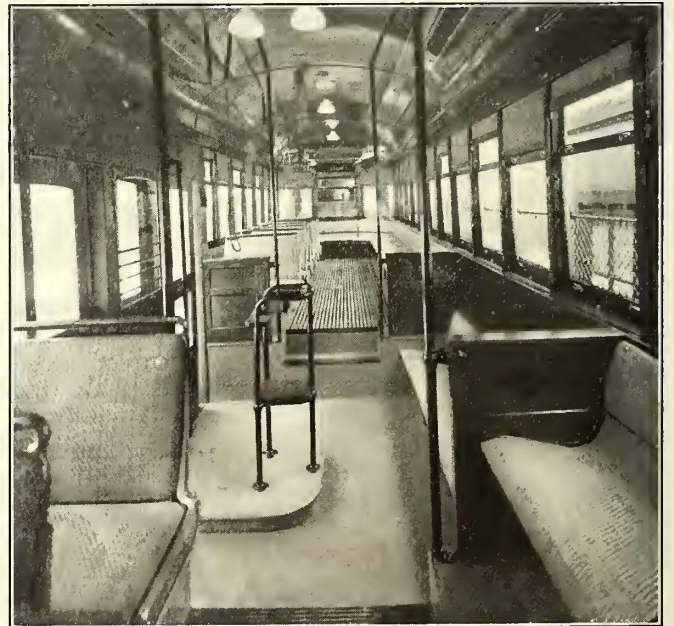
At each end of the side girders which terminate at the corner posts the latter are made continuous across the car, forming both corner posts and roof carlines. They are formed of two 2-in. x 2-in. x $\frac{3}{16}$ -in. angles,

finished over with wood so that no metal is exposed to the interior surface of the car. The intermediate posts are of kiln-dried white ash, $1\frac{3}{4}$ in. x $3\frac{1}{4}$ in. in section. To the tops of these wooden posts the pressed steel carlines are bolted, and two intermediate elm rafters are placed between each two steel carlines. As shown in the illustrations, the roof is of the plain arch type, extending the full length of the car.

The Scullin method of ventilation, adopted as standard by the Cleveland Railway on all plain arch-roof cars, is also used on the present equipment. A small ventilating louver, running the full length of car body, is supported on aluminum brackets with louvers at the side, allowing air currents to play through the louvers from all directions, creating a vacuum over ducts coming up through roofs under the small ventilating louver deck. The brackets are reinforced at the place where the trolley stand and base are supported. Thirteen ducts leading from the inside of the car to the roof under the ventilating louver are covered on the underside of the headlining by neat polished bronze registers. These roof openings are placed in the center of the ceiling, running longitudinally. With this system it is impossible for snow, sleet or rain to reach the interior of the car.

Eighteen windows are provided on the devil-strip side of the car body and fourteen on the entrance side. These, as well as the three windows in the rear end of the car and the two windows in the motor-man's cab, are single sashes arranged to drop into pockets between the window posts. All sashes are made $\frac{5}{8}$ in. thick with brass stiles and cherry rails.

The entrance and exit doors at the center of the car are built of 1-in. solid cherry with two glass panels and brass wearing strips. These doors are equipped with ball-bearing door hangers and operated electro-pneumatically by a push button set in the fare box stand convenient to the conductor. As shown in the



Cleveland Center-Entrance Car—Interior View, Showing Entrance Well

accompanying illustrations, these doors slide into parallel pockets provided in the panel between them.

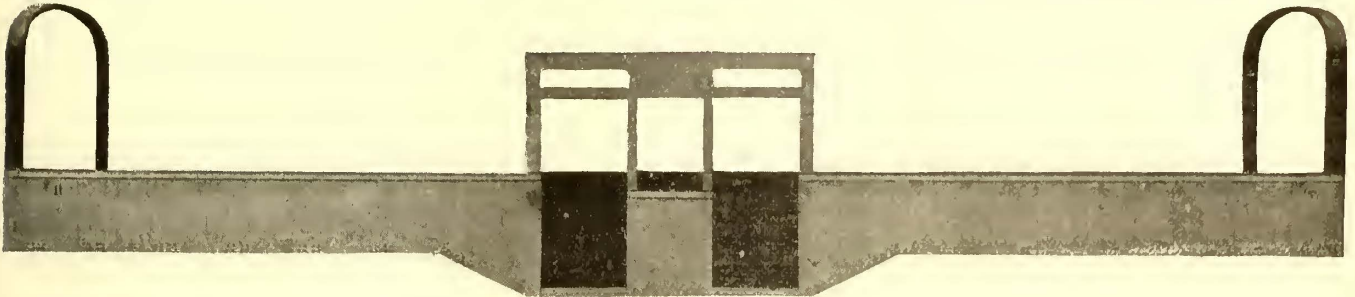
A natural red-cherry wood finish, slightly stained to insure a uniform color, was used in all interior paneling and moldings. The latter are free of all corners liable to collect dust and dirt. The ceiling is formed

of 3/16-in. thick agasote in three longitudinal sections and five transverse sections.

INTERIOR ARRANGEMENT AND FITTINGS

As mentioned earlier in the article, this car was designed for single-end operation, consequently the rear vestibule was available for seating space at all times, and the motorman's cab is permanently in the front vestibule. The cab occupies a maximum width of 3 ft. 2 in. The seating arrangement for passengers

blocked the center aisle but it was also necessary that he stand with his back to one end of the car. In these new motor cars the conductor stands with his back to the panel between the center-entrance doors, which not only permits him to clear the entrance aisle but to observe passengers in both ends of the car body. In operating this car with the combination system of fare collection, the conductor collects fares from passengers entering one end of the car pay-as-you-enter, and the pay-as-you-leave principle is applied



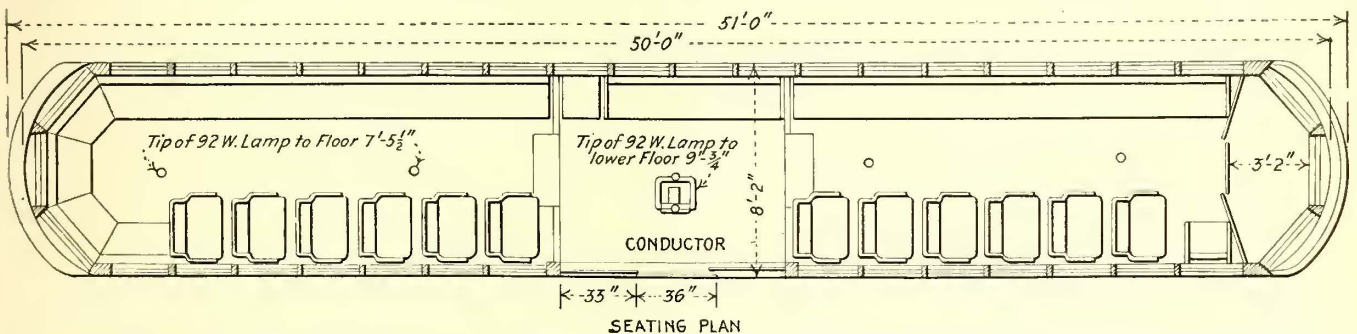
Cleveland Center-Entrance Car—Side View of Steel Under and Side Framing for Car with Center-Entrance Openings on One Side Only and Continuous Girder on Devil-Strip Side

is somewhat different from that in general use, being a combination of cross and longitudinal seats similar to that used on some other types of cars in Cleveland. The cross seats have pressed-steel pedestals. As shown on the seating plan, six cross seats occupy each end of the car body with longitudinal seats circling the rear vestibule and extending the full length of the devil-strip side of the car. The location of the conductor's stand in the entrance well made it possible to utilize the opposite side of the car at this point for seating space. A longitudinal seat has been installed in the well with a removable panel at one end to provide for the forced hot-air heater during the winter months. By this arrangement a maximum seated load of fifty-nine passengers was obtained with a total standing load of 144 passengers. In order to improve conditions for standing passengers, a continuous hand rail supported in brackets 5 ft. 11 in. above the car floor was provided for the full length of the car on the longitudinal seat side. Pipe stanchions were also

when passengers leave the opposite end of the car. The conductor's stand is mounted on a slightly elevated platform which not only protects him from the accumulations of snow and moisture in the entrance well during bad weather but also against passengers crowding him away from his station. This method of fare collection was adopted in order to relieve congestion in the downtown district during the evening rush hours, and after more than a year's operation it has been found to work quite satisfactorily.

HEATING

As mentioned earlier in the article, the Peter Smith Heater Company's forced hot-air heater system was used in these new cars. The combination longitudinal and cross-seat seating arrangement was found to be more advantageous for use with this type of heater than with cross seats throughout. The longitudinal seats permitted the heater duct to be supported under them, and the duct is so designed in section that the



Cleveland Center-Entrance Car—Plan Showing Combination of Longitudinal and Cross Seating, Motorman's Cab at One End Only, Position of Conductor and Location of High-Capacity Tungsten Lamps with Reflectors

provided on each side of the aisle, at the break between the car-body floor level and the entrance well.

FARE COLLECTION

At the time the mechanical department was considering the design of these cars this company had already adopted the method of fare collection in which a combination pay-as-you-enter, pay-as-you-leave principle was used. In the center-entrance trail car, however, the conductor stood opposite the center-entrance doors in the center of the car body; hence he not only

registers direct the hot-air current at an angle of 45 deg. to the floor level. About the only difficulty experienced in installing the heating system was the difference in the elevation of the two ducts leading from the heater to each end of the car body. Inasmuch as the heater was installed at one side of the entrance well, the hot-air duct leading from one side of the heater was taken off at the correct elevation. The duct on the opposite side of the heater, however, had to be taken off at an elevation which would permit it to be installed under the longitudinal seats in the

entrance well and then offset sufficiently to elevate it to a position under the seats in the car body proper.

CAR LIGHTING AND SIGNAL SYSTEM

The system of illuminating these new cars was adopted as a result of an exhaustive test in car illumination made by the Cleveland Railway during 1911 and 1912, the results of which were published in the ELECTRIC RAILWAY JOURNAL for Aug. 2, 1913. In this test the illuminating system which gave the highest efficiency was furnished by five 100-watt Mazda lamps in Holophane, satin-finish reflectors mounted in special shade holders. These lamps were in series and were mounted on the upper deck ceiling along the center line of the car, and a spare lamp was so connected with a selector switch that it could be instantly cut into the circuit in case of failure of any one of the five lamps regularly lighted. In the new cars, however, 92-watt lamps securely fastened in electric pendants and provided with deep Alba reflectors were installed. Five of these lamps were spaced uniformly along the center line of the car ceiling with the spare lamp beside the one over the entrance well. The selector switch was placed in the panel just back of the conductor's stand. All light wiring was installed in flexible loom which passes through the steel carlins between the headlining and the roof sheathing.

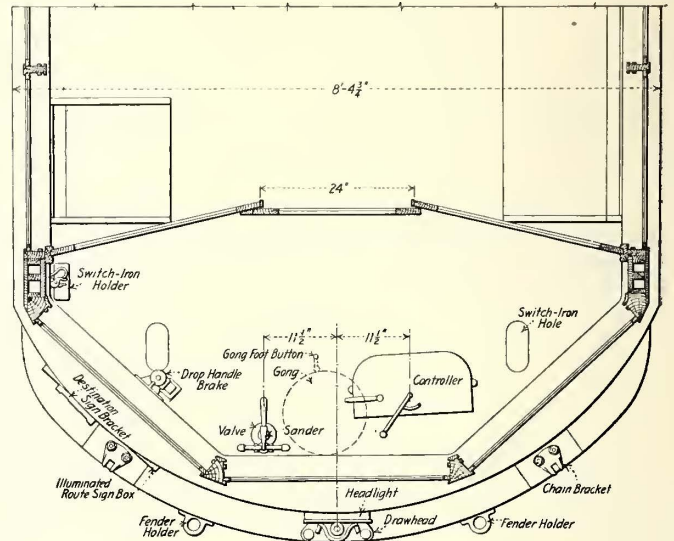
In addition to the usual buzzer system installed with push buttons at convenient locations on the posts between the windows, a Consolidated Car Heating Company's light signal system was provided. The signal circuits were so arranged that the signal lamps in the motorman's cab will indicate the position of the center-entrance doors as well as show the signals operated by means of the conductor's push button. Both the signal and lighting systems were also arranged for trailer operation, a coupler socket and drum switch being provided just inside the rear buffer.

BRAKE APPARATUS, MOTORS AND TRUCKS

The brake apparatus of these center-entrance motor cars is novel in that two 8-in. x 8-in. air cylinders were employed, one operating the brakes on each truck, although the hand brake operates both trucks. A single lever having equal arms was used with one end connected to the push rod of the cylinder and the other end to the truck brake pull rod. The two cylinders were in turn connected by an air pipe to insure uniform pressure on both pistons and consequently equal brake power on both trucks. The brake cylinders were placed horizontally against the large 12-in. channels each side of the center-entrance well and

of this lever was connected in turn to an extension of the forward lever of the air-brake apparatus by a slotted link. From this connection a cable was carried under the center-entrance well and connected to the pull rod of the rear truck brake.

A commutating-pole type motor designated as No. 340, made according to special designs by the Westinghouse Electric & Manufacturing Company and



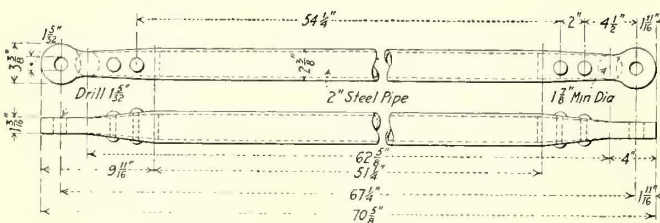
Cleveland Center-Entrance Car—Plan of Platform

having the following characteristics, was adopted: 40 hp on one-hour rating; gear ratio, 15/57, and to operate on 26-in. wheels. It was the aim of the railway and the manufacturers to produce a motor having the same operating characteristics as the 101-B but which could be adapted to a 26-in. wheel. This was accomplished in a large measure by the co-operation of the railway company and the Westinghouse engineers, and a very satisfactory type of motor resulted without sacrificing any of the properties of the older type.

Trucks of special design, No. 51-E, were furnished by The J. G. Brill Company. They were constructed to be equipped with two motors each and to operate with 26-in. one-wear rolled-steel wheels on axles of 4 1/2 in. diameter at the motor bearings and 5-in. diameter at the gear seat, and with the railway's standard 3 3/4-in. x 8-in. journals. Roller side bearings and ball center bearings were also included. The wheelbase of the truck is 4 ft. 10 in., and the height from the rail to the top of the complete center plate is 21 in., with the car body in place.

These cars were designed by the mechanical department of the Cleveland Railway, under the supervision of Terrance Scullin, master mechanic, and were built by the Kuhlman Car Company, Cleveland, Ohio.

The fifth annual dinner of the civil, mechanical and electrical engineers at Boston will be held on the evening of March 4 at the City Club, the principal speakers scheduled being as follows: Guy E. Tripp, chairman of the board Westinghouse Electric & Manufacturing Company, on "The National Government and Business"; Dr. A. E. Kennelly, professor of electrical engineering at Harvard University, on "Results for the Electrical Fraternity Accomplished by the International Electrical Congress," and Dr. M. W. Franklin, on "Ozone Applied to Ventilation." N. J. Neall, Boston, is chairman of the committee on arrangements, Harold G. Payne, 12 Pearl Street, Boston, being in charge of tickets.



Cleveland Center-Entrance Car—Coupler

were hung from the steel underframing in forged-steel stirrups.

A hand-brake system including the usual drop-handle brake staff was installed on the step side of the motorman's cab. The hand-brake rod was hung below the step side and side sill and extended to a long lever operating in a horizontal plane and placed just in front of the center-entrance well. The other end

A. E. R. A. Section Meeting at Newark

At the Public Service Railway's Meeting Held in Newark, N. J., Feb. 19, Robert S. Inglehart Read a Paper on "Keeping the Company Department Store" and James H. McGraw Made an Address on "Organization and Teamwork"

The regular meeting of the Public Service Railway Company's section of the American Electric Railway Association was held at Newark, N. J., Thursday evening, Feb. 19. The business consisted of a paper on "Keeping the Company Department Store," by Robert S. Inglehart, general storekeeper Public Service Railway, and an address on "Organization and Teamwork," by James H. McGraw, president McGraw Publishing Company. In accordance with the practice of this section, written discussion on the technical paper of the evening was presented by two other employees of the company, George J. Newton, assistant purchasing agent, and William J. Hughes, traveling auditor, in addition to the impromptu discussion. About 160 men were in attendance despite the unusually bad weather.

KEEPING THE COMPANY DEPARTMENT STORE

The meeting opened with the paper by Mr. Inglehart, who said that in the early days of electric railways each department had its own store and the supplies were bought in small quantities as required. This method, of course, proved expensive, as it necessitated separate office forces and delivery systems. About four years ago the Public Service Railway centralized its line, mechanical and stationery supplies under one roof and arranged for their distribution by the supply cars.

On the Northern division of the Public Service Railway two points were used for receiving all supplies and materials, namely, the general storeroom at the Plank Road shops, Newark, for all car and line department supplies and for the stationery used by the railway, gas and electric companies of the Public Service Corporation, and the Passaic wharf storeroom, about 1 mile distant from the Plank Road shops, for all maintenance of way and building supplies. On the Southern division all supplies were received at a storeroom in Camden.

ORGANIZATION OF STORES DEPARTMENT—REPLENISHING STOCK

The organization of the stores department comprised twenty-five men in the mechanical, line and stationery store department in addition to five men in the way department storeroom. This included two men for each of the three supply cars. All storehouse bins were arranged in racks, each rack holding a certain class of material. As the stock ledger showed the number of the rack, as well as the number of the lot, even a person unfamiliar with the storeroom could locate any of approximately 12,000 items merely by reference to the stock ledger.

When replenishment was necessary the stock clerks filled out a storeroom stock memorandum form with a description of the article, quantity on hand and lot number. This form was turned over to a ledger clerk, who indicated on it in red ink the quantity on hand as shown by the ledger. If the ledger account did not agree with the stock clerk's record, the material in the bin was counted again and the ledger re-checked to account for the difference. By this method a perpetual inventory was kept of all active materials so that large discrepancies were not found when the annual inventory was taken.

The stock memorandum form was then given to the general storekeeper, who filled in the amount required to

be ordered, and requisition on the purchasing agent was issued accordingly. While it was the policy of the company to keep the stock on hand as low as was consistent with efficient operation, this practice was not permitted to interfere with the purchase of supplies from time to time under favorable market conditions. A maximum quantity had been placed on each stock article, and this information as well as the stock on hand and quantity required was shown on all requisitions issued on the purchasing agent. These data enabled the head of the department to keep posted on the condition of the stock for which he was approving an order for additional supplies.

After the requisition had been signed by the storekeeper, he forwarded it to the head of the department for which the material was wanted. The requisition was then sent to the general manager for approval before going to the purchasing agent.

All requisitions issued by the storekeeper at Camden were forwarded to the general storekeeper in order that the small quantities used at Camden might be supplied from the general storeroom if this could be done to advantage. If the general storekeeper could not furnish the materials, he approved the requisition and forwarded it to the general manager.

After the original copy of the requisition was approved by the general manager it was sent to the purchasing agent, the duplicate being retained by the general manager and the triplicate and quadruplicate by the storeroom. One of the latter two copies was placed in a numerical file and the other in an alphabetical file according to the class of material ordered. Upon receipt of the original copy, the purchasing agent issued an order for the required material and sent copies of the same to the general manager, the general auditor and the storekeeper. The number of the order was placed on the storeroom copies of the requisition, the alphabetical file copy of the requisition was given to the receiving clerk, and the other copy was kept in the storekeeper's file under the date upon which the material was required. If the material was not received on time, the storekeeper requested the purchasing agent to notify the firm upon which the order was issued to hasten the delivery.

RECEIPT OF MATERIAL, TESTING, ETC.

A large percentage of the supplies received at Passaic wharf arrived in carload lots, while only a comparatively small percentage of supplies arrived at the general storeroom in this manner. Many shipments were received daily at the different freight houses in Newark and were carted to the storerooms.

Certain supplies, such as babbitt metal, composition castings, paints, solder, etc., required analysis before they could be turned into stock. For instance, the babbitt metal specifications called for a composition of 83 $\frac{1}{3}$ per cent tin, 8 $\frac{1}{3}$ per cent copper and 8 $\frac{1}{3}$ per cent antimony. An average sample was taken at random from the delivery received and was sent to the chemist for analysis. If the analysis showed a variation of more than 1 per cent from the proportions specified, it was considered sufficient cause to prompt the cancellation of the order with return of the complete shipment.

When the materials were received at the storerooms

the receiving clerks weighed, counted or measured them as the case might be. An entry was then made in the receiving book, which was of loose-leaf form to pro-

all departments over regular invoices. When invoices were received from the accounting department they were checked with the receiving book record, proper entries were made and were noted therein. All invoices were approved by the storekeepers and the head of the department for which the material had been ordered and were then forwarded to the general auditor for payment. The bill clerk before entering the quantity and

Maximum _____

STORE ROOM STOCK MEMORANDUM

Date _____ 191 _____

To Stock Clerk—Please note conditions of Stock, Lot No on hand this date.

ARTICLE	ON HAND	ORDERED	
		QUANTITY	REQ. NO.

Signature _____

PUBLIC SERVICE RAILWAY COMPANY		Month of _____	Invoice No. _____
Pur. Agent Order No. _____	Freight \$ _____	CLASSIFICATION	
Date _____	Carriage \$ _____		
Local Order No. _____	Total \$ _____	CHARGE	DIVISION
Correct {	Date material received _____ By _____		
{	Date services performed _____ By _____		
{	Price, etc. _____ By _____		
{	General Stores book folio _____ By _____		
Entered {	Record book folio _____ By _____		
Extensions checked by _____			
General Approval by _____			
Remarks _____			

Public Service Storekeeping—Storeroom Stock Memorandum

Public Service Storekeeping—Sticker Type Invoice Form

vide a complete record for future reference. This form showed the shipper of the material, with a complete description of the material, the date of arrival and order number, the quantity or weight and how delivered, whether by freight, express, truck, messenger or parcel post; also if any transportation charges were paid. This form was standard for all storerooms. The receiving clerk after checking and entering the materials turned them over to the stock clerk, who placed them under the proper lot numbers.

price on stock ledgers first checked the extensions and discounts. When there was an error on the bill the general auditor was notified by the storekeepers.

CHECKING THE SHIPPERS' INVOICES

If material received by the stores department was not satisfactory for any reason or was not in accordance with the specifications, the purchasing agent was notified and requested to advise shipping instructions for its return. When material was returned for any reason a return purchase form was made out and sent to the general auditor, charging the firm with the value of the material returned. Frequently firms would ship in excess of the quantity specified on the order. When this occurred the overshipment was returned to the shipper unless it could be used to advantage.

Shippers were required to forward their invoices direct to the purchasing department. All invoices must

RECEIVING BOOK														
DATE	RECEIVED FROM	Order No.	WEIGHT or QUANTITY	NAME of ARTICLE	LOT NO.	PRICE	AMOUNT of INVOICE	EXPRESS or FREIGHT	FINISHING	CASH DISCOUNT	Net Price	TOTAL COST	INVOICE No.	REMARKS

Public Service Storekeeping—Headings of Receiving Book

contain the order number. The invoices were checked with the order by the purchasing agent, who certified to the same as to price, quantity and other particulars. He attached to the invoice one of the company's standard sticker invoice forms,* noting thereon the terms

A loose-leaf stock sheet was used as a stores ledger. This showed the lot number, rack number, description of materials and maximum amount authorized. It provided for the date, statement of quantity on hand on the last day of the preceding month, the amount received on requisition during the month, the total and the amount

PURCHASING AGENT'S COPY

REQUISITION ON PURCHASING AGENT

No. 95946 ORIGINAL

PURCHASING AGENT, PLEASE ORDER THE FOLLOWING FOR SHIPMENT TO _____ DATE _____ 19 _____

QUANTITY AUTHORIZED	QUANTITY ON HAND	REQ. NO.	QUANTITY REQUIRED	ARTICLE	FOR WHAT PURPOSE REQUIRED

STORES ORDER

No 179089

ORIGINAL _____ DATE _____

CAR HOUSE _____ SHOP _____

ACCT. No. _____ JOB ORDER _____ MFG. ORDER NO. _____ CAR NO. _____

QUANTITY WANTED	UNIT	ARTICLE	LOT NO.	QUANTITY ISSUED	UNIT COST	AMOUNT

APPROVED _____	DATE _____	BY _____	SIGNED _____
APPROVED _____	DATE _____	BY _____	SIGNED _____
APPROVED _____	DATE _____	BY _____	SIGNED _____

ORDER ISSUED NO. _____ PLACE ORDER WITH _____

DELIVERED BY _____	SIGNED _____
RECEIVED BY _____	APPROVED _____

Public Service Storekeeping—Requisition on Purchasing Agent Made by Storekeeper

Public Service Storekeeping—Stores Order Used by Way Department and Shops

of purchase as well as his approval, and forwarded all invoices to the general auditor to be checked with his records. The invoice passed through the same process in the accounting department and was forwarded to the general storekeeper for his certification. Many of the company's purchases were subject to cash discounts, and invoices for such purchases received preference in

consumed by day and month for the current year. As both sides of the sheet were used in the same manner, each ledger lasted two years.

DRAWING MATERIALS FROM STOCK

Three different forms were used by different departments when they desired to draw materials from stock, namely, stores orders, requisition on storekeeper and the

*See article on "Public Service Sticker Invoice," page 454.

material and time report. All of these served the same purpose so far as the stores department was concerned. The maintenance of way department, Plank Road car shops and Camden shops used the stores order. The carhouses of the Northern division used the requisition on the storekeeper, while the line department used the material and time report.

room employee who made up the order and the motor-man of the supply car. The foreman at the carhouse was obliged to receipt in full for the material which he received.

The material and time reports were used only by the line department and they were signed by the division general foreman. These forms showed the kind of

PUBLIC SERVICE RAILWAY CO.								JOB No.				
LINE DEPARTMENT												
MATERIAL AND TIME REPORT								Station, N. J.				
FOREMAN WILL MAKE A SEPARATE REPORT FOR EACH JOB								191				
TO BE FILLED BY GEN. STOREKEEPER												
Material	Lot No.	Size or Kind	Amount	Put up or Taken Down	Price	Amount	PLACE	TIME				
								Name	Time	Rate	Amt.	
Feed Wire												
Trolley Wire												
Span Wire												
Wire												
Hanger												

Authorization No. _____	Remarks _____	Signed _____ <i>Foreman.</i>
Charge Account No. _____	_____	Approved _____ <i>Gen'l Foreman.</i>

Public Service Storekeeping—Form Used by Line Department in Drawing Materials from Stock

Stores orders were signed by the foreman of the department that required the material. These were made out in duplicate, one of which was kept by the storeroom, while the other was sent to the accounting department. These forms showed the number of the car upon which the material was to be used, the job number and the number of the account to which the cost would be charged. They also showed the quantity required, the unit cost, the name of the article, the lot number and the amount. The order was initialed by both the storeroom employee who delivered the material and the employee of the department who received the material.

Requisitions on the storekeeper were signed by the carhouse foreman and had to be approved by the head of the department before they were honored. These

material, lot number, quantity used, unit cost, amount and job number. They were required in reporting and charging out of stock the materials used from the various line department sub-storerooms.

SUPPLY CAR SERVICE

The supply cars used for delivering materials were operated on schedule and covered the carhouses of the Northern division each week. The larger carhouses received supplies from the storerooms twice a week, while the smaller ones received one delivery a week. The car arrived at the different carhouses on the same days each week, thus enabling the carhouse foreman and supervisor to arrange to have his requisitions reach the storeroom in ample time to provide for delivery by the next car.

All supplies were checked by the stock clerk before they were loaded on the car each afternoon. When the car was loaded it was locked and left for the motor-man and his helper, who took the car out at 7 o'clock on the following morning.

The equipment for handling maintenance of way supplies consisted of thirty cars, including three derrick cars, one engine and one crane car. The supply-car motorman after delivering supplies left the receipts at the storeroom office, after which they were given to the stock ledger clerk, who entered on stock ledgers the quantities delivered. The orders were then priced, extended and rechecked, separated into the different departments, totaled each day and forwarded to the general auditor.

In addition to the regular monthly check of value of materials on hand compared with balances shown on the company's general ledger, the storekeeping department was subject to monthly visits of the traveling auditor, who followed the practice of counting materials in a number of bins, selected at random, and comparing his count with the number on hand as shown by the stock ledger.

REQUISITION ON STOREKEEPER.								No. B 9904	
TO THE STOREKEEPER:								Date _____ 191	
Please deliver to _____								Account _____	
One account only on each order.								Order _____	
Used Last Month	On Hand	Quantity Wanted	ARTICLE*	Lot No.	Quantity Issued	Unit Cost	AMOUNT		

Public Service Storekeeping—Requisition Used by Carhouses of Northern Division

were made out in triplicate; the original was kept in the storeroom, the duplicate (manifest) was forwarded to the general auditor, and the triplicate was retained by the division foreman. These forms showed the quantity used during the last month, the quantity on hand, the quantity required, the lot number, the unit cost and the amount. This requisition was initialed by the store-

DISCUSSION ON STOREKEEPING

Mr. Newton said that the purchasing department applied the system of competitive bidding wherever possible. Estimates were sent in by different manufacturers, these were carefully compared and the order was placed with the lowest bidder. The important element of quality was taken care of in most cases by standardization, or else it was an element which, with prices, was considered in placing the order. Materials like solder, babbitt and composition castings were purchased under the company's own formula, and estimates were submitted with that formula as a criterion. The same plan was followed with printing. The size, weight and quality of the paper had been standardized, after approval by the department heads, so that all printing could now be ordered under specifications. Formerly, much annoying delay was caused by the fact that printers would submit samples of stock with their estimates, and these in turn had to be submitted to the makers of the requisitions. With the standardization of paper stock, however, this source of delay had been eliminated.

A great saving had been effected by advising storekeepers of prospective advances in prices on materials subject to constant market fluctuations, such as turpentine, linseed oil, sponges, nuts, screws, elastic bands, switch rubbers, etc., which were purchased in very large quantities. If an advance in price seemed likely, the storekeepers were advised to requisition, and the orders were placed with the manufacturer who held the material in reserve for the company to draw upon at intervals. By this arrangement the purchasing department was in accord with the company policy of keeping supplies on hand as low as consistent with efficient operation, but at the same time economical purchasing was secured.

In presenting his written discussion Mr. Hughes referred to Mr. Inglehart's description of the course taken by an invoice passing through the storeroom records until it reached the "material and supplies" account. Each month a list of these invoices was prepared and forwarded to the storekeepers for checking in order that no items might be charged on the general books to "material and supplies" account without the knowledge of the storekeepers.

Frequently material was received in advance of the invoice, and if it had to be used at once the charge made was at the last price shown on the stock ledger. If the price on the invoice proved either higher or lower than this charge, an adjustment of prices was made accordingly.

When the storekeeper required for stock materials that could be manufactured more cheaply at the shop than they could be purchased elsewhere, he issued a manufacturing order which showed the order number, quantity on hand, number wanted, lot number, specifications, whether the raw material needed in manufacture was in stock or ordered and any other essential information. All expenditures for labor and material required in manufacture were charged to the order. When the order was finished a complete report in triplicate form was prepared in the shop, one copy for the accounting department, one for the storekeeper and one for the file. This report showed the number of articles manufactured, the cost divided between labor and material and the date of completion. The accounting department's copy of the completed report was sent through the storekeeper, who entered the cost on his records and forwarded them like an invoice. This report also passed through the accounting department just like an invoice, except that instead of an actual cash disbursement the cost of the materials manufactured was transferred from the "goods in process" account to the

"materials and supplies" account after the completion of the order.

When the storekeeper sent certain classes of materials to a carhouse he looked for the return of a like amount of old materials. If it was possible to repair the old materials for future use, the storekeeper charged his account with a fixed sum and credited with a like amount the carhouse from which they had been returned. The storekeeper then issued a repair order on the shop which was somewhat similar to the form of manufacturing order. Charge was made against the repair order with the value of material previously charged against the storekeeper's account and credit was given his account for the same amount as in the case of a manufacturing order. All expenses for labor and material for such repairs were charged to the order and credit was given for any salvage recovered.

Another interesting feature of the railway method of stores accounting was in the monthly distribution report. This report was compiled in the accounting department from the stores orders and manifests received by the storekeeper for materials delivered. These were forwarded daily to the accounting department. The individual amounts shown as to the value of materials delivered on stores orders and manifests were tabulated on the adding machine by the storekeeper and the stores orders and manifests were compared with the adding machine list when received in the accounting department. A receipt was signed and returned to the storekeeper for the total amount which the stores orders and manifests represented. The accounting department verified the extension and examined the classifications to see that the proper account had been charged as well as the correct job order number. Distribution of the expenses and analysis of same were then made on a Hollerith machine. On Friday of each week a report was forwarded to the mechanical engineer showing a distribution of his expenses between labor and material for the week ending on the day previous. These reports were used by him as a guide to enable him to determine whether or not economies could be effected.

ORGANIZATION AND TEAMWORK

Mr. McGraw then addressed the meeting on "Organization and Teamwork." He first discussed the importance of the A. E. R. A. section movement and complimented the company on its progressiveness in demonstrating the great possibilities for good that lie in section work. The Public Service Railway was a great organization, one of the best ever developed. It had the confidence of the electric railway industry throughout the country. It was looked to as a leader in the development of the highest ideals in public service work. It stood fully committed to the best possible service to its public with the lowest possible rate of fare, and it had won the good will of its public to an unusual degree even in these times of an extraordinary public criticism throughout the country. Under these circumstances it seemed almost presumptuous to attempt to talk to officers and men of the Public Service Railway on the subject of organization and teamwork. He realized, however, that this was a company section meeting made up of a body of the younger men, the juniors, so to say; that this was the gathering place or forum where young men could come to the front to express themselves in writing and to discuss and debate important questions of their own work for the development of the best that was in them.

One great reason for lack of man development was this: Nineteen out of twenty young men (and even a good proportion of older men) were inherently better than their work would indicate. The trouble was that

they were satisfied with less than their best. Their limitations were in the forefront instead of being absorbed by their work. They failed to make the effort to live up to the best that was in them. They shirked responsibility without knowing it. This attitude became a habit of mind which shut them out from assuming their share of the load. The man himself might not be aware of it, but the boss was if he was a student of human nature as most bosses must be. What happened? Jones was passed over in favor of the other fellow, perhaps his junior, while Jones sat and wondered why. He had forgotten the homely little ditty that says:

"So you think there is no place waiting for you;
That the boys are too many and the jobs are too few.
Just a word in your ear: By the time you prepare
To hold down a good job the job will be there!"

Daily incidents like this illustrated the need for just the kind of work that was being done by the company section. It was teaching Jones and all of its other members to do independent thinking and also to do things as well as to think them. It was teaching them how to open their own eyes to their own limitations and possibilities in order that they might be able to carry their full share of responsibilities. In short, it was teaching them how to be motors, not trailers.

THE SHIP THAT FOUND HERSELF

As a happy instance of the meaning of organization Mr. McGraw quoted Kipling's story of the ship that found herself. When the ship started on her maiden voyage the frame, the plate, the engine, the crew and other parts each bragged that it alone was the ship, the burden of their solos being, "I am the ship." But with the first storm each part discovered that it was mutually dependent upon the other; in fact, that each was helpless without the other. When port was reached there was no more individual boasting; the burden was now the chorus, "We are the ship."

"We are the ship" was the motto on which to build the ideal electric railway organization. In other words, *we* are the company; not *your* company or *the* company, but *our* company—*our* ship. We have a slogan; now how shall we live up to it? The kind of president and board of directors was the first thing of importance. His auditors knew that the president and board of directors of the Public Service Corporation were big, broad-gaged men actuated by the right motives both toward the men under them and the public which they serve. They were actuated by the spirit that the entire organization of a public service company from the board of directors to the least important employee is made up of public servants, owing to the public a duty as direct as that which they owe to the owners of the property. The same thought had been condensed to the phrase "Safety first, service second, rates third." This feeling applied with special force to those officers and employees who were constantly in touch with the public. Much was heard about the "men higher up," but in public service companies much of the difficulty was with the "men lower down." The public failed to discriminate between the unwise, unjust and inconsiderate action of an agent or employee and the action of the company itself, but the company was always held responsible.

ELECTRIC RAILWAY ORGANIZATION

In speaking of an electric railway organization, we were sure to think of the usual key diagram which showed a fine big circle for the president and board of directors, a smaller one for the general manager, still smaller ones for the department executives, and so on until, perhaps, only pinheads were left to represent

the "subs" and the "sub-subs." Of course, these diagrams were of great value on different properties to show the interdepartmental relations and who's who—if not always why. But the most ingenious diagram could give no hint about the real efficiency of the corporation which is thus pictured. The study of organization must go below such mere mechanical divisions to basic problems like these: How can we best develop the best that is in each individual? How can we foster team work between those individuals? How can we give the organization as a whole so definite a character that its attitude and aims will be justly crystallized in the behavior and expressions of its employees and be understood by the public? And in this study he would include the employees all the way down the line to the platform man.

DEVELOPMENT OF THE INDIVIDUAL

The first task must be the development of the individual, not only the individual at the bottom but also the individual at the top. The success of the electric railway as an organization began with the viewpoint which the president and its board of directors assumed toward their employees. If the company would not condescend to study the individual needs of its men, the men were not very likely to study the needs of the company. Now, studying the needs of the men did not mean necessarily the payment of more and more wages or the granting of shorter and shorter hours, but rather the cultivation of each man's individuality or powers of self-expression to fit him for the next step upward. When a business was so small that one executive could keep in touch with all of his men it was easy to advance each one according to his deserts. In the great corporations of to-day, however, the most capable manager could not develop his men by personal intercourse alone, and in this fact lay the failure of many a large organization to attain the efficiency of its smaller competitor.

How could the democratic spirit which had made this country the greatest in the world be applied usefully to American industrial life? To be sure, technical questions could not be decided by universal suffrage, but we could have an organization which would give each man a chance to express himself about his particular line of work, and which would enable him to advance with no more artificial impediments than he would encounter in political life. The spirit of the Public Service Railway stood for this idea as expressed by the company section. For instance, not only the architect and the master mechanic should design the shop, but the very man who worked under an ice-covered car body should also have a word. How much greater interest every employee would feel in his work if he knew that his experience was also an appreciated factor in the company's decisions!

A great many companies now had meetings of the general manager and department heads at stated intervals. This practice was an excellent one so far as it went; but it could be carried still further and conferences could be instituted between the foremen, the assistant foremen and the understudies of the department heads, so that when the subordinate men advance they, too, would have some acquaintance with the other fellow's problems. But the Public Service Railway had gone still further than this by the organization of a company section which, like the good old New England town meeting, was open to all regardless of position and gave each man the chance for the utmost freedom of expression on the topics that touched his bosom. He did not believe that there could be a better way than this to broaden the education of every man and to bring all classes and ranks of employees together, thus secur-

ing that mutual understanding and personal intercourse so difficult in a big corporation. Of course, some men are not so resourceful in speaking as they are in acting. For this reason, written discussions should be encouraged just as much as oral discussions.

Mr. McGraw then described the editorial organization of the periodicals of the McGraw Publishing Company. Each paper was departmentalized so that each editor, whether associate or assistant, had a division for which he was solely responsible except as to general editorial policy. Frequent conferences were also held at which the needs of each department were discussed and at which plans were made to increase or decrease activities in certain lines according to the wants of the industry served. Thus, while each man's individual ability was developed, he also obtained the all-around knowledge necessary to give him the proper sense of perspective.

Mr. McGraw added that the success of any organization in developing and keeping its men must be measured by its degree of self-perpetuation. If it must go far afield every time a big job becomes vacant, its action reflected on the executive far more than on the rank and file. The company section was a great force in developing men for higher positions.

TEAMWORK

If the organization was composed of men who were capable of growing up to larger responsibilities, the next problem was that of directing the energies of these men to a common end. This had its difficulties because ambition and co-operation might be mutually destructive instead of mutually helpful forces. It was necessary to show that in the long run what was best for the organization as a whole was also best for the individuals in that organization. It was not enough to love one's work and to be ambitious to get on in the organization; each man must also love his fellow-worker if ideal service both to his customers and the stockholders was the goal. To love one's fellow-worker meant simply this: that a man should understand the other fellow's problems so well that every move he made would be the move that would be the best for all and not for the individual. Mr. McGraw then emphasized that point by examples from electric railway practice.

For instance, the track engineer when figuring on the comparative costs of rail joints should not try to "put one over" on the power and accounting departments by ignoring the value of the electrical energy that he might have to take from the trolley line for installing those joints. It was true that he wanted to make the best possible showing for his department, but he must not forget that he and the power engineer were going to be bad friends just as soon as the latter discovered the leak. So, again, the carhouse foreman must bear in mind that a car had no business to burn its lamps when once it had entered the carhouse. Teamwork here meant plainly enough: "Keep down the other fellow's expense as willingly as you want to keep down your own."

It was natural that when the annual budgets were prepared, each department should think its own wants the most pressing; but when so many hands were knocking at the gates of the treasury every dollar spent must be granted only where it would go the furthest. But it should not be left entirely to the general manager, the president and the board of directors to decide what department was the most deserving. The budget makers should first try to decide among themselves whether the desired betterment in service could not be obtained by some other division of the appropriation than that worked out independently by each man. Additional feeder capacity, for example, might keep the cars to

schedule for much less money than new, higher-powered rolling stock.

In a large organization which numbered hundreds, nay, thousands, of men such effective teamwork as this might seem almost impossible, for even with the monthly section meetings it was still a hard problem to tie together in harmonious understanding all the rank and file scattered on hundreds of miles of track. But a good start had already been made by the baseball leagues and other friendly sporting competitions, and by the trips which the management arranged to show the men from one division over the properties of another—a practice that could only tend to broaden their minds and to give them a greater pride in their organization. Yet, after all, it was not the section meeting, the sporting competition or the excursion trip that was making the Public Service men the greatest group of teamworkers in the world—it was the knowledge that the directors of the company were broad-minded enough to treat them as men who had a real interest in their work and as men who had within them the seeds of ever greater worth.

THE ORGANIZATION AND THE PUBLIC

The last problem in organization was that of public relations. This subject had always been an important one but never had it been of such commanding importance as to-day when so many absurd ideas were extant concerning the fabulous profits and alleged tyrannical attitude of public service corporations. The rank and file who were in direct contact with the realities knew better and could perform truly patriotic service by setting their fellow-citizens right on this vital matter. But it was not so much what the men said as what they did that would win the good will of the public. They were the working force of the greatest public utility organization the world had ever known. Through their connection with that organization they were responsible for the welfare and comfort of millions of people—for their light, their power, their transportation. Was it not a worthy ambition to say to themselves: "We will supply that light, that power and that transportation so well that the people will arise and call us blessed"?

It was true, considered in one sense, that each man was only a very small fraction of a great organization, but in another sense he was really *the* organization, for his every word and action might be interpreted by the public as the spirit animating the Public Service Corporation as a whole. The conductor who aided a crippled passenger to alight, the trackman who did his work with the least disturbance of a citizen's sidewalk, and the transportation superintendent who could sympathetically listen to a fair or unfair complaint were all just as important intermediaries with the public as the biggest stockholder; in fact, they might be more important because the people were affected more directly by the action of an employee. These innumerable points of contact between the corporation's employees and the public created that atmosphere which made or marred the success of a public utility even when no great tangible faults or merits were in question. It was needless to add that the fair policy of the man higher up could have the most beneficial effect on these missionary labors of the rank and file. If the directors were imbued with the ideal that public service was a public trust, they would not only give good service to their patrons but would see to it that their own enlightened sentiments were made to permeate every branch, twig and leaf of the organization. Then and then only would the organization have acquired that definite personality which would make every employee a true and worthy representative and exponent of his company's policies.

CONCLUSION

In concluding, Mr. McGraw said to his auditors that his discussion must have been rather academic to them as employees of the Public Service Corporation of New Jersey, as no other public utility of this country had been so progressive in developing the features of organization that he had discussed. Their management was the first to install cadet engineering and apprenticeship courses which attract to electric railway work the kind of men that can "make good" in jobs where education and executive ability must go hand in hand; it was the first to secure real teamwork through personal contact at monthly section meetings; it was the first to inaugurate a system of welfare work that far exceeded in benefits the model methods of the great government of Germany; yet during this time it had raised its railway, lighting and power service to the highest possible standards. Here were achievements that every Public Service man should be proud to trumpet forth as a fitting reply to the silly denunciations of what that great statesman Bismarck rightly had called the "reptile press."

Upon the conclusion of Mr. McGraw's address a vote of thanks was given to the speakers of the evening. The meeting was then adjourned.

WELFARE DEPARTMENT FOR NEW YORK ELECTRIC RAILWAYS

T. P. Shonts, president of the Interborough Rapid Transit Company and the New York Railways, announced on Feb. 2 that a welfare department had been formed in connection with these companies and placed under the supervision of H. H. Vreeland, vice-president of the Interborough-Metropolitan Company. Welfare work in the organization of these companies has dated from the time twenty years ago when Mr. Vreeland inaugurated in connection with the old Metropolitan Street Railway what is now known as the New York Railways Association. Since that time there have been different movements looking toward the improvement of the social and economic surroundings of the employees, brought about through the voluntary co-operation of the officials of the companies and the directors and evidenced by personal contributions and the extension of the companies' credit in supporting these movements. Now, however, there has been evolved a desire on the part of all more effectively and scientifically to combine the functions of administering and developing the welfare work already being done. Previously this has been handled by the different departments, but the work has become so extensive and the monetary amounts involved have become so large that it has seemed best to the directors of the company to place all the welfare work directly under their supervision. In other words, the work is now to be completely unified under the head of one supervisor instead of being handled in a subdivided form by the various departments.

In order to bring about this unification it has been decided to create a separate and distinct unit of organization to be known as the "welfare department." To co-ordinate the various functions of the work there is to be a general welfare committee, consisting of the department heads of the companies and serving in an advisory capacity in furthering the work of the welfare department. The welfare department is to be in charge of an officer with the title of "director of welfare work," who will also act as chairman of the welfare committee. The director of welfare work as a line officer will work in close harmony with other department heads, and as chairman of the welfare work

he will be staff officer reporting directly to the president. The appointment of Mr. Vreeland as the first holder of this new office took effect Feb. 1.

The extent to which the companies concerned have previously engaged in welfare work may be judged from the following list of activities. It should be noticed that some of the lines of welfare work in the list are in connection with the street railways and others are in connection with the subway and elevated lines.

(1) The inauguration of the Voluntary Relief Department and the Relief Association. These organizations comprise at the present time approximately 60 per cent of the employees of the entire system. They pay certain death benefits according to the class membership held by the employees and enable the employees to carry life insurance at a minimum cost. The Interborough Rapid Transit Company pays all the administrative expenses of its association.

(2) In connection with one of these associations a loan fund has been established for the purpose of aiding employees who, by reason of sickness or death in their families, become in need.

(3) In an effort to reduce the high cost of living, the company, with the approval and co-operation of the employees, has established three co-operative stores in New York City upon the company's property. The operation of these stores has previously been described in the *ELECTRIC RAILWAY JOURNAL*.

(4) At practically all terminal points throughout the city the company maintains restaurants open twenty-four hours during the day at which cooked food is served to the employees at cost.

(5) At many of its terminal points the company maintains recreation rooms in which there are libraries, pool tables, baths and other comforts.

(6) The company has devoted some of its real estate holdings to playgrounds for its employees for baseball, football, tennis, etc., with a grand stand for use in bad weather.

(7) The company has organized a baseball league with clubs from the various departments. In this there is the keenest rivalry. The officers of the company, to show their interest, personally contribute each year a pennant and gold medals for members of the successful team.

(8) The Interborough Rapid Transit Company has a band of 100 employees, uniformed and equipped at the expense of the company. This organization plays at various social and other functions of the employees and often participates in patriotic and civic functions.

(9) Employees' picnics, balls, clambakes and other outings are further examples of the things concerning the employees in which the companies co-operate.

(10) The Interborough Rapid Transit Company publishes monthly and circulates among all its employees the *Interborough Bulletin*, containing articles of interest to the employees and a page or two relating to matters of personal interest to them.

(11) The company furnishes free to all transportation employees in the subway white duck uniforms, which are laundered without cost to the employees.

(12) The most recent example of welfare work on the part of the companies was the Thanksgiving gift made Dec. 1 to the wife of every married employee who had been in the service one month or more. This consisted of a pass good for free transportation over the system on which the husband is employed.

Under the new arrangement the work in connection with these welfare activities will be thoroughly organized on a unified basis, and various new movements will be taken up by the welfare committee and welfare department as these are deemed advisable.

Papers at the C. E. R. A. Convention

Abstracts Are Published of the Papers Read at the Cleveland Meeting of the Central Electric Railway Association—A Report Is Also Presented of the Proceedings on Thursday and Friday

RAILWAY MOTORS

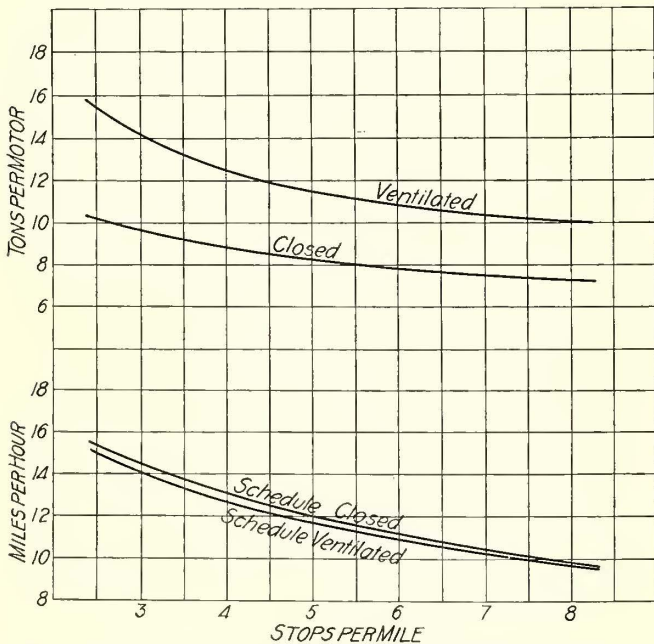
BY J. F. LAYNG, GENERAL ELECTRIC COMPANY

When the purchase of railway motors is made, the first cost is not the only thing that is now considered. The different phases touched upon are generally as follows:

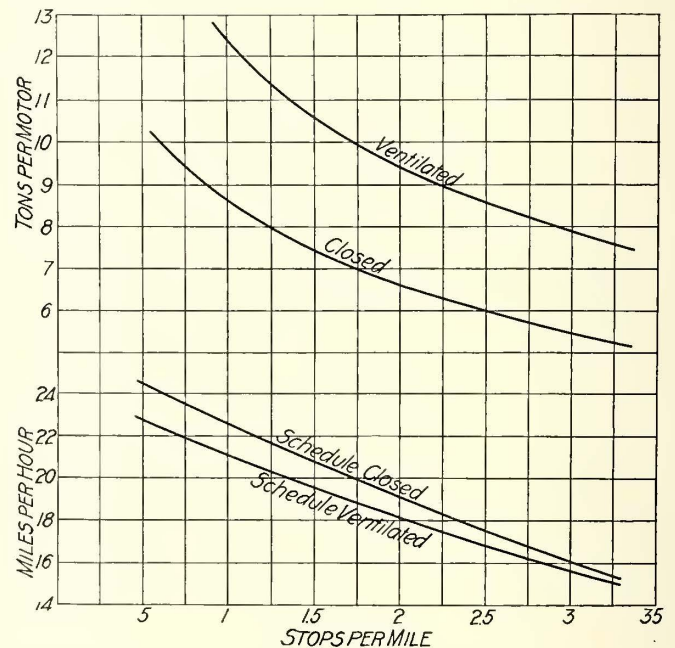
Service capacity, reliability, efficiency or energy consumption, maintenance, first cost and weight.

During the past few years many mechanical improvements have been made in lubrication as well as in the application of sheet-steel commutator covers, axle-bearing guards and a number of other small points which, while not revolutionary, will tend to re-

forms of ventilated motors exist, but the one in most general use is that in which the air is taken in at the upper and pinion side of the motor, the air flowing between the field coils, over the surface of the armature, under the commutator and through longitudinal holes in the armature laminations, and forced by a radial fan to atmosphere. With this method the interior of the motor is kept at practically a uniform temperature, and the work capacity is greatly increased. An example of this is shown by a 50-hp motor which, when entirely closed, can propel a car weighing 7.2 tons per motor and making eight stops per mile. The same motor ventilated and making the same stops can haul 10 tons per motor. If this motor is operated in a service with but one stop per mile



Service Capacity Curves of 50-Hp Railway Motor, Ventilated and Closed; 69:15 Gearing, 35-In. Wheels, 550 Volts



Service Capacity Curves of 50-Hp Railway Motor, Ventilated and Closed; 65:19 Gearing, 33-In. Wheels, 550 Volts

duce the maintenance and facilitate handling and care of the apparatus. The use of box frame motors is gradually increasing because master mechanics want a motor with the fewest possible parts and one that will be entirely free from oil within the motor shell. Another reason why box frame motors are usually selected is that while it is possible with the split-frame motor to make many minor repairs without removing the motor from underneath the car, bad repair conditions in the pit often make the total detention and maintenance costs greater than if the motor had been taken completely from the truck. With the present mechanical design of the motors and trucks of single-truck cars it is usually considered absolutely essential to have a split-frame motor.

The only radical improvement in the electrical design of railway motors during recent years has been the adoption of commutating poles to meet relatively high voltages which are being used in city and inter-urban lines.

During the last four years, however, a very decided improvement has been made in ventilation. Many

it could haul a car weighing 8.6 tons per motor, and when this same motor is ventilated it would be possible to increase this weight to 12.2 tons per motor. All of these figures are based upon motors with a temperature rise of 65 deg. C. There is necessarily some slight difference in the schedule speed for the two weights of equipment with the same gearing. This is illustrated by the two accompanying curves.

The continuous rating is another indication of the work capacity of the motor. A certain motor when fully inclosed and operating on 500 volts will have a continuous rating of 29.5 amp. This same motor under the same conditions ventilated will have a continuous capacity of 44 amp. These figures show that the ventilated motor will accomplish a given work at a much lower temperature than the same motor non-ventilated; or, to put it in another way, a much smaller ventilated motor can be used to perform a certain service. An example which illustrates this point is that of a car weighing 45 tons, equipped with four 100-hp motors weighing 4100 lb. each. These motors were removed from the car and four 40-hp ven-

tilated motors with field control were substituted. These same motors are satisfactorily performing the same schedules that had been operated previously by the larger motors. The surprising feature of this test has been that the hottest part of the windings of the smaller ventilated motor which performed this service was 59 deg. C. rise, or approximately the same temperature as that obtained by the 100-hp non-ventilated motor. This point is brought out merely to show what can be accomplished in work capacity by ventilation, and not that the manufacturer would ordinarily be willing to recommend such a small motor for this service. The mechanical construction of the smaller motor does not fit it to perform regularly, in all classes of service, the duties imposed by this heavier car. Thousands of these motors are in daily service on all classes of roadbed, and not a single case of equipment failure has been traced to ventilation.

The usual practice is to place the air intake at right angles to the direction of car motion. With this arrangement wheel wash and heavier dirt pass the intake without entering the motor. A certain amount of dust is drawn through the motor, but in order to be drawn in with the air circulation this dust must necessarily be very fine and of a light character. Practically all of it is suspended in the air circulation of the motor and forced out, and does not lodge within the interior of the motor shell. Inspection of many equipments in service show that the brush holders, brush-holder supports, commutators and commutator V rings are cleaner than, or at least as clean as, other motors which are in the same service.

A number of tests which have recently been made show that in frequent stops (city service) non-ventilated motors with an hourly rating of 25 per cent greater than ventilated motors run at practically the same temperature. This shows that when ventilated and non-ventilated motors are being considered for the same service the ventilated motor will run at much lower temperatures, and therefore it should naturally be a lower maintenance machine than the non-ventilated motor which runs at a higher temperature; and also that in so far as work capacity is concerned, this type of motor gives the greatest value for the investment.

FIELD CONTROL

When selecting equipments, many operating officials frequently ask the question: "What are the advantages of field control?" For frequent-stop city service with field control, there will be a saving from 6 per cent to approximately 10 per cent in energy consumption and for elevated service from 4 per cent to 7 per cent. It is very hard to make a statement for interurban service as there are such wide variations in interurban work. Where the interurban stops are infrequent, the saving is very small and it is not considered advisable to accept the additional complications of equipment for energy saving alone. In general, it may be said that with field control a motor of somewhat lesser hourly rating, and consequently a somewhat lighter motor, can perform any service for which it is selected, but the increased cost of the control equipment, together with the complication of the additional elements required, makes the total cost of equipment approximately the same as if standard equipments were selected.

As regards the future motor, there are so many lines of investigation based on improvements in insulation, ventilation and further investigations of the value of field control that it is extremely difficult to prophesy what improvements the coming year will bring forth.

DISCUSSION ON JOINT WEIGHT AND INSPECTION BUREAU

BY J. H. CRALL, GENERAL FREIGHT AND PASSENGER AGENT
TERRE HAUTE, INDIANAPOLIS & EASTERN
TRACTION COMPANY

The question of the advisability of establishing a joint weight and inspection bureau was first considered in the early part of 1912 at a meeting of the Central Electric Traffic Association, and it was decided to make a test by the employment of one man at an expense of \$100 per month at the Indianapolis freight terminals for a period of ninety days. This inspection, which was as thorough as it could be made by the employment of only one man, resulted in a saving, within this period, of \$1,186.16, or an average of \$16.95 per day, at a total expense of \$300. This saving could have been materially increased by the employment of an additional inspector, as the freight handled where this test was made is too heavy to enable one man to give personal attention to all shipments, which pass through four separate freight houses. In the face of this showing there has not as yet been sufficient interest shown by the member lines relative to the establishment of such a bureau to warrant the venture.

The duties of the local agents, especially at the larger terminals where most of these abuses are apparent, are of such a nature that they cannot give this matter the close personal attention which it demands. Corrections by local agents on classification and rates could in most instances be made, but corrections on weights require close, careful inspection. In the test made at the Indianapolis terminal it was shown that most of the corrections were made on weights, and not on rates and classification, as for example:

A shipment of 1000 rolls of roofing paper was billed at 5000 lb.; the actual weight was 6000 lb.

A shipment of pipe and castings was billed at 1700 lb.; the actual weight was 4700 lb.

Fifty-two boxes of oranges were billed at 2000 lb.; the actual weight was 3400 lb.

A shipment of advertising matter billed at 1050 lb. was found to weigh 4250 lb.

A manufacturer having an order for 268 auto tops was billing these at 450 lb., and this was changed to 550 lb. actual weight. On this order alone there was a saving and increase in revenue of \$77.72.

These are only a few of the hundreds of corrections made during this three months' trial. It necessarily follows that to remedy these errors in weights personal attention of an inspector is imperative, as the billing clerk almost invariably issues his expense bill from the information given him on the shipping instructions.

Another reason why a joint weight and inspection bureau should be maintained is the effect it would have upon the shipper. It is an undisputed fact that when there are few restrictions and billing is not carefully scrutinized many shippers take advantage of this delinquency by under-billing. But the fact that a bureau of this kind was maintained would undoubtedly have a tendency to eliminate this practice to a great extent. The mere knowledge that shipments were subject to inspection would have this tendency.

Inspection at any particular terminal or station would not only be a local benefit but a benefit to all lines having interline traffic arrangements. This being the fact, it follows that all interested lines should share in the cost of maintenance. I am inclined to believe that if this bureau is established by this association it should be started in a limited way, possibly along the following lines:

A chief inspector—To have charge of all inspections, to make inspection at intermediate points, and to check and compile all reports, at a salary of \$125 per month.

At Indianapolis should be two inspectors at \$75 per month. In addition to checking at Indianapolis they should inspect Terre Haute, Lafayette, Kokomo, Muncie and intermediate stations.

At Fort Wayne should be one inspector at \$75 per month. In addition to inspection at Fort Wayne he should have charge at Kendallville, Waterloo, Bluffton and intermediate stations.

At Lima should be two inspectors at \$75 per month, who would, in addition to their work at the two freight houses in Lima, have charge at Toledo, Bluffton, Wapakoneta, Findlay, Sidney and intermediate stations.

At Dayton should be two inspectors at \$75 per month, who would, in addition to inspecting the four freight houses at Dayton, have charge at Columbus, Piqua, Hamilton and intermediate stations.

At Cleveland should be one inspector at \$75 per month. In addition to inspection at Cleveland he should have charge at Norwalk, Mansfield and intermediate points.

The traveling expenses of the chief inspector would be about \$55, the traveling expenses of other inspectors about \$80, and stationery and postage would be about \$15, making a total cost each month of \$875.

The chief inspector would devote most of his time to junction points and other important places not covered by regular inspectors, in addition to which he would compile all reports and have charge of and direct his assistants. The actual mileage of the member lines handling freight is 3051. If they would all join in this expense the cost to such participating lines would be \$3.11 per mile per year. If we can keep the cost approximately within these figures, would it not be advisable, as a business proposition, to establish a bureau, as the saving in revenue would be four times the cost of maintenance?

DISCUSSION ON JOINT WEIGHT AND INSPECTION BUREAU

BY C. O. SULLIVAN, TRAFFIC MANAGER WESTERN OHIO RAILWAY

It is a question why such an important matter as the establishment of a joint weight and inspection bureau has been neglected. The interurban lines have been depending upon the shipping public to furnish correct weights and descriptions of articles transported, although it is now known positively that they are losing a great deal of money by doing so. The facts are that the shipping public, being aware that no inspection is made, gives underweight and false descriptions of freight.

There is no way for the accounting department to detect underweights except upon such articles as have estimated weights assigned to them in the official classification. But even in such instances I know of cases where, with the weights given in classification, articles have been accepted and billed at lesser weights. This is due to carelessness on the part of the agents, and it shows that there the interurban lines have more than the shipper to contend with.

An inspector for a joint bureau is wholly independent, and he is not hampered, as an agent is, by the possibility of losing business when he calls attention to classification of weights and descriptions of freight. He can depend upon the fact that the law is just as severe upon the shipper for giving false weights and descriptions as it is upon the railroad for transporting shipments for one consignor at a less charge than for

another. In addition, the activity of an inspector puts the agent upon his mettle, for the latter must realize that if he allows underbilling to continue he will eventually be reported.

Too much attention has been given to the cost of a joint inspection bureau and not enough attention has been accorded to the benefits that will be derived from it. If the matter is taken up with the accounting department under the existing loose methods, it will be found that a surprising number of cases of incorrect billing have been caught even in this way. But there is no chance for the accounting department to catch underweights, and this can only be corrected by inspectors.

The committee's report on the Indianapolis inspection test shows that this cost was \$287 during the ninety days. On this basis it would cost \$1,148 per year for one inspector, or \$11,486 for ten inspectors. With the support of at least 2500 lines of membership lines out of the 3900 miles in this association the expense would be about \$4 per mile per year. The committee shows the earnings to be \$1,250 for ninety days, and on this basis it would amount to \$5,000 per year for one inspector, or \$50,000 for ten inspectors. However, I believe that this amount will be increased \$15,000 during the first year that the bureau is established, making the first year show a gross earning of \$65,000. This would leave a net earning of \$38,514 on the basis of the Indianapolis test, but on my estimate it would leave a net earning of \$50,000, or on the basis of 2500 miles a net earning of \$20 per mile.

With regard to the smaller lines, it should be said that these will receive freight from the larger terminals where inspectors are regularly stationed, and they will thus secure a benefit from this source as well as having their stations inspected at regular intervals.

It would be impossible to have inspectors at all stations all the time, but it will be the aim to have every station of any consequence inspected, so that the smaller lines will feel the benefit of the inspection at the larger terminals and will benefit locally as well. The fact that agents will be subject to visits by the inspector will get them into the habit of watching all the shipments, and if an agent is found persistently to neglect watching his billing he can be removed.

The question may arise as to how long it will be necessary to continue such an inspection bureau. It should be permanent. The steam lines have such a bureau that has been operating for twenty-five years or more, yet with the almost perfect system of inspection, together with the laws making falsification punishable by fine and imprisonment, the shipping public still tries to get its freight transported at less than the regular price whenever that is possible.

The joint weight and inspection bureau of the steam lines at Cleveland, Cincinnati, Columbus, Dayton, Akron, Springfield and Toledo for the month of November, 1913, weighed a total number of 3319 cars, of which 948 showed underweights. The gain in weight resulting from the carload weighings amounted to 18,352,000 lb. The total number of less-than-carload shipments which were found to be underweight was 7172, giving a gain in weight of 824,000 lb. Both carload and less-than-carload shipments involved a saving, due to the existence of the bureau, of the charges on more than 19,000,000 lb.

With regard to the inspection of classification, the total gain amounted to more than 2,000,000 lb., most of the changes in classification taking place by raising shipments billed as second-class to first-class, with shipments raised from third-class to second-class next, and then with shipments raised from fourth-class to third-class.

The total saving from both weight inspection and classification inspection amounted to the charges on more than 21,300,000 lb. These figures show the vast amount of tonnage that would be lost by the steam lines each month except for the rigid system of inspection, and if it were not for this inspection they would, no doubt, lose many million pounds more than indicated by the existing figures. It should be remembered that only seven of the larger terminals in the State of Ohio are taken as a basis for this case. All of these terminals are served by the interurban lines.

In closing I must urge upon you to consider this matter very thoroughly, and it is my hope that some action will be taken at this meeting which will permit the establishment of a permanent joint weight and inspection bureau for the interurban lines.

ANNUAL REPORT OF THE SECRETARY-TREASURER

BY A. L. NEEREAMER

The interurban membership of this association on Dec. 31, 1912, consisted of fifty-eight lines, covering 3841 miles and one city line. Since that time the city line and one interurban line, amounting to 60 miles, have withdrawn. During the same period two interurban lines amounting to 45 miles have affiliated with the association. This, together with the merging of some of the member lines and extensions of others, leaves the present membership fifty-eight lines, covering 3859 miles, an increase of 18 miles. During the year 1912 the membership in the supply men's department was 131 and for the year ended Dec. 31, 1913, 121, a decrease of ten. Receipts and disbursements for the year 1913 are as follows:

RECEIPTS	
Cash on hand Jan. 1, 1913.....	\$1,641.37
Interurban lines	3,785.65
City lines	9.38
Supply men	968.00
Sale of buttons	18.00
Stationery and printing	1,272.19
Central Electric Railway Accountants' Association.....	28.50
Miscellaneous	10.57
Interest	51.32
	\$7,784.98
DISBURSEMENTS	
Payroll	\$3,280.00
Traveling expenses	172.37
Stationery and printing	1,437.75
Postage	185.00
Telephone and telegraph.....	100.65
Office incidentals	14.00
Taxes and insurance	6.69
Freight and express	56.56
Office fixtures	2.00
Rent	504.00
Legal expense	19.85
Central Electric Railway Accountants' Association.....	134.12
Checking account	87.68
Savings deposit	1,784.31
	\$7,784.98

You will note from this report that there is on deposit \$1,871.99, of which \$1,784.31 is with the Fletcher Savings & Trust Company, drawing 3 per cent interest.

Your attention is also called to the following statement of accounts receivable and payable:

ACCOUNTS RECEIVABLE AND PAYABLE DEC. 31, 1913			
Cash on deposit.....	\$1,871.99	Accounts payable	\$0,000.00
Receivable from rail-roads	270.30	Total assets	2,142.29
	\$2,142.29		\$2,142.29

During 1913 your secretary made a trip through the eastern part of the territory, endeavoring to secure additional railroad members. During that trip, after presenting the proposition to a number of non-member lines, he was able to secure but two members, and since the first of the year another one of the lines has affiliated with the association, this line not being included in the report for the year 1913. There are still quite a

number of lines in the eastern and northern part of the territory that are not members of this association. During the year covered by this report your secretary corresponded with those lines, explaining in detail the work which we are doing and the benefits that might be derived by becoming a member, endeavoring by correspondence to persuade these lines to join the association, but did not meet with any success.

For the valuable assistance received from the officers, committees and members during the past year your secretary wishes to extend his thanks and express his hearty appreciation.

ANNUAL REPORT OF THE CHAIRMAN OF CENTRAL ELECTRIC TRAFFIC ASSOCIATION

BY A. L. NEEREAMER, CHAIRMAN

Your chairman takes pleasure in submitting herewith his report for the year ended Dec. 31, 1913.

The past year has been one of great activity in this association, and many important points have been discussed and harmoniously settled. No one great proposition stands out as an achievement during the past year, yet in the aggregate the work accomplished has been greater than in any previous period.

Of the membership of the Central Electric Railway Association forty-six lines, representing 3569 miles, participate in the tariffs and other publications of this body. This is an increase of 291 miles over the previous year. The number of interested lines remains the same, but this can be easily accounted for when we consider that a sufficient number of the lines merged during the period mentioned to offset the additional members.

The interchangeable 1000-mile ticket is now participated in by thirty lines, covering 2792 miles, an increase of 246 miles but a decrease of two lines for the reasons given above.

The chairman files the official classification for thirty-eight member lines.

We now have in course of reconstruction the following tariffs which will be printed and filed as soon as possible: the joint and local baggage tariff, the official interurban railway equipment register, joint exceptions to official classification and joint passenger tariff No. 6. This latter tariff will show an almost complete reconstruction. All useless rates and routes are being eliminated, and the territory covered will be very greatly increased, particularly that portion of the territory which has been heretofore confined to intrastate traffic and has now been opened to interstate traffic.

During the year just passed there have been two issues of the official classification, Nos. 40 and 41. Both of these issues have had quite a number of supplements, for some of which it was necessary to secure special permission from the various railroad commissions. The fact that the filing of these was handled through the chairman's office has saved considerable labor and expense to the member lines, particularly in securing the "special permission."

The interchangeable 1000-mile ticket is proving more popular each year. During the year just passed approximately 5000 of these tickets have been ordered by the member lines and placed in the hands of their agents. This makes an average of about 4000 per year since its inception.

As a means of stimulating through traffic the chairman submits for consideration the following suggestion: That a card about 18 in. x 20 in. be printed advertising the sale of through interline tickets, checking of baggage and sale of the interchangeable mileage ticket by member lines, this card to be posted by all

companies at their stations and distributed about the various cities. This suggestion is offered for the reason that a number of cases have been brought to the attention of the chairman where the traveling public did not know it was possible to purchase through tickets and check baggage to destination.

For the successful results that have been accomplished by this association the chairman desires to thank the various committees and members, not only of this body but of the parent body, for the conscientious co-operation and support given him. At this time he also desires to extend special commendation to the members of the Traffic Association who attended the last two meetings, during which all of the rates and divisions between headline points were checked. As a record of the hard work of the members present this task was accomplished in two meetings, the best record heretofore having been four meetings.

With loyal co-operation and the display of the same spirit during the coming year, greater and more valuable work can be accomplished as well as the scope of the association extended.

DISCUSSION ON JOINT WEIGHT AND INSPECTION BUREAU

BY F. D. NORVEIL, GENERAL FREIGHT AND PASSENGER AGENT UNION TRACTION COMPANY OF INDIANA

"Weight and Inspection" very early received attention from the steam railroads. Their organization, known as the joint weight and inspection bureau, has ramifications in every important city in the United States, its control being absolutely independent of any one or any combination of railroads. These companies decided after years of trial of different plans that the only sure way was inspection by inspectors who were responsible only to the head of the organization.

While it is not my intention to charge direct dishonesty against any shipping interests, we know from our experiences that we cannot depend upon the shippers to give correct weights or correct classifications in all cases. Hence the necessity of some supervision.

THE TRIAL IN 1912

The Central Electric Traffic Association early in 1912 decided to make a test case at some industrial center, placing one man in charge as an inspector with absolute authority to correct billings of all kinds—both inbound and outbound. A few electric lines joined in the expense necessary for the experiment, and it was begun on May 25, 1912, and terminated on Aug. 31, 1912. Shipments aggregating 789,691 lb. which were inspected showed a total saving to the lines interested of \$1,250.40. This period covered sixty-two working days, with an average of 11,362 lb. and a saving of \$17.99 for each day the inspector was employed. Indianapolis was selected by the Traffic Association as being geographically well situated and under shipping conditions the best for trying out an experiment of this character. The lines interested were the Indianapolis, Columbus & Southern, the Indianapolis & Cincinnati Traction, the Terre Haute, Indianapolis & Eastern, and the Union Traction Company of Indiana. The saving for each line named in the order named was: \$93.08, \$126.79, \$373.04 and \$657.49, or a total of \$1,250.40. The expense incident to this experiment aggregated about \$300.

It was first thought that we might extend the operation of this proposition to many of the towns in the Central Electric Traffic Association's territory, but the expense looked appalling, and it was suggested that an effort be made to join the steam road weight and in-

spection bureau and let their inspectors and their rules cover the traction lines. This matter was referred to a special committee appointed at South Bend, Ind., at the fall meeting in 1912. After various efforts on the part of the committee to get some expression from the steam roads' weight and inspection bureau, it was found that the proposition could not be considered, and it was therefore dropped. However, the matter has again been brought up in order to effect some line of action which will accomplish the most good at the least expense.

There are three freight houses at the Indianapolis Terminal, and to divide his time equally among these freight houses the inspector worked two days out of each week in rotation. In other words, one freight house would receive inspection on Monday and not again until Thursday, except in a case where the inspector might be called in on some special occasion to settle a question of importance between parties offering deliveries and the warehouse men.

It seemed as though the work of the inspector even put "ginger" into other employees and caused them to pay greater attention to classifications, weights and other particulars than they would do were there no inspector on duty.

Do not mistake the importance of this work or imagine that all the good that was done was confined wholly to the city of Indianapolis, because shipments originating at points outside of that city received the same inspection and correction as consignments which were forwarded from Indianapolis. This was equally true as regards shipments coming from foreign lines for an Indianapolis delivery, so that the good done at any inspection point is not confined wholly to that point.

POSSIBILITIES OF THE NEW BUREAU

Taking this trial as a basis, we argue that inspection at the very large industrial centers and points where large shipments originate would practically cover the State of Indiana. In other words, an inspector at Indianapolis, Fort Wayne, Terre Haute and South Bend, with one or two traveling inspectors, say for such junction points as Lafayette, Kokomo, Richmond, etc., would practically cover the entire transportation business of the State, and the same plan would apply in Ohio as well. I question whether at the beginning it would be necessary to make this a distinct organization but believe that the duties incident to its supervision should be cared for by the chairman of the Central Electric Traffic Association, as was done at the time of the Indianapolis experiment. He might receive the help of an advisory committee, composed of, say, three members of the Traffic Association, so that they might decide important questions which could not await the regular meetings of the association.

The expense as outlined for the State of Indiana could probably be covered for \$500 per month, and by confining regular inspectors to fewer points this expense could in like manner be decreased. From the fact that nearly every business is now employing a traffic man, who closely scrutinizes every waybill coming to his house in his effort to earn his salary, it appears that business men are taking advantage of every technicality to get some return on freight paid.

There is no question that the items covered by the official classification will be more closely drawn from time to time, and, on account of the stringent rules forced on the railroads, whether they desire it or not, they must use every means in their power to get all the revenue that is due them, and we all know that this is little enough.

When the business done by electric railways was confined wholly to their own line, they might have

taken the liberty to say it was nobody's business how they did their work, but the great increase in the interchange of traffic made by electric railways as between themselves makes such a stand untenable. No one railway has the right, through the carelessness of its employees, to burden a connecting line with errors in billing or from any other cause.

This reason alone should make for closer scrutiny of checking bills against the freight at all passing points, as all errors in billing and wrong classification are in a manner preventable. An instance recently came to our notice of bad inspection which occurred in this manner: A consignment of shoes forwarded from a factory in Ohio to various agencies in Indiana was originally sent in fiber packing cases, meeting the specifications of the official classification, being properly sealed, etc. After a time the remainder of this same consignment was returned in the original packing cases. However, in the later case the shipment was accepted by the forwarding agent without his compelling the shipper to comply with the regulations governing the handling of package freight in fiber cases. In many instances these kinds of shipments are accepted without the corners being sealed or otherwise strengthened, simply being closed by a cord tied around them. As the strength of a fiber case is absolutely dependent upon the proper sealing, the consignment referred to had no protection whatever and might just as well have been done up in ordinary wrapping paper. Such carelessness as this would be detected by an inspector, and many a dollar would be saved in loss and damage to the carrier.

Before closing this paper I would like to call your attention to Interstate Commerce Commission's decision, No. 4631, of June 18, 1913, on the matter of alleged irregularities and discrepancies in the weighing of freight by carriers. Evidence of the importance of this subject, from the viewpoint of the commission, is borne out as follows, quoting from this report: "While it is true much of this investigation has been along the lines of car load weights," it further states "that some attention incidently has been given to platform scales."

This investigation took on a wide range. Hearings were held in all parts of the country and occupied forty-six days, with over 7000 pages of testimony. Surely a subject of this importance to the steam lines and the Interstate Commerce Commission should receive some attention from the electric railways.

REPAIRS AND WELDS OF TRACK AND ROLLING STOCK BY ELECTRICITY

BY E. C. PRICE, VICE-PRESIDENT THE INDIANAPOLIS SWITCH & FROG COMPANY

The term electric welding without classification or definition is vague and covers a variety of methods, such as the "spot," or "soak," welding in which the parts to be welded or united are interposed between electrical poles carrying an alternating current of high amperage and low voltage. The interposed members, acting as resistance, are thus brought to a welding heat, and during this time mechanical pressure is applied, making a perfect butt weld. However, with large areas, or in case of excessive impurities in the metal, the slag retained within the weld renders it more or less imperfect. This method is rapid but limited in its use.

In another method of electric welding a carbon-arc flame from a low and varying voltage and heavy current is directed against the parts to be welded until the surfaces are brought to a welding heat. If the metal is to

be added, it is placed in small sections within the heated area or on the surface against which the flame is directed. This process admits of hammering or forging the metals while at a welding heat, effecting a substantial weld for a wide range of work, particularly where the heating of the whole member is not detrimental.

The latest method of electric welding is the outgrowth of the carbon-arc welding, but it differs in process, application and results, having proved particularly adaptable to certain classes of work for the following reasons: First, a metal electrode is employed and constitutes the material to be added to or welded on a worn or broken part; second, the welding heat is confined to an area equivalent to the area of the end or point of the metal electrode and the welding action is instantaneous, beginning when the arc is drawn and terminating with the withdrawal of the electrode; third, the metal is not simply melted or laid on as in welding by flame, but makes a thorough amalgam.

The electrode is fluxated steel, iron or other metal of proper and varying constituency and size, averaging 3/16 in. or 1/4 in. in diameter. Suitable electrical current is passed through the welding machine, adapted and regulated according to the nature of the work, and then through a flexible cable to which is attached an insulated handle or head holding the metal electrode. This forms the positive electrode, and the part to be welded or added to forms the negative electrode.

To start the welding, the electrode is placed in contact and withdrawn just a sufficient distance to form a short arc. This arc makes a pocket or cavity in the negative member and at the same time deposits therein a molten globule of metal from the positive electrode. The action is continuous until the positive electrode is melted down. The molten metal follows the direction of the current and unites by "first intention," making a perfect joining of the metals. It does this without disseminating undue heat.

Thus the method is particularly applicable in the filling in of key seats and the building up of worn bearings and tapers of armature or commutator shafts, without removing the shaft or injuring the winding. The electrode used for this class of work is a steel that is easily machined and the process has a wide range of use in and around carhouses. Where broken wrought-iron, cast-steel, malleable-iron or gray-iron parts were formerly discarded, they can now be reclaimed at a very little outlay and frequently in less time than is required to procure or apply new parts, it being possible in many instances to repair breakages without removing the parts from the cars.

Special track work, such as frogs, switches, mates and crossings, particularly of the later type of construction, including hard-center or solid manganese work, always become worn or broken down at the intersections, although the main portion may be still practically as good as new. The worn-down intersections are built up by depositing new metal, using an electrode of special hard steel. This is then ground down to the original surface at a cost for material and labor varying from 1 per cent to 9 per cent of the value of the layout without disturbing the paving or interfering with traffic to any extent.

The durability or permanency of repairs has not been fully determined because the proper steel properly applied has shown wearing qualities equal to, if not greater than, the original metal. Work done at the time the process and materials were first perfected, which was about two years ago, is still holding up and giving good service. The metal unites with and adheres to any normal manganese steel and, while the application of heat to manganese has a tendency to soften it, the metal is toughened and the added hard steel be-

comes the new wearing surface. Since the heat is applied only at the points of and under the deposit, the adjacent surface is not affected or impaired.

An analysis of the failures recorded in the welding of manganese steel would indicate contributing causes that, with ordinary care, could be eliminated. But in connection with the welding of manganese or other hard wearing steels an occasional instance has been discovered which is not thoroughly understood or explained, namely, the presence of a peculiar content or ingredient that causes vehement boiling or combustion, practically consuming the electrode metal without a residue of deposit. This, however, is a rare occurrence and is simply mentioned as an interesting fact.

The building up of Bessemer or open-hearth rail is attended with practically no contingencies, and a veneer of hard-welding steel either on special work or for the filling in of low or battered joints practically converts the ordinary construction into hard-service or armor-plated work. Cupped joints, deep corrugations or depressions are filled in, then ground to the original surface with a track grinder.

The cost of the latter class of work varies somewhat with the condition of the track, traffic and grinding facilities, but an average cost for filling in cups from 8 in. to 14 in. in length and from $\frac{1}{4}$ in. to $\frac{3}{8}$ in. in thickness and re-grinding is about 75 cents per joint. Roads equipped for doing this kind of work can build up depressions as soon as any appreciable wear is in evidence, as steel can be applied as lightly as 1/16 in.

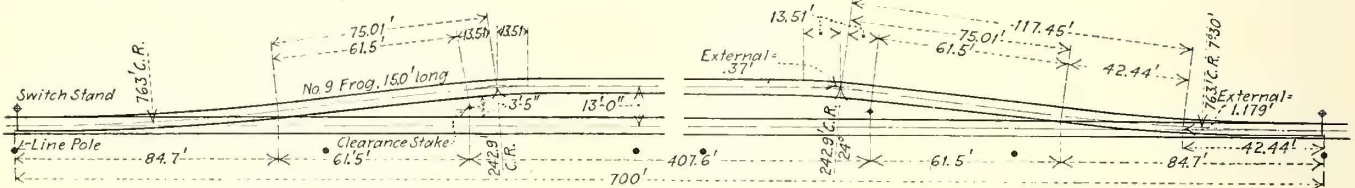


Fig. 1—Track Construction and Maintenance—Through Type Electric Siding

in thickness. This requires less grinding and keeps the track normal in surface and the special work built up to the benefit of the rolling stock as well as the patrons of the road.

In the maintenance of roadway, one of the gravest problems is that of joint plates and bonds. A joint that will eliminate pounding and subsequent cupping of rails, that will not require re-bolting or the taking up of pavement, and that will have perfect conductivity, is a profitable investment, even though it is installed at a cost several times that of the ordinary bolted and bonded joints.

A description of one form of welded joint is as follows: A pair of plates fitted to a bearing on the base or flange of the rail are clamped or temporarily bolted in place and welded around the edges. In the case of side bearing rails, head supports are also welded in place and in some instances the base of the rails is welded to a plate placed lengthwise beneath the joints. One man and a helper will apply from seven joints to twelve joints per day, the cost for the ordinary girder rail being from \$3 to \$5 per joint for straight splices and from \$4 to \$6 per joint for compromises. This cost is based on welding under traffic. The strength of the joint is demonstrated by the fact that where a rail has broken owing to spiking down too near the joints during the welding process the joint has held intact and the rail broken from 4 ft. to 6 ft. from the joint. Meter readings have shown the conductivity to be practically double that of the rail sections and the joints installed during the last two years have withstood temperature ranges of more than 100 deg.

TRACK CONSTRUCTION AND MAINTENANCE

BY L. A. MITCHELL, SUPERINTENDENT TRACK AND ROADWAY UNION TRACTION COMPANY OF INDIANA

The location of a line of railroad is generally governed by the topography of the country between the points it is intended to connect, but the topography too often receives too much consideration, or, rather, an alignment is established with the idea of evading heavy grading work and with too little consideration of the grades and curves that will exist and will have to be operated over after the line is completed. After the preliminary survey has been made and the topography of the country is thoroughly known to the engineer, he instructs his locating party to locate a line with a certain limiting degree of curvature and limiting gradient. These two are inseparable, as a curve of any given degree will offer to the operation of a train a resistance which is equivalent to a certain grade.

TRAIN RESISTANCE DUE TO CURVES, GRADES AND SLIDING WHEELS

It is unfortunate that the experiments for determining the amount of curve resistance to the operation of a train have not been more numerous or more satisfactory. The results which have been obtained, however, show that in all probability the resistance of a curve is about $\frac{1}{2}$ lb. per ton per degree of curvature. The resistance offered to train operation due to grade

is 22.4 times the rate of grade per 100 ft. per ton or 14/33 times the rate of grade per mile. This equation and the first on curve resistance may be combined, and it will be found that a 1-deg. curve will offer resistance equal to a grade of 0.025 ft. per 100 ft.

It can readily be seen that for flatter curves the resistance to train operation due to curvature for single-car trains will not be great, but in the operation of 100,000 car miles this resistance will be considerable. Nearly all electric railways are compelled to have curves of 100 deg. or greater, on account of passing through towns and cities, and, according to the preceding assumption, a 100-deg. curve would be equivalent to a $2\frac{1}{2}$ per cent grade on tangent track. However, I do not believe any of the experiments noted were made on curves of such high degree, and no doubt other forces enter into the operation of the car around a curve of such high degree. On these sharp curves it is necessary to have guard rails, at least a single guard rail, and many engineers think a double guard rail is necessary. The wheels which come in contact with these guard rails necessarily offer greater resistance to the movement of the car than if no guard rails were present.

Another resistance is the sliding of wheels, both lateral and longitudinal. This resistance enters into train operation no matter what the curvature, but it is much greater on sharp curves. From the standpoint of maintenance, curves increase the cost of wheel maintenance as well as the cost of renewing rails. In addition, we have the increased amount of power necessary to carry a train over a given piece of track. Probably the most noticeable example of the resistance of curves

is when we stop one of our heavy interurban cars with one or both trucks in a sharp curve, particularly when the line voltage is weak. With practically all wheels in contact with guard rails—and with the trucks at an angle, the resistance is maximum just before the car commences to move.

DRAINAGE

Drainage conditions can very often be materially improved from a maintenance standpoint if proper consideration is given to this matter at the time the road is located and constructed. This has been especially neglected in the construction of city tracks. We can find many examples where it is almost impossible to keep the track in any kind of surface, owing to the fact that the water which has followed down along the rail or seeped through the street covering has found its way to the foundation of the track, where no way

placed on a material which is not considered reliable when subjected to excessive erosion.

Many foundations were found to have been placed on gravel varying from 1 ft. to 4 ft. or 5 ft. below the stream bed, and during the excessive high velocity of the water in the streams they were undermined and the superstructure damaged. It was found that other foundations were placed on a thin layer of hard pan which varied from 1 ft. to 3 ft. in thickness and was partly soluble in water. As this material was washed out the foundation failed. In one case the bridge abutment was placed on gravel, although solid rock existed about 4 ft. below the base of the foundation.

If it was not known before, it was certainly proved during last year's flood that a gravel foundation for piers or abutments carried to any reasonable depth is not safe without driving piles. It has also been clearly determined that a stratum of hard pan should be of

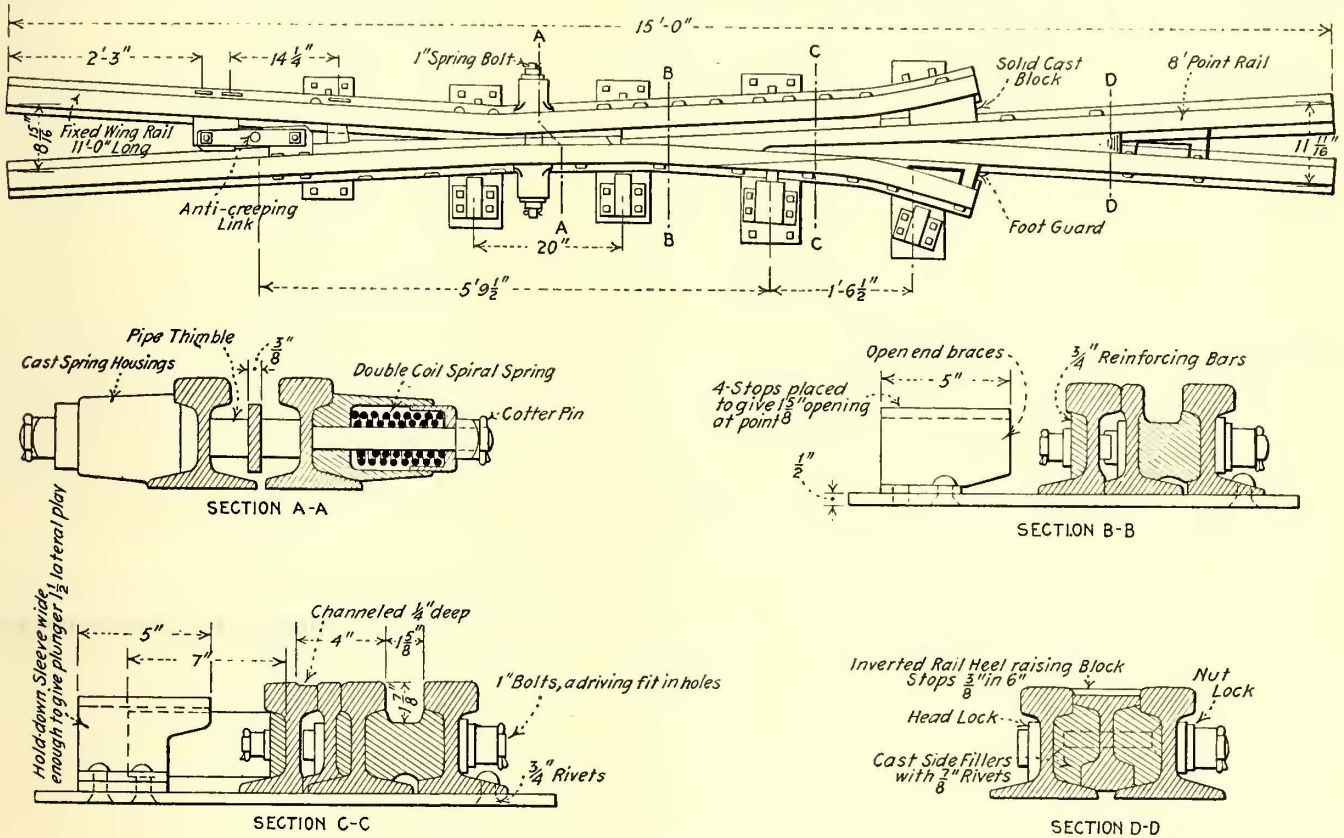


Fig. 2—Track Construction and Maintenance—Construction of No. 9 Frog for Through Type Electric Siding

has been provided for it to get away. Such track will have to be rebuilt very much sooner than if a tile drain had been placed under the foundation and connected with sewer inlets at street intersections. If the track foundation is concrete, the tile drain should be laid under the concrete and surrounded by cinders, crushed stone or some other loose material so as to afford opportunity for any water that might get under this foundation to drain into the sewers. It is also advisable to place surface drains to take off any water that may run along the flangeways, at least at street intersections, and connect these to sewer inlets.

FOUNDATIONS

Many of us in Ohio and Indiana found out several things about the foundations of our bridges after the flood of 1913. From what information I can obtain, I believe that not less than 95 per cent of the bridge failures on both steam and electric lines were due to poor foundations. Almost invariably these foundations had not been carried deep enough or they had been

greater thickness than 1 ft. or 2 ft. before it is used as a foundation. In all probability, a stratum of hard pan should have a thickness of not less than 8 ft., and the foundation should be carried at least one-half of this distance into the foundation material. Further, this hard pan should not disintegrate when allowed to stand in water.

Investigation as to the quality of material can easily be made by using a 2-in. or 2 1/2-in. auger inside of a 3 1/2-in. pipe. A sample of the material can be obtained as frequently as desired and to a considerable depth. This method, of course, will not be very satisfactory in a gravel-like material when any boulders are present.

BALLAST

Ballast is a material that is just as essential to the riding qualities of good track as good rails and ties. Poor riding track which is so on account of poor ballast conditions introduces stresses into a car body which will eventually loosen nearly every joint of the whole structure. If the car is allowed to run until this con-

dition is pronounced, it means ultimately that the extra car shop labor and material will cost more than proper track ballasting and surfacing.

The Pennsylvania Railroad, in 1911, made some rather extensive tests to determine the best kind of a cushion for broken stone ballast to be placed between the sub-grade and the ballast proper. Its experiments were made with the idea of using broken stone ballast entirely, but the object was to find out how much and what kind of material was the best to take care of the drainage of the ballast proper and also to distribute the load transmitted through the ballast over the sub-grade. These experiments showed that cinders and good clean gravel were probably the two best materials that could be used as a ballast cushion; also that about

STANDARD CONSTRUCTION PROPOSED FOR SIDINGS
 For many years it was impossible for electric roads to adopt standards for construction because their method of transportation was new and subject to rapid developments. I am submitting four drawings as possible standards for side-track construction.

Fig. 1 shows the general layout for a through type electric railway siding, using a No. 9 frog which has a lead of about 85 ft., with a frog angle of 6 deg. 21 min. and a 7 deg. 30 min. curvature from the switch points to the frog. Electric railways have generally constructed sidings with too large a frog angle, which necessitates a sharp degree of curvature leading to the siding. This excessive frog angle has been the cause of many accidents and has also increased the main-

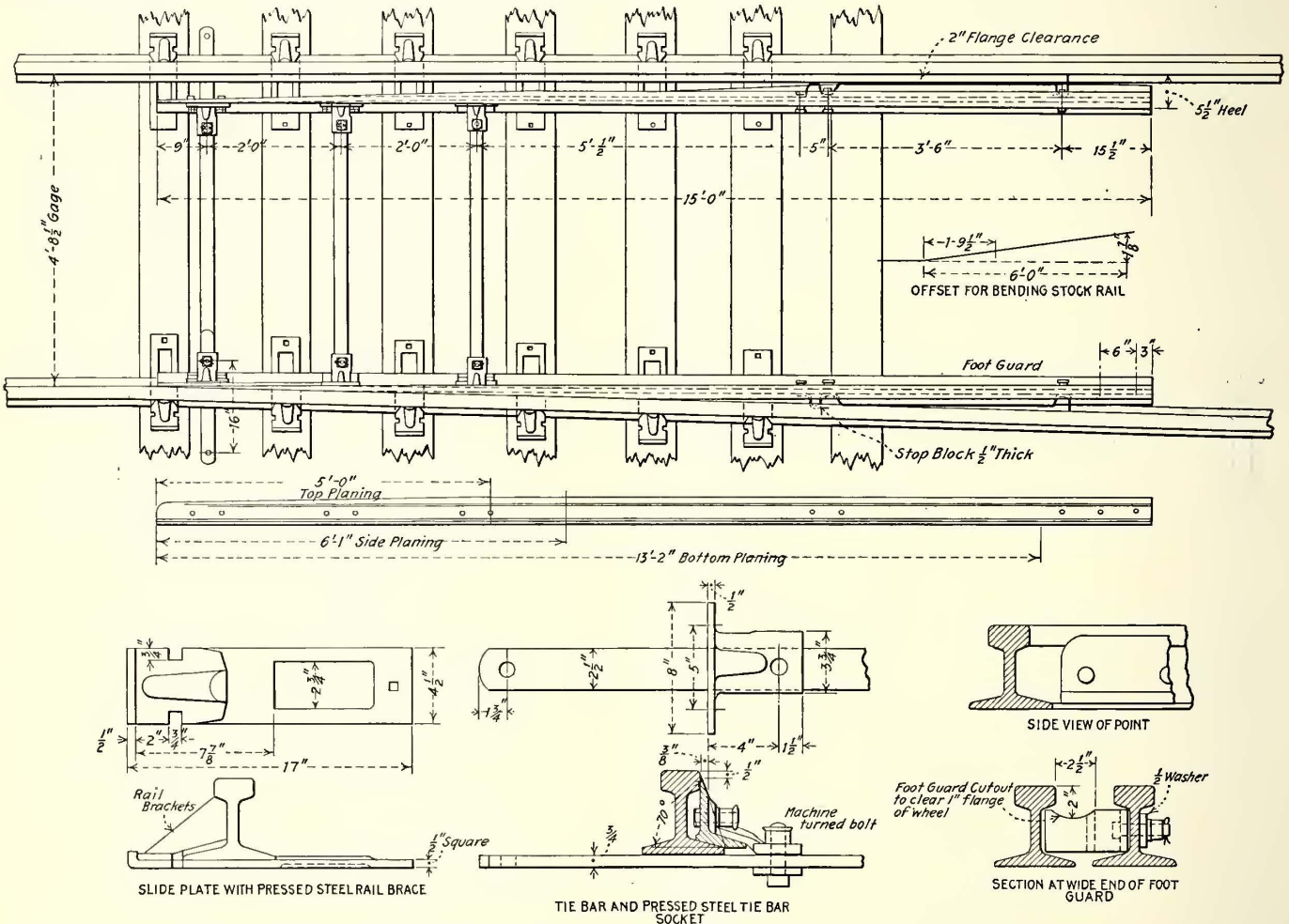


Fig. 3—Track Construction and Maintenance—Detail of Switch Points for Standard Siding

2 ft. of either of these materials under the ballast proper gave the most uniform distribution of load over the sub-grade. For the loads electric railways ordinarily carry 1 ft. of this material would be ample thoroughly to distribute the load over the sub-grade, and this with an additional 1 ft. of regular ballast, either stone or gravel, would give very excellent track. Inasmuch as cinders are a continuous by-product of most electric railways, it would seem that very excellent track could ultimately be obtained by using this material as ballast and then putting in gravel or broken stone on top of the cinders for the regular ballast course.

Cinders have a peculiar quality of absorbing water, nor do they wash away so fast as gravel when water flows over the track. On the other hand, cinders will compress and after use for a considerable time will have a more uneven surface than gravel.

tenance cost on the siding entrance. The siding shown here has a clear distance between clearance stakes of a fraction more than 407 ft., and the total length of the siding between switch stands is 700 ft. The clear distance of this siding will allow the storage of six of the largest interurban electric cars. The reason for making this siding a certain number of pole lengths long is that this allows each switch stand to be placed opposite a pole, thus facilitating the wiring of the electric switch lamp direct from a pole already in place; also, should an overhead trolley switch be used, it would be operated by the switch stand and so could be installed without the necessity of an additional pole.

Fig. 2 shows the construction of the No. 9 frog used in the foregoing siding, with 70 lb. A. S. C. E. rail. This frog has been found to be very satisfactory. All of the plates under this frog are 1/2-in. thick, and all fillers are rolled steel. This frog has but one spring

and one holding-down bar. It is fully equipped with foot guards and an anti-creeper. All bolts in this frog are of special heat-treated steel, whose elastic limit is not less than 75,000 lb. per sq. in. and whose ultimate strength is 100,000 lb.

Fig. 3 is a detail of the switch points for this standard siding, showing dimensions of plates and rail braces; also the extent of the side and base planing. These points are 15 ft. long and are equipped with foot guards. One head rod is adjustable and the other two rods are rigid.

Fig. 4 shows a switch stand which is very desirable on account of its few movable parts and also because every part of this stand is open and can be seen easily, thus enabling a section man to inspect this stand without disturbing any part of it. Another feature is that when the switch is thrown properly the handle will drop into the notch in the top plate. This is evidence to the trainmen that the switch points are in their proper position. Still another good feature is that it is impossible to twist the stem of this stand, because the connecting rod and the crank on the lower part of the stand are always in a straight line, so that should a train run through a switch there will be a direct tension or compression on the crank and the connecting rod. This condition is obtained because the lever handle, in throwing this switch, swings through 180 deg. and leaves the crank for either position of the switch points in a plane at right angles to the plane of the switch handle.

STREET CONSTRUCTION, INCLUDING JOINTS

The foundation material, weight and section of rail and the design of switches and frogs are features of street construction which are very important, but I do not believe that there is any one thing that is of as much importance as the construction of the joint. It has been the experience of practically every electric railway that the joint has failed first and that reconstruction was made necessary on account of the failure of the joints, whereas the rail in between the joints had many years of life.

In modern street construction four types of joints are used. All of these are tight, with the ends of the rails milled so that they will fit tight together with no allowance for expansion and contraction. These types are the driven-bolt joint, riveted joint, welded joint and the combination of bolted and welded or riveted and welded. As far as I can ascertain, the purely welded joint has given trouble. The only explanation I can see for this is that in applying the weld the ends of the rail are heated to a temperature high enough to change the molecular construction of the steel in such a way as to cause fractures of the rail just back of the weld. I have not heard of any failures of the combination joint where bolts or rivets and a small weld were used. I believe that practically as satisfactory a joint can be obtained as any now in use by using driving fit bolts or rivets and supporting the whole joint by means of a broad steel tie. This gives a supported joint, and if the rails are properly ground at the joint so that no hammer is allowed to start, this type promises as long a life as any now in use.

Some companies are buying their rails with the holes

drilled or punched a fraction of an inch smaller than the size of the bolt that they intend to use. Then, by means of reaming machines, they ream these apertures out to a true round hole of the exact size that they wish to obtain. Very satisfactory results have been obtained, however, by having these holes drilled to the proper size at the rail mill and then using machine bolts of the same size as the hole. I do not believe that a joint bolt for street track of the heavier type of construction should be less than 1 1/8 in. in diameter. Fig. 5 shows the supported bolted joint described.

Where street track is constructed with tight joints and steel ties are used at the joints or throughout the total length of the track, joint bonds and cross bonds can be eliminated by welding the joint bars to the rail and the rail to the steel tie. All rail joints in street track should be ground to an even surface, as the specifications under which we buy rail allow for a possible maximum difference in height of the rails of 3/64-in., and this is sufficient to start a hammer which will very quickly cup the rails.

The foundation of street track is a question upon

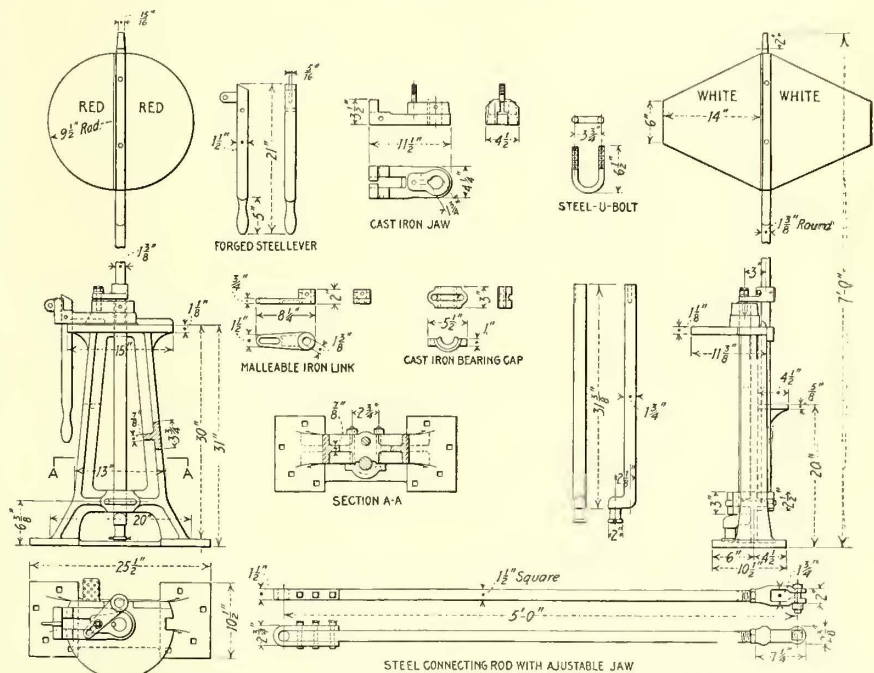


Fig. 4—Track Construction and Maintenance—Details and Assembly of Switch Stands

which engineers differ very widely. Some say that street track foundation should be absolutely rigid, others say that it should be elastic like open track construction, and still others say that it should be a combination of the two. Some engineers assert that they have obtained good results by placing track on ordinary stone or gravel ballast, tamping it well and then concreting on top of the ballast as a foundation for the pavement only. Another type of foundation is to lay from 6 in. to 12 in. of concrete in the bottom of the trench, place in about 1 in. of sand, surface the track on this sand and then fill in to the proper elevation with concrete. The remaining method is to have concrete from the bottom of the trench up to the cushion for the pavement. It is impossible with any kind of ballast to tamp up track so that there will be no settlement, and consequently the pavement will finally work loose about the rails. It would seem, therefore, that a rigid foundation will give a construction which will require the least maintenance of track and pavement.

The proper type of rail for street construction has

also been the subject of a great deal of thought. I believe that we will eventually come to the use of T-rails entirely, with a section of sufficient height to allow for paving. This height should not be less than 7 in. A chamfered granite block has been found to give excellent service as a flangeway. Higher carbon steel rails have probably not been used sufficiently to determine the extent of their advantages and whether or not they are worth the increased expense. It is undoubtedly true, however, that for bolts a special steel is advisable. Special steel bolts with an elastic limit of not less than 75,000 lb. per square inch and an ultimate strength of 100,000 lb. are giving a very much stronger joint construction and are also rendering excellent service in built-up railroad crossings.

GUARD RAILS, SPECIAL WORK AND CROSSINGS

In constructing short radius curves at street intersections it is a general practice to have the guard rail higher than the running rail. This is so whether the

wheel will receive a strong blow when it comes in contact with the raised portion of the flangeway. We want to avoid pounding in the special work as well as at joints, and the raised flangeway with a long flat approach is the way to eliminate this hammer.

Railroad crossings and the expense of maintaining them have always been a source of much concern to both steam and electric engineers. Out of 152 railroad crossings during the year 1913, I had eighteen new installations, at an average cost of \$260 per crossing. If I include these new crossings, my average maintenance cost per crossing was \$68 for the year. An average maintenance cost excluding the cost of the new work but including the cost of installing it was \$37.50. It is impossible to arrive at any average cost of maintenance for a railroad crossing, because it depends entirely upon the amount of traffic, but this cost can be decreased and the life of the crossing increased by having a construction which allows as little movement as possible between the various pieces. All of the frog

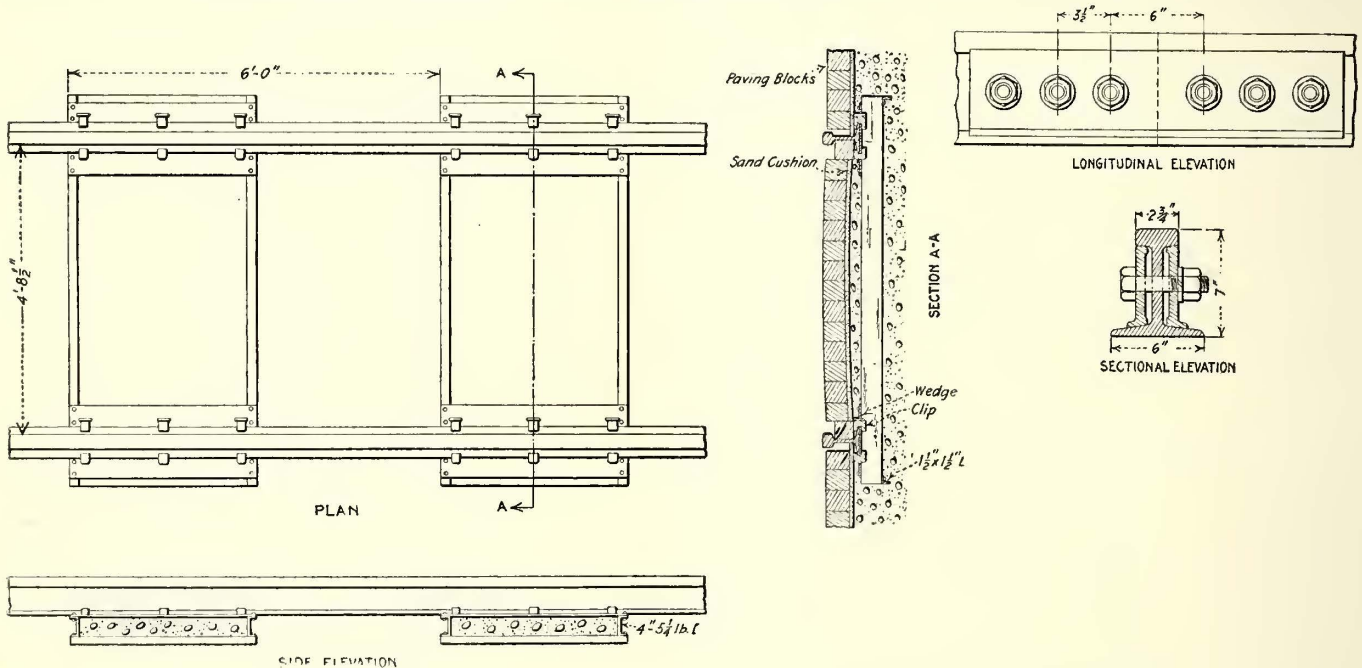


Fig. 5—Track Construction and Maintenance—Sections and Plan of City T-Rail Construction; Also Details of Joint

guard is rolled as part of the running rail or a rail is used as a guard. I have found it very satisfactory, however, to use a guard rail of the same height as the running rail, and to bolt this to the running rail every 2 ft. by 1-in. machine bolts with steel lugs holding the guard rail at the proper distance from the running rail to secure the proper flangeway. In case a rail is used as a guard rail, the method described gives a much more substantial form of construction than using a rail of less height than the running rail and supporting it on steel plates to give it the proper elevation because the equal height guard rail has as a firmer foundation the same ties that support the running rail. This equal-height construction also makes an easier riding street intersection for vehicles.

The raising of flangeways in frogs and mates so that the flange of the car wheels will ride while the tread of the wheel is passing over the opening in the ball of the rail has been widely discussed, and it has been stated that chipped flanges will occur where this type of special work is used. But if a car is operated at the proper speed over a piece of special work with raised flangeways, chipped flange trouble is not probable. A common mistake in the raising of flangeways is that the approach is made too steep so that the flange of a

bolts should be driving fit and of special steel, the filler should fit the rail sections under the ball and at the base, and machine knee braces should be used. A rigid inspection of crossings by taking them apart will often reveal a very poor fit between the fillers and the rails and also between the knee braces and the rails. To obtain rigidity in a crossing and reduce the possibility of movement between various parts, solid cast manganese crossings are used to a large extent. Manganese steel, however, will break easily, and I am inclined to believe that the better type of crossing is the built-up type with manganese steel running and easer rails.

The foundation of a crossing should be continuous throughout its whole length of the crossing and should extend beyond the joints of the wing rails. In many cases timbers are used and placed under the steam railroad rails throughout the entire length of the crossing to give them a continuous support. I have found, however, that a steel structure consisting of channels and plates riveted together, filled with concrete and placed in its entirety on broken stone ballast gives very satisfactory results. A crossing with this type of foundation as installed under two main line tracks of the Big Four Railroad did not require any attention

for a whole year, whereas in the same length of time an ordinary built-up crossing installed at practically the same time, but without this type of foundation, showed considerable wear and was working to quite an extent, even though the traffic over it was probably less than one-half that of the crossings with the steel foundation. The latter showed very slight wear for the period mentioned. From my experience it looks as though this type of crossing foundation is a decided improvement over other methods, but it may be that longer experience will show that even this foundation can be improved.

RECORDS

The cost of construction and maintenance work must be known to the engineer in order that he may determine, while the work is going on, that it is not more expensive than it should be. Materials purchased for renewals must be kept track of to ascertain if they are rendering proper and efficient service. To obtain this information the records must be such that the desired information will be at hand at the proper time and in the proper form.

ACCOUNT OF THE C. E. R. A. PROCEEDINGS

The annual meeting of the Central Electric Railway Association was held in Assembly Hall, the Hollenden Hotel, Cleveland, this week on Thursday and Friday. The sessions began Thursday morning with 137 delegates in attendance. President Brady called the meeting to order and introduced Hon. Newton D. Baker, Mayor of Cleveland, who made an address of welcome.

Mayor Baker said that he was very glad that the Central association had selected Cleveland as its meeting place this year. Street railways throughout the country were in a period of transition. Over-extension of them had occurred, and the results were still in evidence, although much of this over-construction of railways was justified from the standpoint of city and rural development. Regulation of public utilities in some form was now generally regarded as inevitable. In Europe, where regulation of this kind had preceded that in this country, it had forced private owners of city railways to a large extent out of transportation enterprises. Here regulation is complicated because of outlying and unprofitable lines which had been built for the future. But even where regulation was not active the primary purpose of railway men should be to act as public servants. So far as the future was concerned, the effect of regulation of public utilities would be to improve the mutual understanding and sympathy between the railway company and the public, and the value of pioneering would be recognized. In other words, a calmer attitude on both sides was certain. The Mayor continued that in Cleveland the railway company was a partner of the city. In this case regulation had been very successful, and the relations between the public utility and the city were now on a thoroughly satisfactory basis.

JOINT WEIGHT AND INSPECTION BUREAU

Following the address by Mayor Newton, the president announced that the first business on the program was a discussion of the proposed joint weight and inspection bureau. The papers on this subject by J. H. Crall, C. O. Sullivan and F. D. Norviel were then read. They appear elsewhere in this issue.

Summing up the papers, Mr. Norviel said that he had interviewed several business houses on the subject and that he had been met with ridicule when he called attention to inaccuracies in billing, weights and classification. Mr. Sullivan said that the expense of maintain-

ing the existing bureau of weight and inspection on the steam railroads was divided on a mileage basis, and he did not believe that in the case of the proposed electric railway bureau it should be done on a basis of business handling. Mr. Crall said that so far as his own line was concerned it could have its inspection done more cheaply by hiring a special inspector than by co-operating in any joint bureau on a mileage basis. Nevertheless, he believed in the co-operative plan.

In continuation of the discussion several delegates expressed the belief that the benefit to be derived from such a bureau by the different companies was in direct proportion to the business done and not according to mileage. G. W. Parker, Detroit United Railway, said that a great deal of good on his road had followed a campaign to raise the efficiency of the station agents. He did not believe that the shippers were to blame for inaccuracies in all cases. Overworked shipping clerks often guess at weights. However, he hoped that the work of the committee would be continued as it would be of great value. S. W. Greenland, Fort Wayne & Northern Indiana Traction Company, said that his company expected to install an inspection bureau for itself if the co-operative plan was not adopted.

President Brady said that inspectors should be employed in any case, and that it was a question simply whether they should be employed by the individual road or on the co-operative plan. F. D. Carpenter, Western Ohio Railway, said that if the mileage basis would not do some other should be adopted. He expressed himself as strongly in favor of establishing a bureau of some kind promptly. Then if the details of operation were not satisfactory they could be changed later if necessary. H. A. Nicholl, Union Traction Company, of Indiana, moved that the association should go on record in favor of the bureau and that it should refer the matter to the Central Electric Railway Traffic Association with instructions to work out the details of operation, provided enough roads would join in the plan. The motion was carried unanimously.

CLAIM INDEX BUREAU

William Tichenor, Terre Haute, Indianapolis & Eastern Traction Company, who was to have delivered an address on the subject of the claim index bureau of the association, was unavoidably prevented from attending the meeting. Instead, the discussion was opened by Elmer E. Slick, claim agent Union Traction Company of Indiana. He said that his company had received practically no benefit from the local bureau and practically none from private bureaus. In fact, he believed that few claim fakers really existed and those which were engaged in this business could be discovered without outside agencies.

President Brady said that if the existing local bureau of the association was not serving any useful purpose it should be dropped. After further discussion in regard to the value of the local bureau, the matter of its continuance was referred to the executive committee for consideration and action.

ELECTRIC WELDING FOR TRACK AND ROLLING STOCK

The next subject on the program was "Repairs and Welds of Tracks and Rolling Stock by Electricity," by E. G. Price, Indianapolis Switch & Frog Company. This paper is published in abstract elsewhere.

After reading his paper, Mr. Price exhibited several interesting samples of steel to which additional pieces of both hard and soft metal had been welded.

In further discussion of the paper it developed that the necessity of screens around operators when working in public streets had been shown. These screens prevented onlookers from inconvenience from the

bright light produced during the welding. The fact was also brought out that the direct current carried metal with it so that welding could be done with an inverted arc, provided that a small electrode was used. Any tendency of the metal to become overheated and consequently cracked was overcome by the use of thin films of welded material. Power for welding cost from $\frac{1}{2}$ cent to $1\frac{1}{4}$ cents per minute, but it should be borne in mind that the power so taken from the trolley wire stops instantly when the arc is broken. The sought-for pocketing of metal on the welded part took place with voltages as low as 125, but better results were secured with 200 volts, and 500 volts was necessary for best operation. Grinding of welds after they had been made was necessary because if an attempt was made to smooth off the surface by the carbon flame it injured the surface of the metal.

TRACK CONSTRUCTION AND MAINTENANCE

The paper on track construction and maintenance by L. A. Mitchell, Union Traction Company of Indiana, was then presented by Mr. Mitchell. It is presented in abstract elsewhere in this issue.

During the discussion C. H. Clark, Cleveland, said that if sulphur was present in track ballast through the use of slag or cinders, it was apt to corrode the rails. Mr. Mitchell said that International steel ties had been in use on the lines of the Union Traction Company of Indiana for some fifteen months and had given very satisfactory service. S. W. Greenland, Fort Wayne, said that he had been using cast welded joints for three years without a single failure.

Mr. Clark said that the Cleveland Railway had been employing for some time high-carbon rail with titanium to prevent brittleness. The Clark joints used by the company had high-carbon plates and high-grade rivets. There had never been a failure of this kind of joint. The cost per joint was about \$5. G. J. A. Paul, Youngstown, said that the experience on the Mahoning & Shenango Valley Railway with cinders used as a sub-ballast had been satisfactory, but that it had not been used directly as ballast because of its tendency to deteriorate the rails.

The association then adjourned to accept the invitation of the Cleveland Railway to take a trolley trip around the city and visit various factories, particularly those engaged in manufacture of electrical and electric railway apparatus. This trip was very enjoyable.

FRIDAY'S SESSION

The session on Friday was opened with an address on "Taxation," by Peter Witt, City Street Railway Commissioner of Cleveland. Mr. Witt made a vigorous speech advocating the exemption of taxation on improvements. Such a plan, he said, would relieve the increasing burden of taxation which is being carried by corporations. As an example, he cited the unprofitable extensions of the Cleveland Railway, which, he said, were taxed heavily, although the lines increased land values enormously. According to Mr. Witt, a single-tax campaign will be inaugurated next year in Ohio.

The address made by Mr. Witt was followed by a paper on "Railway Motors," by J. F. Layng, railway engineer General Electric Company. This paper is published in abstract elsewhere in this issue.

The annual report of A. L. Neereamer as secretary and treasurer of the association was then read by Mr. Neereamer.

President Brady then delivered his annual address as retiring president. He referred to various local problems before the association and also to national problems in which all of the members were inter-

ested. Mr. Brady cited especially the dangers to the community in general and to the taxpayer in particular of municipal ownership of electric railway companies. Regulation of public utility companies, he said, to be successful must be reasonable. Examples of regulation and of ownership of public utilities, such as are often quoted from European practice, are not comparable with situations in this country because of the great difference in conditions. Mr. Brady believed that a campaign for government ownership of railroads here was inevitable and that such a campaign would have an important though indirect influence on the favor with which municipal operation of public utilities would be considered. He believed that the best course to pursue was one of publicity upon the whole question.

The president then called for the report of the nominating committee. This recommended the following:

For president: E. F. Schneider, general manager Cleveland, Southwestern & Columbus Railway.

For first vice-president: Charles L. Henry, president and general manager Cincinnati & Indianapolis Traction Company, Indianapolis.

For second vice-president: A. Benham, general manager Ohio Electric Railway, Springfield, Ohio.

For treasurer: A. L. Neereamer, Indianapolis.

These officers were unanimously elected. After President Brady had officially announced the result of the election, Mr. Schneider, the new president, was invited to take the chair. He did so and made a short address in which he expressed his appreciation of the honor conferred upon him. The meeting was then adjourned.

OTHER BUSINESS AND ENTERTAINMENT

The Central Electric Traffic Association held its meeting on the evening of Wednesday, Feb. 25. The report of the chairman was read and discussed. It appears elsewhere in this issue. At the close of the meeting Mr. Neereamer was re-elected chairman.

A smoker for the entertainment of those delegates who arrived in Cleveland early was also held Wednesday evening. The entertainment was provided by professional talent with volunteer assistance. Among those who gave their services were Messrs. Crume, Kennedy, Scullin, Witt and Starkey.

The thanks of the association for this entertainment, which was arranged by the suppliers, were officially extended to them by the association in a vote taken the following day.

MEETING OF 1914 CONVENTION LOCATION COMMITTEE

A meeting of the committee on the location of the 1914 convention of the American Electric Railway Association was held last week. Those in attendance were C. Loomis Allen, chairman; H. C. Donecker and L. S. Storrs, representing the Railway Association, and C. R. Ellicott, H. C. McConnaughy and S. K. Colby, representing the Manufacturers' Association. Secretary Burritt was also in attendance.

It was decided to appoint a committee consisting of Messrs. Storrs, Colby and McConnaughy to visit Boston and consult with the representatives there of the Chamber of Commerce and the Mayor of the city to see what arrangements could be made for holding the 1914 convention in Boston. Secretary Burritt was requested to visit Washington and consult the Chamber of Commerce in Washington to see what arrangements could be made for holding the 1914 convention in Washington.

Another meeting of the committee was scheduled for the afternoon of Feb. 27, when the report of these two committees will be considered.

COMMUNICATIONS

ROLLER BEARINGS IN PLACE OF JOURNAL BRASSES

MICHIGAN UNITED TRACTION COMPANY
ALBION, MICH., Feb. 18, 1914.

To the Editors:

Referring to your editorial of Jan. 31 entitled "The M.C.B. Brass Should Be Discarded," I am not certain that the M.C.B. brass should be discarded simply because some roads using high brakeshoe pressures have had some trouble with displacement of journal brasses. Of course, some roads have for several years been using a design of journal brass which has reduced their hot boxes and have overcome the displacement difficulty by redesigning the brass to give a larger arc of contact on the journal. But this is not necessarily the proper remedy. If the brakeshoe pressure is applied on both sides of the wheel, the tendency to displace the brass and to set up other strains on the truck will be greatly reduced.

However, braking on both sides of the wheel, although undoubtedly a correct method, has not been adopted simply because it adds somewhat to the details on the truck and because it increases the first cost. Yet some of the larger interurban lines are putting on heavier steel coaches and heavier equipment, and, when a pressure of 100 per cent of the light weight of the equipment is applied on one side of the wheel, the M.C.B. limit per brakeshoe has already been reached and exceeded.

I believe that the whole subject of journal brasses, brakeshoes, brake pressures and the redesigning of the journal bearings should be submitted to a committee of the A. E. R. A. with the idea of obtaining recommendations as to the best solution of the whole problem. In this connection it may be appropriate to suggest that the committee investigate most thoroughly the question of whether a new brass should be recommended, or some other form of ball or roller bearing, to take the place of the time-worn and much-abused M.C.B. brass.

There are quite a number of cars now running with this type of bearing and it is quite conceivable that, with the high-grade materials available and the improved methods of manufacture at this time, there may be a solution of the bearing question entirely different from a redesigning of the M.C.B. brass. Cost of power is continually climbing, and if there are any advantages in power consumption, in oil consumption, in cost of maintenance, or in reliability of service, due to another type of bearing, these and other points will be brought out in the investigations of the committee and the whole industry will benefit by its work.

R. C. TAYLOR, Superintendent of Equipment.

END THRUST ON JOURNAL BRASSES

BAY STATE STREET RAILWAY
BOSTON, MASS., Feb. 24, 1914.

To the Editors:

The editorial in your issue of Jan. 31 and the article upon the use of an extended brass on the New York, Westchester & Boston Railway were very much to the point, but it is possible to go somewhat farther in the matter of journal box design, with particular reference to the damaging effects resulting from excessive end play, especially on lighter equipment. In fast interurban service very heavy equipments are generally used, but the long-radius curves ordinarily found on the line enable the car to escape the side lash or pounding back and forth of journals so often encountered with local city or suburban rolling stock on sharp curves. Our

troubles with the so-called "M. C. B. standard design" of box have arisen from the limited bearing surface on the top of the journal, with a resulting tendency on its part to draw to one side under a heavy application of the brakes, mainly in interurban service; and in addition, on city cars, the end thrust has required special treatment.

In the M. C. B. standard 3 $\frac{3}{4}$ -in. x 7-in. box the standard shoulders at each end of the journal are too small to take care of the end thrust for any length of time, and the shoulders soon wear into the brass. Then, as the play increases, the axle bearings, gears and gear cases become damaged. About two years ago this was overcome by placing an end-thrust bar at the end of the journal. The dimensions of the end-thrust bar are about 5 $\frac{3}{4}$ in. x $\frac{7}{8}$ in. x 1 $\frac{1}{8}$ in., the bar being of malleable iron and lined with babbitt on the inside face, the metal being held in place by pouring it through the tapered holes. A photograph of the open journal box with the thrust bar in place was shown in the Oct. 5, 1912, issue of the ELECTRIC RAILWAY JOURNAL on page 617. A similar illustration was also shown in the 1912 report of the equipment committee of the American Electric Railway Engineering Association. In extending the brass down the side to about half the diameter of the axle it was found necessary to use only about 30 per cent of its bearing area to take care of the side play.

To introduce this improvement it was necessary only to extend the boss on the side of the journal box 1 in. and place ribs or lugs at the sides so that the end-thrust bar could be properly carried. This additional work on the standard box did not change its actual features or prevent its use in connection with the old standards. This small alteration of the box has covered the ground fairly satisfactorily and has required no change in the standard journals.

In making use of the extended brass the box has to be lifted a little higher than is usually necessary, and to accomplish this, together with the use of the end-thrust bar, the lugs supporting the latter must not project out far enough to interfere with the lifting of the box sufficiently so that the extended brass can be slipped into place. I feel that the subject should have the further attention of the Engineering Association, and it, no doubt, will be taken up as soon as the opportunity permits.

E. W. HOLST, Superintendent of Equipment.

WELL-BUILT TRUCKS A HELP FOR JOURNAL-BRASS TROUBLES

NEW YORK, Feb. 24, 1914.

To the Editors:

Experience with journal brasses on motor trucks seems to indicate that most of the troubles (principally consisting in the brass being worn out of shape) seem to be due to the pull of the motors on the axle, as well as to the action of the brake. In all cases these are aggravated by the loose fit of the journal boxes in the pedestal guides. If proper attention is given to this point, most troubles with journal brasses will vanish. There have been trucks turned out by prominent manufacturers which were literally thrown together and in which scarcely anything fitted; even truck bolts were a loose fit before the pressure of the nut was applied. On the other hand, some trucks are built with care, journal boxes are fitted to pedestal guides, bolt holes are reamed with a taper reamer and bolts are a driving fit.

In using outside brakeshoes on well-built steel motor trucks the action of the air brake has never caused any trouble with journal brasses.

Over twenty-five years ago the old Eames Vacuum

Brake Company, now the New York Air Brake Company, used fifteen or twenty different styles of locomotive brake rigging, and among these was one with a brakeshoe on each side of the driving wheel. This type was applied principally to eight-wheeled engines, usually at the request of the railroad company, which wished to avoid the pressure on one side of the driving boxes. However, most roads did not consider the point a serious one and do not do so at this time. We did not call that type of brake a "clasp brake" then—some one has invented the name since. E. C. BOYNTON.

PACIFIC CLAIM AGENTS' EXECUTIVE COMMITTEE MEETING

The executive committee of the Pacific Claim Agents' Association met at 11 a. m., Feb. 6, 1914, at Seattle, Wash., in the office building of the Puget Sound Traction, Light & Power Company, where the secretary-treasurer of the association maintains offices.



Pacific Claim Agents' Executive Committee Meeting at Seattle

Those present were: President J. H. Handlon, claim agent United Railroads of San Francisco; First Vice-president Thomas G. Aston, claim agent Washington Water Power Company, Spokane, Wash.; Second Vice-president A. M. Lee, assistant general claim agent Northern Pacific Railway Company, Seattle, Wash.; A. E. Beck, claim solicitor British Columbia Electric Railway, Vancouver, B. C.; H. G. Winsor, claim agent Tacoma Railway & Power Company, Tacoma, Wash.; H. K. Relf, claim agent Spokane, Portland & Seattle Railroad, Portland, Ore.; B. F. Boynton, claim agent Portland Railway, Light & Power Company; George Carson, general claim agent Puget Sound Traction, Light & Power Company, Seattle, Wash., and T. N. Henry, temporary secretary-treasurer.

After the subject committee for the 1914 convention had made its report and President Handlon had read a list of a large number of suggested topics, it was finally decided to have written discussions on the following subjects prepared for the annual convention to be held at Spokane on July 9, 10 and 11, 1914:

What methods should be pursued to keep informed of the movements of witnesses in cases where litigation is likely to arise?

What are the most effective methods that can be adopted by public service corporations in prosecuting fraudulent claimants and professional witnesses?

The prevention of automobile accidents. Statistical information showing the accident cost of trainmen with respect to length of service.

To what extent can the claim department co-operate with the operating department in the matter of selecting trainmen as to their moral, mental and physical fitness?

What can be done toward remedying the trespassing evil?

The following questions were also selected for oral discussion: "Is it advisable for a statement to be secured from an injured person immediately after an accident occurs without regard to liability or the intention of the injured person to file claim?" and "What policy should be adopted in the disposition of claims of doubtful liability?"

It was decided to establish a library of safety literature at the office of the secretary-treasurer of the association and to make an exhibition of this safety literature at the Spokane annual meeting for the benefit of the public.

The following committee was appointed by the president to make a report on the safety movement from the standpoint of the public and from the standpoint of transportation companies: Messrs. Carson, Aston, Lee, Boynton, Beck and Winsor. The following committee was selected to have charge of the entertainment to be afforded the members of the association at Spokane: Messrs. Aston, Relf, McDonald, Crowther, Ryan and Kone. T. N. Henry was elected secretary-treasurer of the association.

MEETING OF 1915 CONVENTION COMMITTEE

A meeting of the committee of the American Electric Railway Association on the location of the 1915 convention was held in New York Feb. 25. Those in attendance were J. D. Mortimer, chairman, C. L. Henry and H. C. Donecker, for the Railway Association, and E. H. Baker and H. G. McConaughy, for the Manufacturers' Association. Secretary Burritt was also in attendance.

The committee first attempted to estimate the number which will attend the San Francisco convention because a guarantee must be given to the hotels so that rooms will be reserved. It was decided, however, that in view of the unusual circumstances of distance, etc., connected with this meeting it was practically impossible for the committee to estimate the attendance without further information. Consequently it asked Secretary Burritt to mail to each member company a circular letter asking each company to advise the association of the number of men each will send to the convention and for which the company will guarantee the hotel charges, also the number of additional representatives who will probably attend the meeting. The letter will be accompanied by a blank on which this information may be entered.

The companies will also be asked to state as closely as possible the period of time for which the rooms will probably be required, the kind of room wanted, etc. This letter will be accompanied by a statement of the rates to be charged during the convention period by the different hotels, if this information is available at this time. The committee sent a telegram to Messrs. Gregory and Hanlon, the Pacific Coast members of the committee, for this information. The hotels in San Francisco request this information from the association by July 1 of this year so that they may make the desired reservations.

ANGLO-AMERICAN EXPOSITION

The exposition which is being arranged to celebrate the 100th anniversary of the treaty of Ghent is expected to promote a friendly feeling between the two countries. To this end the management urges that the representatives of American firms should be men capable of making the most of the opportunity. Each exhibition space should be regarded as an actual branch of the house represented.

Equipment and Its Maintenance

Short Descriptions of Labor, Mechanical and Electrical Practices in Every Department of Electric Railroading

(Contributions from the Men in the Field Are Solicited and Will Be Paid for at Special Rates)

STATUARY BRONZE FINISH OF CAR HARDWARE

BY O. T. KREUSSER

The repolishing of the bright brass work on cars every few years, or at more frequent intervals, to keep it presentable, has undoubtedly exasperated more than one individual who is interested in car maintenance. In order to refinish the hardware properly, it is necessary to remove and repolish it. This means the labor of removal and replacement with its accompanying loss of parts; furthermore, the permanency of finish depends entirely upon the life of the lacquer which is used to prevent the tarnishing.

To obviate this trouble and at the same time enhance the finished appearance that bronze trimmings give to a car the statuary bronze or oxidized surface finish was introduced. The theory of this treatment is to tarnish the brass work with chemicals to a suitable and attractive shade before installation, and then when it is worn or chafed the tarnish due to natural oxidization will readily blend with the tarnish which was first applied artificially. In this way good appearance is maintained permanently, as the trimmings can be readily cleaned and freshened simply by rubbing them off with a rag and oil when necessary. Many roads have obtained these statuary finishes (of which there are endless shades of color) on new equipment as applied by the hardware manufacturers, but they do not know how to duplicate the finish when replacements or repairs become necessary.

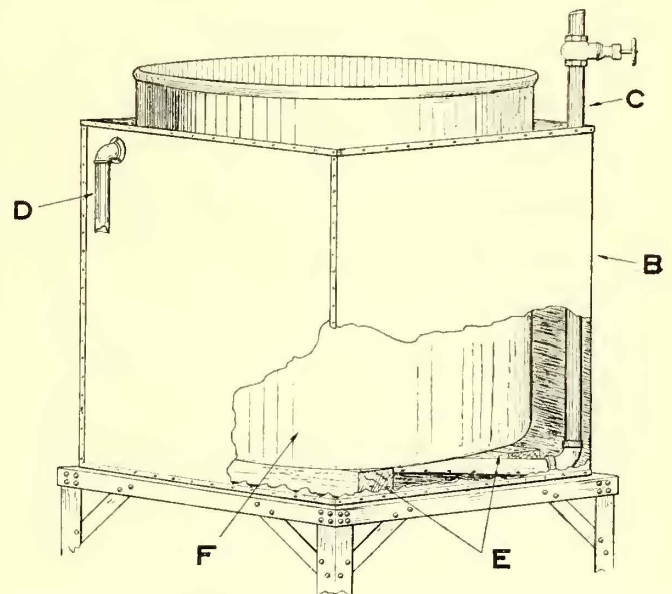
The following process can be readily adopted at any shop that has access to a sand blast. It will give uniform results without the necessity of scratch brushing at a cost of labor and material no greater than that of polishing.

Before coloring it is necessary to obtain a clean matte surface on the brass work to permit the coloring chemicals to act evenly and without spotting and also to attain some depth in the surface of the metal. The sand blast readily accomplishes this and at the same time removes all old lacquer, dirt, grease, etc. The coarseness of the sand and the air pressure used determine the roughness of the matte finish. The operator should handle everything during and after sand-blasting with cloth gloves in order to eliminate finger marks on the finished work.

After sand-blasting, the work is hung on copper wire hooks, suitably arranged on sticks (in order to handle as many pieces as possible in one operation), and then thoroughly rinsed in clear water. A bristle brush is used, if necessary, to remove dust and sand, and then the pieces are dipped into solution No. 1, which is made up in approximately the following proportions: hot water, 10 gal.; copper sulphate (bluestone), 20 lb., and potassium chlorate, 20 lb. This solution is heated to about 200 deg. Fahr. or above, either by a steam coil in a water bath which surrounds an earthen crock containing the solution or by direct flame under the water bath. Metal should not be allowed to come permanently in contact with the solution on account of the latter's rapid corrosive properties.

After the pieces have been permitted to hang in solution No. 1 for several minutes, they will assume a light brown color. They are then rinsed in clear water and dipped momentarily but repeatedly in a wooden tub containing No. 2, a very dilute cold solution of about 2 oz. of sodium sulphide (liver of sulphur) and 10 gal. of water, until the proper deep brown shade is obtained.

Following this process, the pieces are rinsed thoroughly in clear water, dried in sawdust and lacquered. The lacquering is not absolutely necessary but eliminates any undesirable appearance which may be caused



B— $\frac{1}{8}$ -in. sheet-iron tank. C—Steam pipe with perforations at bottom of tank. D—Water overflow to sewer connection. E—Hard maple blocks supporting crock above steam pipe. F—Earthenware crock, 24-in. or larger in diameter.

Statuary Bronze Hardware—Method of Heating Solution with Water Bath

by chemicals not thoroughly washed or by dust getting into the matte surface.

Solution No. 1 can be used indefinitely by adding additional chemicals, a few pounds at a time, and stirring as required. It is advisable always to work the solution at about the same temperature in order to get uniform results. Solution No. 2 will be more active if made upon the day of use.

The process is accomplished very rapidly, and with a little system the man engaged can keep the several operations running simultaneously. Long pieces, such as brass hand-strap rails or other parts that are too long to be placed endwise in the crock may be readily treated by slowly moving them across the top of the crock and by ladling the hot solution over them with an earthenware dipper. Screws, etc., after sand-blasting, should be handled throughout the process in an earthenware basket.

NEW USES FOR ELECTRIC ARC WELDING

BY R. H. PARSONS, ELECTRICAL FOREMAN THIRD AVENUE RAILWAY, NEW YORK

It is no longer necessary to defend the practicability of electric arc welding, as that fact is proved by its continued successful use in many large shops. For example, the Third Avenue Railway has been using a home-made welding outfit at its Sixty-fifth Street shops for more than two years. The variety of work to which

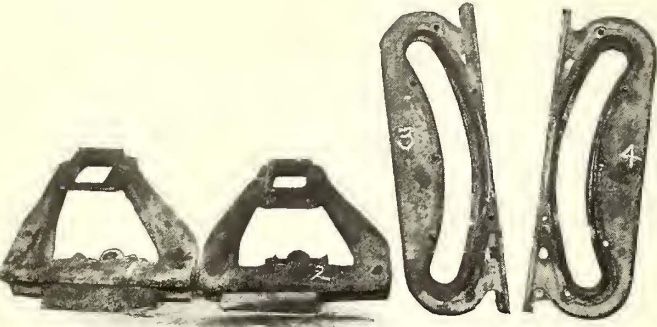


Fig. 1—Worn and Repaired Compression Spring Bracket and Radial Casting

this outfit is adapted is surprising. The accompanying halftones illustrate a few of the jobs that have been carried out with this equipment since it was described in the *ELECTRIC RAILWAY JOURNAL* for June 21, 1913.

Fig. 1 shows some easily recognized truck parts. No. 1 is a compression spring bracket of a Brill 22-E truck of which the part holding the compression block is nearly worn through. No. 2 is a similar bracket which was worn to the same extent but which was repaired by filling it in with the electric welding process. No. 3 is a radial casting of a Brill 22-E truck worn badly in the slide, as illustrated by the chalk mark on the casting. No. 4 is a similar part, which was worn as badly as No. 3 but which was repaired.

Fig. 2 presents a number of small parts which will be explained in detail, using the chalk-marked numbers as guides. The parts in the center on which the numbers cannot be seen are a good sample of "before and after." They show a compression block of a 22-E truck. After the repair noted in this picture, the block was ground to a smooth finish and is now as good as new. Nos. 12 and 13 show one of a large number of reclaimed body spring posts, also of Brill 22-E trucks. As they are



Fig. 2—Miscellaneous Parts, Before and After Welding

built up by the electric welder they are hammered continuously on an anvil. When built up to a size a trifle larger than needed, and while still quite hot, the post is dipped two or three times in cold water, thus chilling and hardening the surface extremely. The post is then ground to a smooth finish, and is then actually better than a new steel one.

Nos. 7, 8 and 9 are life-guard brackets which formerly

were welded by a blacksmith. The present method, however, is to cut and drill the pieces of straight flat iron by the use of jigs and then to place them in a form which holds them in the shape to which they should conform when finished. While in the form the holes in the brackets are placed over pins to keep the pieces in their proper position, nor are the pieces allowed to touch each other. The pieces are then welded, and upon cooling they are removed from the form finished. The job is completed in about one-half the time taken by the old method of welding the pieces with the blacksmith fire, cutting off the ends and drilling.

Nos. 10 and 11 are brake levers. No. 10 is worn quite badly at the place where it rests on the support. No. 11 is a similar lever which was worn but which has been built up by the electric welding process. The lever is ground smooth before re-use.

Nos. 14 and 15 present a brake lever fulcrum which was originally made for a narrow beam but which later was changed for use on a wider beam. The end of the old fulcrum was cut off, a new piece was made by the blacksmith, as shown by No. 14, and then this piece was welded on with the result shown in No. 15. Fulcrums for 200 trucks have been so remodeled.

No. 16 shows the fulcrum as it was before cutting it for No. 15. Some of these fulcrums were found to give way at the place shown by the pencil mark. To overcome this a $\frac{3}{4}$ -in. x 1-in. iron was bent to fit over the part where the eyelet is, extending to about the center of the back of the fulcrum. Then the iron was secured to the fulcrum by means of electric welding.

Fig. 3 is a pedestal for a storage-battery sweeper. This piece was broken at the points shown by the chalk marks, the jaws having been broken off entirely when the sweeper left the track during the snowstorm of Feb. 13. The pedestal was removed from the sweeper, sent to the shop, repaired and returned to the sweeper within twelve hours. This job was accomplished by bolting the jaws in place with two strips of iron and by welding. The metal was preheated in a blacksmith forge, welded while hot and when finished it was left to cool in the dying forge fire. This precaution was taken to

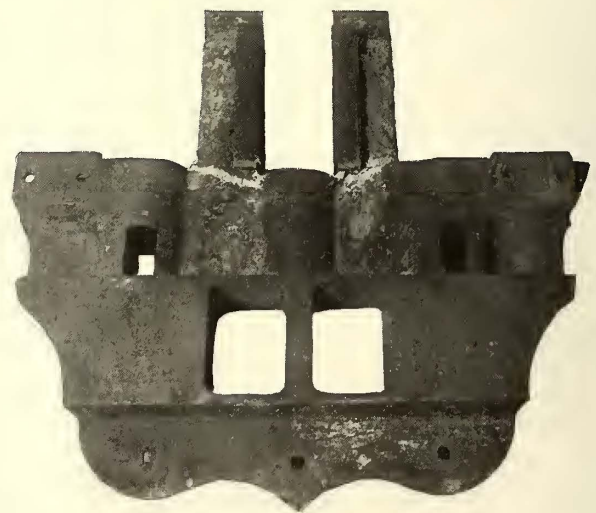


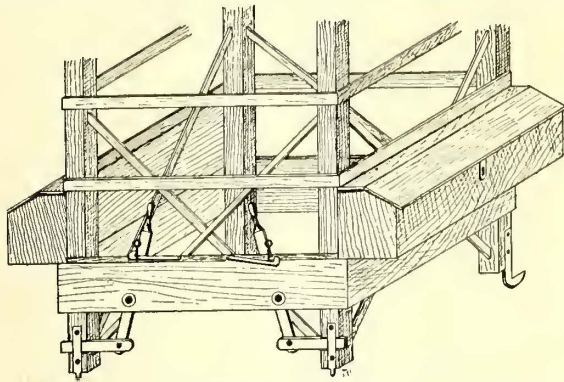
Fig. 3—Repaired Pedestal of a Storage Battery Sweeper

prevent cracking from unequal contraction, as the material was cast iron.

It is unnecessary to give the costs and other particulars of these jobs, since it is apparent to all how great the saving must be, particularly in the case of castings Nos. 1 and 3 and the sweeper pedestal. The main point is to be able to keep the cars moving by having available a convenient means of repairing important parts.

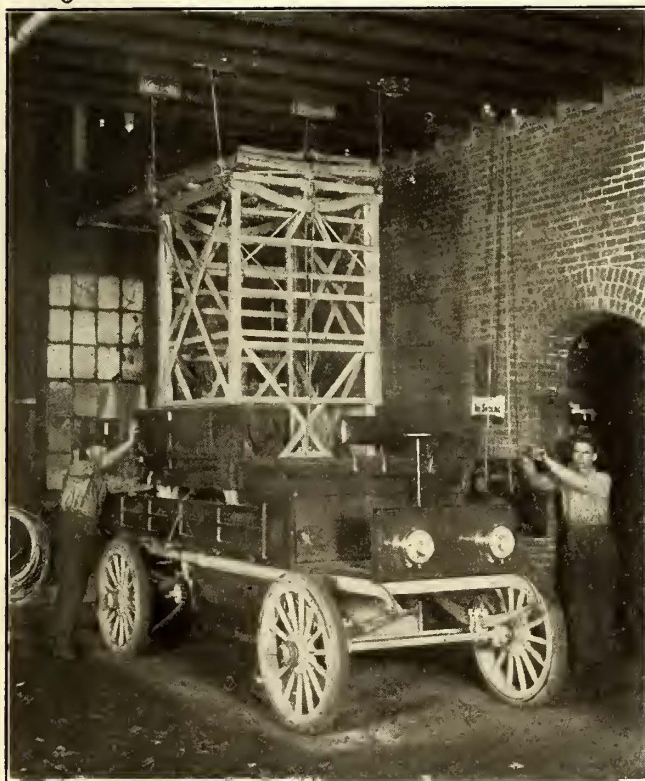
ELECTRIC TRUCK WITH REMOVABLE TOWER

The Union Electric Company, Dubuque, Ia., has in use an electric 1-ton truck which is equipped with a removable trolley-repair tower so that the vehicle may be employed either as a regular delivery truck or as a tower



Method of Attaching Tower of Truck Body

wagon. When not in use the extensible tower is hung on ropes and pulleys in one corner of the garage. To convert the truck into a trolley-repair wagon, it is backed under the suspended tower and the framework is lowered by means of the double windlass at the right. Bolts hold the tower in place on the body of the wagon. The



Truck with Removable Trolley-Repair Tower

chassis of this General Vehicle truck, which is equipped with an Edison battery, was purchased by the Dubuque company about twelve months ago, tower and body having since been built in the company's own repair shops. H. G. Gorr, superintendent of light and power, designed this form of removable tower.

The Victorian Parliament has passed four bills for the construction of electric railways around Melbourne, Australia. The total cost of the railways will be about \$1,140,000.

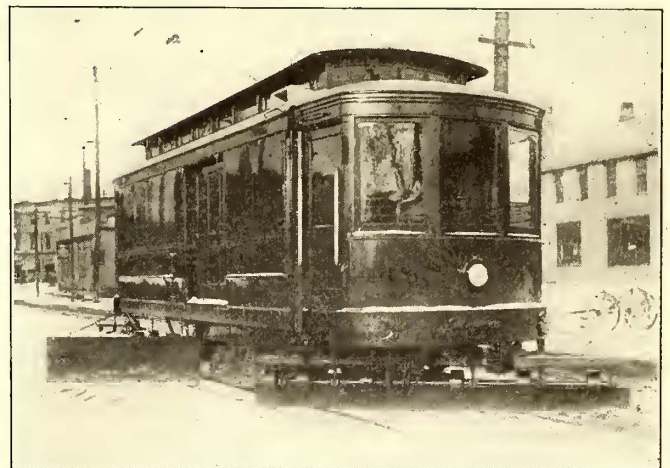
MICHIGAN UTILITY CARS WITH SNOW-REMOVAL EQUIPMENT

The Michigan United Traction Company, which operates the interurban lines radiating from Jackson to



Michigan United Utility Car—Section of Double Track Cleared by Snow Scraper

Kalamazoo, Lansing, St. Johns and Owosso, and also the city lines in these places, has just placed in service in each city general utility cars of the type shown in the accompanying halftones. The car bodies are 35 ft. long and are supplied with single Dupont trucks, two GE-57 motors and double-end K-34 controllers. The bodies have steel underframes and are fitted with forged drawbars designed for heavy hauling and wrecking purposes. They are fitted with center side doors and are supplied with jacks, blocks, rerailers, hose bridges, ropes, chains and, in fact, everything necessary to handle derailed or disabled city cars. They

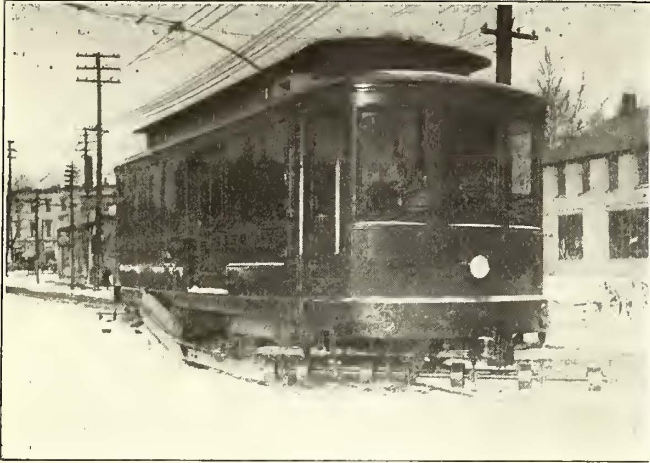


Michigan United Utility Car—Wings and Scraper in Operating Position

are also equipped with large sand boxes for carrying 60 cu. ft. of sand, so that they may be used for sanding the tracks when necessary. During the winter months these utility cars are equipped with diagonal snow scrapers and with side wings on both sides and ends. These devices are all operated by hand wheels from the interior of the car.

The diagonal scrapers, it is believed, are unique. They are mounted on the cars normally at an angle of 45 deg. to the track and project beyond the rail 3 ft. on each side. These scrapers are pivoted on the right-

hand end and may be set to take any width of devil-strip from 4 ft. to 6 ft., or they will swing to the inside limits of the car body for clearance at the carhouses. The scraper blades are 3/16-in. steel, 12 ft. long, with curved top. They are cut and lapped at the center to conform to the contour of city pavement. The blades

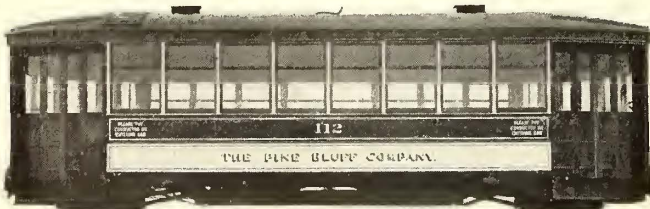


Michigan United Utility Car—Wings and Scraper in Carrying Position

are hung on six-scroll springs mounted on a solid shaft resting in compensating bearings. These diagonal scrapers clean the snow from the center of the devil-strip to the right-hand side, and then the snow may be winged up to 8 ft. outside the rail. During a recent storm these cars were operated at full speed, and after passing up one track and down the other, left the street clean to the rails for a total width of 31 ft. 4 in. Their operation during the winter has been very satisfactory. The diagonal scrapers were designed by the engineers of the Michigan United Traction Company, in consultation with F. N. Root, and are being manufactured for general sale by the Root Spring Scraper Company, Kalamazoo, Mich.

STEEL UNDERFRAME CARS FOR PINE BLUFF, ARK

Within the past year the Southern Car Company, High Point, N. C., built for the Pine Bluff Company, Pine Bluff, Ark., twelve steel underframe single-truck, arch-roof cars of the type illustrated, in accordance with the designs of Ford, Bacon & Davis, consulting engineers. These cars are completely vestibuled with hinged doors so that no bulkhead doors were considered necessary. The platform steps are fixed. The principal



Arch-Roof Single-Truck Car Without Bulkhead Doors

dimensions of these cars are as follows: Length of the car body over the bumpers, 33 ft. 10 in.; over the dashers, 32 ft. 4 in.; over the corner posts, 21 ft. 4 in.; over the platform steps over all, 4 ft. 6 in.; over the side posts, 8 ft. 3 in.; over the letterboards, 8 ft. 3 1/2 in.; over the upper drip rails, 8 ft. 6 in.; over the side-sill angles, 8 ft. 2 1/2 in.; distance from the top of the rail to the top of the roof at the center, 10 ft. 8 11/16

in.; distance from the top of the rail to the floor level, 2 ft. 9 11/16 in. The step heights are 12 13/16 in. from the top of the rails to the first step and 12 in. from the first to the second step. The truck has a wheelbase of 9 ft. and is fitted with 33-in. wheels.

The side sills comprise 1 1/4-in. x 12-in. steel plate with an angle at the bottom and a steel bar riveted to the plate on the same side as the angle; the end sills are 10-in., 15-lb. channels which are riveted to the side sills and reinforced at the corners with angles; the cross sills, which are riveted to the side sills through intermediate angles, are 6-in., 8-lb. channels. As to the body framing, the corner posts are of yellow pine 3 1/2 in. x 3 3/4 in., made in two pieces; the side posts are 1 in. thick by 1 3/4 in. maximum width and the continuous-type carlines are formed of steel 1 3/4 in. deep and 3 in. wide bolted to side pieces and wooden carlines. Poplar is used for the roof and agasote for the ceilings.



Underframe of Pine Bluff Single-Truck Car

The interior finish is in dull mahogany. Ventilation is obtained by means of Garland ventilators, two per car. The operating equipment of each car includes two GE-219 motors rated at 40 hp each, K-36 control and St. Louis vertical wheel brakes.

PROPOSED SELKIRK TUNNEL AND ELECTRIFICATION

Plans for the boring and ultimate electrification of a five-mile, double-track cut-off tunnel through the Selkirk Mountains in British Columbia are being considered by the Canadian Pacific Railroad. The bore of the tunnel will be 17 ft., and the grades encountered will reach about 2 per cent. It is expected that the tunnel will be approached by an electrified section of 7 miles of double track and that the third-rail 2400-volt d.c. system will be employed. Power will probably be supplied from a future power station to be installed near the electrification, rather than by undergoing the great expense of erecting a long transmission line over this mountainous section, in order to purchase energy from any already existing station.

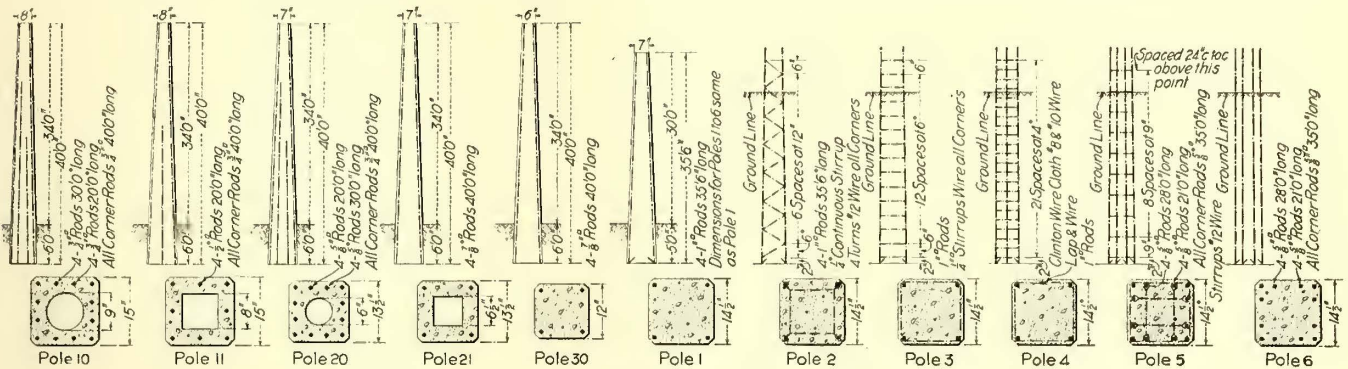
When the question, Shall smoking be abolished on street cars? comes up for settlement with any city, there can be only one answer in the opinion of *The Journal of the American Medical Association*. From the point of view of hygiene and common cleanliness, to say nothing of the comfort of the majority, smoking on street cars is an indefensible nuisance.

RECENT CONCRETE-POLE TESTS

Two subsidiary companies of H. M. Byllesby & Company, of Chicago, have made systematic tests of solid and hollow reinforced poles, with the object of determining the best form of pole and placing of reinforcement. Six poles each were tested by the Oklahoma Gas & Electric Company at Oklahoma City, Okla., and the

poles butted against a heavy, rounded-end timber braced against the bank, with another timber renewed for each test braced against the butt.

At Nashville the pull was applied by a cable attached 1 ft. from the top of the pole and passing through a block at the top of a guyed mast. The pull was applied by a hoisting crab and measured by means of a pair of dynamometers. Here the poles were braced at the



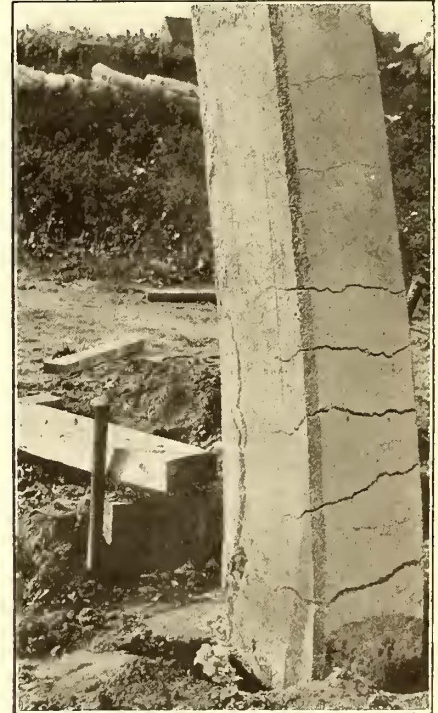
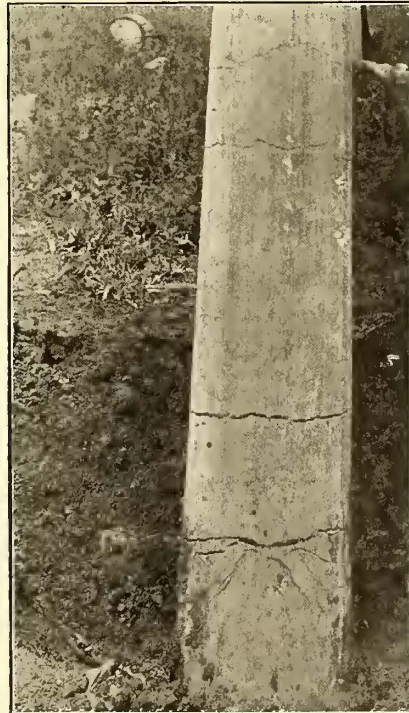
Designs of Test Poles—Poles 10 to 30 Were Tested at Oklahoma, 1 to 6 at Nashville

Nashville Railway & Light Company at Nashville, Tenn. The cross-section of the poles and the schemes used in reinforcing are shown in the accompanying diagram.

The concrete for all poles was in the proportions 1:2:3½, and high-carbon square, cold-twisted steel bars of 50,000 lb. per square inch elastic limit were used for reinforcing. The rods were bent to insure good bonding. The poles were molded in wooden forms by men experienced in concrete work but not especially trained for pole making so as to duplicate field conditions. The

ground line and concrete footings were placed around the butts. Deflections were measured by means of a rule at Oklahoma and by rule and plumb bob at Nashville. Poles were tested to destruction in all cases.

The general conclusion was that hollow poles are not successful in resisting shearing forces from the ground line down, as all showed shearing failure in this region. After failure the tendency of the concrete on the compression side was to slide by that on the tension side, causing a shearing action in the side walls. Inasmuch



Concrete Pole Tests—Cracks from Stresses in Poles 3, 4 and 5

hollow poles were made with sectional tapered sheet-iron cones.

At Oklahoma City the pull was applied by means of a cable attached 6 in. below the top of the pole and passing over a block attached to a neighboring gas tank frame. A coal car was attached to the free end of the cable and loaded with sacks of sand. At the ground line

as hollow poles are more expensive than solid ones and are more difficult to make and as they are not much lighter for equal strength, their use is not advised. Poles having few bars with some butt reinforcement were shown to be preferable.

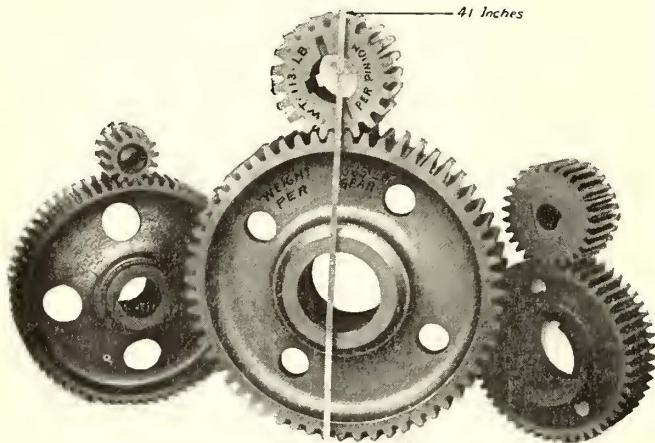
At Nashville the tests showed that a safety factor of two is obtained when 1200 lb. per square inch unit stress

is allowed for 1:2:3½ concrete and 30,000 lb. per square inch for high-carbon steel. The average calculated breaking load (straight-line formula used) for four hollow poles was 2375 lb., and the actual breaking load was 1557 lb. applied 6 in. from the top. Five of the solid poles had calculated average breaking loads of 3500 lb., while the actual breaking load was 3610 lb.

The tests at Oklahoma City were under the direction of J. M. Brown, superintendent of the electrical department, under the supervision of W. R. Molinard, secretary and general manager of the Oklahoma Gas & Electric Company, a subsidiary of H. M. Byllesby & Company. H. M. Fisher superintended the building and testing of the poles for the Nashville Railway & Light Company.

AMERICAN GEARS FOR HEAVY ELECTRIC TRACTION IN ENGLAND

The Tool Steel Gear & Pinion Company, Cincinnati, Ohio, through its London representatives, Scholey & Company, Ltd., recently received the contract for a total of 344 gears and 344 pinions to be used in electrification work on the London & South Western Rail-



Comparison of Gears and Pinions for City, Heavy and Interurban Traction

way, London, England, one of the large steam railroads. Not only is this the largest single order that has been placed in England but the gears are believed to be the largest known in electric railway service. They have sixty teeth, two diametral pitch, with 6-in. face, 8-in. bore and an outside diameter of 30½ in. The forged blanks from which these gears are made weighed a little more than 700 lb. each, while the finished gear weighs 565 lb. The gears are to be used on 200-hp motors. The accompanying halftone shows the size of the gear and pinion as compared with an ordinary city service gear and pinion and with an interurban gear and pinion. The diameter of the city service gear is usually about 23 in. to 24 in., while the diameter of the ordinary interurban gear will run from 17 in. to 20 in. The gears for the London & South Western Railway will weigh about three times as much as a gear for city service and two or three times as much as a gear for interurban service. The order for this equipment was placed after an English engineer had visited the United States to investigate thoroughly the record of this maker's tool-steel gears and pinions in heavy-duty service. The first shipment has already gone forward to London.

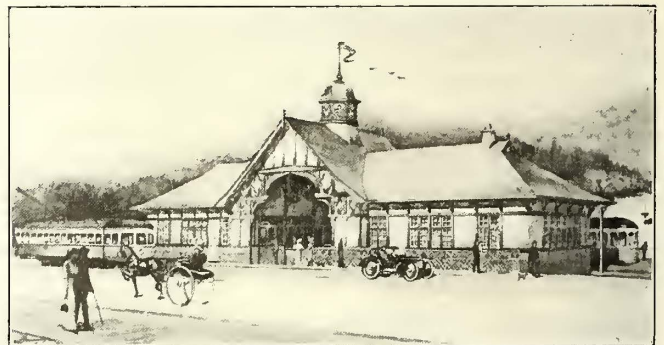
Another large contract has just been placed with the same company by the London & North Western Railway, another of the large British lines which are being

electrified in London and vicinity. The first order from this company called for 178 gears and pinions, the gears being a trifle larger than those for the London & South Western line. These gears are to have sixty teeth, thirteen module (the metric pitch designation), with 6-in. face and 8 1/16-in. bore. The outside diameter of these gears will be 31¾ in. and the estimated weight will be about 600 lb.

EBURNE INTERURBAN STATION AT VANCOUVER, B. C.

The terminal of the Eburne and Lulu Island interurban line at Vancouver, B. C., has become inadequate on account of traffic increases in recent years, and last year it was decided that an entirely new station was needed. The company improved the opportunity to move the site about two blocks, and the new station is now nearing completion. A view from the architect's drawing accompanies this article.

The city cars pass on one side of the station and the interurban cars on the other. A passageway to connect the two lines extends through the building and is flanked on one side by ticket offices to handle crowds during the season when the Lulu Island race tracks are open. On one side of the passage is the general waiting room, separated from the passage by plate-glass windows, thus allowing a range of vision from the ticket offices which gives the agents supervision over the waiting room at



Eburne Station at Vancouver, B. C.

rush-hour periods. At other times a small ticket office in one corner of the waiting room is used. On the other side of the passage are the ticket and staff offices and a public lavatory, which is entered from the rear platform. On the side of the building adjoining the interurban tracks an overhanging roof projects 10 ft. and is supported on posts.

The station building is of wooden frame construction, finished on the exterior in half timber with cement and granite stucco panels. The station was designed by R. Lyon, architectural engineer for the British Columbia Electric Railway Company.

AMBULANCE CHASING DENOUNCED

In a recent lecture before the Boston University Law School, former President William Howard Taft declared that the fraud and chicanery of the ambulance-chasing lawyer are enough to cause statutory prohibition against this evil. "The ambulance chaser," said the former chief executive, "is a term that has come to be accepted in the profession, and these, together with scheming lawyers who seek business through their agents, do not make for a better tone in our profession. One of the great benefits of the workmen's compensation act will be the elimination of this class."

News of Electric Railways

Committee on Federal Relations of the A. E. R. A. on Pending Bills

Arthur W. Brady, chairman of the committee on public relations of the American Electric Railway Association, has addressed a letter to the members of the association calling attention to the steel-car bills, the Stevens bill and the proposed bill for the regulation of securities now pending in Congress. Of the five steel-car bills introduced in the House and the one bill introduced in the Senate, only one now excludes electric railways from its provisions. These bills provide generally that no carrier engaged in interstate commerce by railroad shall after a certain date put into use any new passenger, express or baggage cars not of steel, or within a certain further period have in use any such cars not of steel. The Stevens bill vests the Interstate Commerce Commission with full power "to investigate the roadbed, track, structures, equipment and facilities used by common carriers in interstate or foreign commerce, the operating rules, regulations, methods, train schedules, size of train crews, hours of labor of railroad employees, or any other matter affecting the safe operation of trains engaged in interstate or foreign commerce." The commission is to have power, after notice and hearing, "to issue an order or orders fixing, determining and designating the changes, improvements and repairs to be made in the way and structures, the kind of equipment, the standard of equipment and supplies, the installation of signal systems, train control devices, automatic train stops, and other safety appliances, the operating rules, regulations and methods, train schedules, running time of trains, size of train crews and hours of labor of railroad employees to be adopted, used and maintained in the operation of trains in interstate or foreign commerce."

Heavy penalties are imposed for failure to obey such orders. Attention is also called by Mr. Brady to the bills to require the use of block signals on the lines of all common carriers "engaged in interstate commerce by railroad."

Mr. Brady says that a widespread misunderstanding exists as to what carriers are engaged in interstate commerce. The belief that a carrier is engaged in such commerce only if its road extends into more than one State, or if through cars are operated over a route extending into more than one State, is erroneous. The courts appear inclined to hold that the slightest tincture of an interstate transaction renders a carrier an interstate carrier. Thus the mere carrying of interstate express matter for an express company by a railroad lying wholly within one State has been held to make that railroad an interstate carrier. Under the decision of the Supreme Court of the United States last year in the Omaha & Council Bluffs case, however, purely urban electric railways do not fall within the jurisdiction of the Interstate Commerce Commission under existing laws, even though engaged in interstate commerce. A bill is pending, however, introduced by Congressman Green of Iowa, to amend the existing acts so as to make them applicable to such companies. This bill is approved by the commission.

The committee of the association has labored under considerable disadvantage from its inability to ascertain accurately what electric railways are engaged in interstate commerce, particularly as no list of such companies is published by the Interstate Commerce Commission, and the association has requested that a blank which it inclosed with Mr. Brady's communication be filled out and mailed promptly.

A hearing upon the bills mentioned was held on behalf of the electric railways before a subcommittee of the House committee on interstate and foreign commerce on Jan. 23, 1914. Members of the committee on federal relations of the American Electric Railway Association and other representatives of electric railways were present and asked for the exclusion of electric railways from the operation of any of these bills on the grounds that few of the electric carriers are interstate carriers, except in a technical sense; that in practically every state there is now a commission having substantially all the powers over electric railways proposed to be vested in the Interstate Commerce Commission by the bills in question; that the interurban electric railways en-

gaged in interstate commerce are now subject to the operation of the original interstate commerce act; that the rolling stock of the electric interstate carriers is comparatively new, and that to require radical changes in their rolling stock equipment as proposed by the steel-car bills would impose a burden upon them both unnecessary and beyond the financial ability of these companies to assume.

Members of the Interstate Commerce Commission appeared before the House interstate and foreign commerce committee on Feb. 19, 1914, as expert advisers on the proposed bill to authorize federal regulation of railroad securities. Commissioner Clements said:

"Personal guilt should be provided for in legislation to empower the Interstate Commerce Commission to regulate issues of railroad securities. Put the responsibility on the directors to see that they neither misapply nor permit the misapplication of moneys."

Chairman Clark told the committee that no common carrier could have good reason to object to government supervision when securities were to be issued for proper purposes. He condemned "pyramiding" of stocks and bonds and permitting railroads to bond themselves to buy stocks of other roads for speculative purposes. He thought the proposed exemption of short-term notes should be carefully considered because of probable refunding requirements, and that it might interfere with effectual regulation.

On Feb. 25 the holding companies bill had not yet been Commission, appearing before the House committee on interstate and foreign commerce, disapproved of the Clayton bill, giving the commission power to supervise the future issue of railroad securities, on the ground that it would practically compel the commission to give a clean bill of health to prior issues and otherwise place that body in an embarrassing position. As a substitute Mr. Meyer advocated an amendment to Section 20 of the Interstate Commerce act, extending the powers of the commission to secure information of the relations between railroads and holding companies and contractors.

Up to Feb. 25 the holding companies bill had not yet been introduced in either House.

The conferences which have been held between Chairman Sims and other members of the railway capitalization subcommittee with the Interstate Commerce Commission indicate, according to one source of information, that the following propositions in all probability will be embodied in the first draft of the proposed railway capitalization law:

Prohibition against any railroad corporation issuing stock, bonds, or other indebtedness, except for actual necessary railroad property purposes, so as to add to the railroad's value, and the issue then only to be upon approval of the Interstate Commerce Commission.

Personal guilt and responsibility of directors and other officers, including imprisonment penalties for violation of the proposed law.

Reasonable restrictions on the amounts of stock and bond issues.

Guarantee by applying railroad, as a condition precedent to approval of stock or bond issues, that the proceeds will apply to the railroad's upkeep, extension or other legitimate ascertained use.

Restrictions to make impossible the disposition of stock or bond issues except for bona fide value in open market.

Public hearings upon applications of railroads and other common carriers to issue stock and bonds, upon notice to the particular railroad and to the Department of Justice, and possibly to the railroad commission of the state or states affected.

Regulation of purchases of railroad supplies to prevent officers selling to themselves through double corporation connections.

Avoidance of finality or guarantee effect of the Interstate Commerce Commission's "O K" on stock and bond issues in case of subsequent court or other proceedings.

Authority to competent courts to enjoin all issues contrary to this proposed law upon suit of the United States or any officer or stockholder of the offending railroad.

Decision in Indianapolis & Cincinnati Traction Company Arbitration Case

The Public Service Commission of Indiana on Feb. 21 handed down its decision in regard to the rate of wages of trainmen of the Indianapolis & Cincinnati Traction Company. Following the agreement of Nov. 7, 1913, between the Indianapolis Traction & Terminal Company and its employees, which ended the strike of Nov. 1-7, 1913, the Indianapolis & Cincinnati Traction Company entered into an agreement with its trainmen providing that the Public Service Commission should sit as a board of arbitration and decide for three years any grievances which might be presented to the company and not satisfactorily adjusted between the company and the employees. On Nov. 25, 1913, Charles L. Henry, president of the company, and a committee of employees presented to the commission twenty-one grievances regarding wages, working conditions, etc. These were subsequently withdrawn, and the company and its employees satisfactorily adjusted nineteen of the grievances, submitting to the commission only the demand for a flat wage scale of 35 cents an hour instead of the present sliding scale of 21 cents to 30 cents an hour, and the demand that the two divisions of the company be operated separately, which necessitated the addition of one car. The hearings before the commission were brief. Mr. Henry represented the company in presenting evidence to show why the financial condition of the road did not permit any increase in wages. The men were represented by a committee of employees. The ruling of the commission reviews the evidence presented, and reads in part as follows:

"The trainmen asked that each division be operated separately; that is, that the cars running between Greensburg and Indianapolis over that division be not transferred at Indianapolis and run between Indianapolis and Connersville over that division, and that a separate set of cars be set apart for each division. This would require ten cars instead of nine, make one extra train crew necessary and increase the pay roll of the trainmen more than 10 per cent. The advantage that would accrue to the trainmen would be a greater layover at the end of each run. The layover time on the present schedule is from ten minutes to an hour and twenty minutes, but in most cases from about twenty to thirty minutes, and the running time over each division from about one hour and thirty or forty minutes to two hours and ten minutes. The trainmen contended that these layover periods are quite frequently lost to them by reason of delays on the road between terminals, and that they should have more layover time in which to rest preparatory to the next run. The desirability of such a change in the working hours of the trainmen will, no doubt, be conceded by everyone, but in this case the award on that point, as well as on the matter of the increase in wages, must be determined largely, if not wholly, by the state of the financial budget of the company.

"The scale of wages paid to the trainmen in the employ of the respondent begins with a wage of 21 cents an hour and increases 1 cent an hour each year until a maximum of 30 cents an hour is reached. This is substantially the scale now paid by all interurban roads in this part of the country, and the maximum is 3 cents an hour more than the maximum in the award recently made in the arbitration between the employees and the Indianapolis Traction & Terminal Company.

"The average of earnings of trainmen on respondent's road is considerably more than that of other employees of the company in other departments of service. This may be accounted for in part by the fact that trainmen are on duty more hours per month than are other employees. The working hours of trainmen, however, are as good as will be found on any other interurban road. On the present time cards all runs but two are straight runs. Very few are less than ten hours and only a few are more than eleven hours. Two swing runs are completed in substantially thirteen hours, with ten hours and thirty minutes of platform time, and they are daylight runs, or practically so. The runs are so arranged that the men may reside in the cities on the line of respondent's road other than Indianapolis, and have thereby some valuable advantages in the matter of living expenses.

"Wages of trainmen have been increased 24.99 per cent in seven years, which is more than the increase in the cost of living during that time.

"The properties now owned by the Indianapolis & Cincinnati Traction Company passed through a receivership from 1906 to November, 1910, at which time they were sold at a receiver's sale to the respondent. No dividend on stock or interest on bonds was paid during the period of the receivership, and since the reorganization dividends amounting to \$27,500 have been paid on the preferred stock, the only return the investors have received in eight years on an investment of \$1,800,000.

"The gross operating revenues last year were barely sufficient to pay the operating expenses and interest on bonds, and there is no indication of an increase in revenues in the near future. It will be necessary for the company to borrow money to make repairs due to the flood damages of last year and to install such block signal equipment as may be required. The operating revenues of this company are 29 per cent less per mile than those of any other interurban railway running into Indianapolis, and 49 per cent less than those of the road having the highest rate of income per mile.

"In the settlement of the nineteen grievances which were adjusted between the company and the employees the company conceded practically all the demands of the employees, and these concessions entail an additional and substantial burden on the company. From the uncontroverted evidence the employees receive all of the operating revenue not expended for repairs or in the payment of interest charges. The stockholders are receiving no dividends on their stock, and until recently no interest was paid on bonded indebtedness. Certainly when labor receives all the income, as it is and has been doing in this case, there can be no just claim that any part of the invested capital should be applied on or added to a wage which is as liberal as the wage scale of the trainmen employed by the respondent company.

"We have absolute confidence that the employees will concede the justness of this conclusion when they understand all the facts about the inability of the company to pay a higher wage. The personnel of the committee of employees which appeared before us would seem to justify this confidence. We therefore find in favor of the Indianapolis & Cincinnati Traction Company on grievances one and two."

Application Made by Cleveland Railway for Approval of Stock Increase

The Cleveland Railway applied to the Ohio Public Utilities Commission on Feb. 21 for authority to issue \$2,141,100 of common stock, the proceeds to be used to purchase new cars and make other improvements, all at an estimated cost of \$3,477,631. To meet the entire amount of the proposed expenditures the company will later apply for authority to issue \$2,000,000 of additional stock. The money derived from the sale of the stock to be issued at present will be expended as follows: new motor cars, trail cars and equipment, \$950,000; right-of-way for the East Seventieth Street extension, \$160,000; tracks on East Seventy-ninth Street and East Eighty-second Street, \$275,000; tracks for the East Thirtieth Street cross-town line, \$150,000; land for the Harvard Avenue shops, \$100,000; garage at Scovil Avenue and East Fourteenth Street, \$4,000; equipment of office with dictagraph system, \$1,600.

The members of the street railway committee of the City Council inspected the new carhouse and yards of the Cleveland Railway at St. Clair Avenue and East 129th Street, Cleveland, recently and voted to approve the expenditure of the money required for the improvement. Councilman William Stolte, who introduced the resolution in Council providing for an inspection of the property, announced that he merely wanted to learn whether the expenditure was justified and whether the company and the city could afford it. J. J. Stanley, president of the company; George L. Radcliffe, general manager, and C. H. Clark, engineer of maintenance of way, accompanied the committee, as did Terrence Scullin, master mechanic, who designed the carhouse and yards. Peter Witt, street railway commissioner, and J. H. Alexander, engineer in his office, also were mem-

bers of the party, although Mr. Witt had previously informed the committee that he would not accompany the members in an official capacity.

Mr. Stanley stated that the company had endeavored to construct a building that would afford comfort and convenience to the employees and not be a detriment to the adjoining property. The yards and building had been made sufficiently large to accommodate the growth of traffic for some years to come. The items of cost for the plant follow: land, \$34,213; buildings, \$86,950; fencing, \$2,812; fire protection, \$23,635; track and overhead work, \$62,152. The cost of the office building alone was \$47,775. It is said that the company will spend about \$5,000,000 within the next five years in erecting improved houses and building car yards. The next one will probably be built at the terminus of the Superior Avenue line to replace the carhouse and yards at East 105th Street, which is some distance from the end of the line.

In an interview at Columbus F. E. Munn, a member of the state tax commission, declared that the valuation of \$22,124,180 placed on the property of the Cleveland Railway must stand unless the courts order a reduction. He said that the advice of the Cleveland City Council to the company to pay on only \$19,000,000 will not affect the action taken by the commission.

The City Council on Feb. 24 approved the request of the Cleveland Railway for authority to spend \$573,312 for the renewal of about 6 miles of track and the resurfacing of 8,555 ft. of track in another location. The Council also approved the agreement made between the city officials and the company by which \$18,000 a month will be deducted from the gross receipts and credited to the maintenance, depreciation and renewal reserve to make up the deficit existing from charging off the value of old power houses and equipment and that which was caused by exceeding the allowance for the past two or three years.

Rental Basis for Chicago's Proposed Subways Recommended by Bion J. Arnold and George Weston

In connection with the proposed Chicago passenger subways, one of the most important subjects under discussion is their rental value to the surface railways of Chicago, now combined under the name of the Chicago Surface Lines. On Feb. 20 Bion J. Arnold, chairman of the Board of Supervising Engineers, Chicago Traction, and George Weston, a member of the board as a representative of the city, presented a letter on the subject to the subway subcommittee of the committee on local transportation of the Chicago City Council. This report was in response to a request for a recommended basis for determining the annual rental, if any, which should be paid by the Chicago Surface Lines to the city of Chicago for the use of the subways.

Under the street railway settlement ordinances of 1907 there has been accumulated in the city treasury a traction fund which, on Feb. 1, 1914, amounted to about \$13,000,000. Messrs. Arnold and Weston say that the best plan under the copartnership arrangement with the companies would be for the city to invest its traction fund in subways or other extensions to the surface line properties in such a manner as to increase the service return for the people and charge no rental at all for such money as the city invests in subways or extensions. By this method the traction fund would be utilized in effect as an amortization fund, and the purchase price, or agreed capital value of the company, kept down accordingly. They also contended that the maximum service to the public and a fair return to the companies on the agreed capital value should be the two fundamentals upon which the operation of any traction system should be based. After stating this fact the letter continues:

"However, inasmuch as the companies are interested in the divisible net profits over and above their 5 per cent return upon their investment, we believe that the citizens and the city of Chicago would best be served by limiting the return of the companies upon their agreed capital value, including the 5 per cent interest allowance, to some fixed maximum amount, and that all earnings over this fixed percentage should be placed in what might be called a 'surplus earnings fund' to be applied to subway rental or an amortization fund."

In addition to the excess net profits over the fixed maximum rate of return to the companies upon their agreed capital value it was recommended that the saving realized by the operation of cars in the subways also be set aside for subway rental to be paid to the city. This saving and the excess net profits shall be paid to the city, it is proposed, until the subway rental shall equal 5 per cent upon the investment. The remainder of this fund, if any, is to be utilized as an amortization fund. In making their calculations Messrs. Arnold and Weston recommended 7 per cent to be the maximum allowable return to the companies upon the agreed capital value. It is proposed that this 7 per cent be a maximum but not a guaranteed percentage, it being understood that the return to the company shall be limited to its proportion of the divisible net profits, as provided in the ordinances of Feb. 11, 1907.

Referring to the proposed Clark Street subway, from Eighteenth Street to Elm Street, and the proposed West Side "U" loop subway, as well as the proposed short subways under railroad tracks on the West Side, a table was presented showing the financial results of subway operation using two-car trains, assuming that the maximum return to the companies shall be 7 per cent and that the ratio of operating expenses to gross earnings is 65 per cent. This table goes back to 1912 in relation to the city's 55 per cent of the net receipts and to the companies' total return upon purchase price. It assumes parts of the subway in operation in 1917, and gives figures year by year until 1926 inclusive. At the end of 1926 it is figured that the saving from subway operation will amount to \$8,375,000. The city's 55 per cent of the net receipts from 1912 to 1926 inclusive is estimated as \$54,552,600. The average of the companies' total return upon purchase price from 1912 to 1926 inclusive is 6.96 per cent. From 1923 to 1926 inclusive the companies' return will be 7 per cent or over, the rate in 1926 being 7.303 per cent. The total rental to the city is given as \$9,840,000 in the period from 1917 to 1926 inclusive. The city's investment in subways will range from \$18,000,000 in 1917 to \$48,000,000 in 1926, but in the year last mentioned there would be in addition subways in course of construction to be ready for operation in the year 1927 to the amount of \$17,000,000. The rental return to the city in percentage of its subway investment is given as ranging from 1.93 per cent in 1917 to 3.92 per cent in 1926.

In explaining the report to the subcommittee Mr. Arnold said that the city cannot have high-class subway service and large profits. On motion of Alderman Captain, a member of the subcommittee, the engineers were asked to submit additional figures showing the rental values on subways worth \$26,000,000 at a 5 per cent rate of return.

At a meeting of the subcommittee of the local transportation committee of the Chicago City Council on Feb. 23, Leonard A. Busby, president of the Chicago Surface Lines, stated that his company would not put \$5,000,000 into the subway construction except in accordance with the fixed letter of the 1907 traction ordinance. This provides that if the railway companies invest in the subway construction the city would not be able to recapture the subway until it purchased the entire traction property. Prior to this announcement the subcommittee worked with the idea in mind that the companies would assist in financing the initial subway and drafted an ordinance along that line. In addition to this object W. W. Gurley, attorney for the surface lines, added further confusion to the tentative plans by advising the subcommittee that the city could not legally use the West Van Buren and Washington Street tunnels as a part of the subway scheme. This opinion was sustained by assistant corporation counsel assigned to subway work. Both of these objections were of vital importance to the success of the initial subway scheme, and to meet them the subcommittee decided that the city should finance the initial subway and the corporation counsel was instructed to redraft the ordinance along that line.

At the suggestion of Bion J. Arnold the subcommittee considered the following change in the initial subway route to eliminate the second objection: The original scheme provided for a U-shaped tunnel beginning at Clinton Street west of the Chicago River, proceeding east on Washington Street to Michigan Avenue, thence south on Michigan Avenue to Jackson Boulevard, thence west on Jackson Boulevard to a

point near the Chicago River where it diverges to the south, using the Van Buren Street tunnel under the river. It is now proposed that the subway shall use Randolph Street on the north, proceeding south on Michigan Avenue to Harrison Street, thence west on Harrison to some point in West Chicago. This will require two new subways under the Chicago River and will increase the cost of this initial line. It is planned, however, to extend the time of completion from 1917, as originally proposed, to 1919, so that the subways can be built and equipped entirely out of the city's traction fund.

Mr. Dalrymple on His Visit to America

James Dalrymple, general manager of the Glasgow (Scotland) Corporation Tramways, has submitted to the members of the Glasgow Corporation a preliminary report containing about 6000 words on the recent visit of himself and the master of works of Glasgow to the United States and Canada. Mr. Dalrymple was very much grieved with the uncomplimentary way in which Americans spoke of their municipal representatives. He scarcely ever heard a good word in regard to a city council. Some of the best and most capable Americans he met, however, were members of the city councils and civic officials. He doubts very much whether the commission form is the last word in city government. He takes up in turn each of the cities which were visited. An abstract of his most significant remarks about his street railway investigations follows:

"No city in the world has the same traffic problems to solve as New York. On Manhattan Island alone there are 457 miles of surface lines, 120 miles of elevated lines, and 71 miles of subway lines. All these together carry annually about 1,100,000,000 passengers. There is a universal 5-cent fare. The company has for some time been experimenting with various types of cars, and among these is the double-deck car. We found it different in many respects from our double-deck car. It seemed, however, to suit the conditions quite well, and was highly spoken of by the general manager. The only other double-deck car which we saw in service was at Pittsburgh. We did not care to sit in the lower portion of the car, as it gave one the feeling of being too near the street. There are also in service a number of single-deck cars with this low floor, which we inspected very carefully. We were much interested in the storage-battery cars on the crosstown lines. They appear to answer the purpose all right. Every year, as another forty or fifty story office building is erected, the problem of meeting the congestion of traffic is becoming more difficult.

"One of the great drawbacks to the successful operation of tramways, more especially in some of the Eastern cities, is the change which is continually going on in the personnel of the staff. We were informed that in some systems almost the entire staff changes every year. This, of course, is very different from the conditions on this side. Americans never seem to join the street railway service with the intention of remaining at the work. They can very often do better, whereas with us no better employment can be found.

"There has been for the past few years a considerable outcry on the part of tramway authorities in regard to fares. The cash fare all over the United States is 5 cents. In many places tickets are sold at a discount, which brings down the average income per passenger to about 4 cents or even less. In some places these tickets are used to such an extent that very little actual cash is handed to the conductor. These reductions in fares are being pressed on the companies, and, at the same time, the city boundaries are being extended, and passengers must be carried to the new boundary line without any additional fare. Of course, the system of transfers is universally adopted. All these arrangements must lead to a great deal of abuse. In the case of discount tickets the officials admit that they are defrauded by the conductors. The transfer system also is very much abused, and this abuse is very difficult to check.

"The only municipal tramway lines that we saw were those in Toronto and San Francisco, and, of course, in both of these cities 90 per cent of the lines are still in the hands of private companies. The idea of municipalization of street railways is, no doubt, gaining ground in the United States, and if one of the larger cities were to take a step forward and make a success of a municipally owned and operated

street railway a great change might very soon take place in the street railway business throughout the whole country.

"The relationship between the municipality of Cleveland and the street railway has for many years been very peculiar. In Cleveland the fare is 3 cents instead of 5, and quite recently there was an arbitration between the city and the company in regard to the terms of the agreement. It did not seem to us that the company was spending a sufficient amount on its track, and the arrangements under which the company is carrying on business did not seem at all satisfactory.

"While being shown over the street railway system in Milwaukee we were particularly struck with the magnificent head office accommodation. We have seen most of the tramway offices in this country and also on the Continent, but we have never seen any arrangement so complete as we saw at Milwaukee.

"As a general rule the street railway companies of the United States have not spent much on their workshops and car sheds. Things are, however, now improving very much. We were much interested in the newer style of carhouse. This is of a simple description; indeed, it seemed only to be used when the cars were being cleaned or inspected. At other times the cars were allowed to lie out in the open. It was really not a carhouse, but a car yard. This free and easy way of storing tramcars is becoming fairly general. The companies are saved the expense of erecting elaborate carhouses such as we have here, and, as their experience of the fire risk has not been very good, that danger is practically eliminated. Ample provision, however, is made in the open yards for dealing with fire by the erection of platforms 20 ft. high, on each of which is placed a stand-pipe.

"Everybody we met seemed anxious to learn how Glasgow operates its municipal tramways. All kinds of tales have been circulated through the press as to the results of municipal operations in Glasgow and in this country generally, but the citizens of the American cities have apparently come to the conclusion that these are, for the most part, fairy tales, and are anxious now to get the actual facts.

"We knew Los Angeles best because of its remarkable tramway system. It is generally admitted among tramwaymen that the Los Angeles city and suburban street railway systems are, in many ways, the finest in the States. We know of no other city of the size with such an extensive and complete system.

"We were anxious to see the street railway system of Pittsburgh, as the company is experimenting with the double-deck car. The Pittsburgh people have carried out a great improvement in the heart of the city by cutting away a hump. We examined this piece of work with much interest.

"After leaving Washington we spent a couple of very busy days in Philadelphia. The street railway system of Philadelphia is very extensive, and proposals are being made for further extensions, both underground and elevated, which are to cost many millions of pounds sterling. The street railways are all owned and operated by one company, but the city has organized a special department to deal with the whole question of city transit. This department is under the charge of an experienced street railway man, A. Merritt Taylor, who has prepared a very complete and interesting report on the proposed extensions. The cars in Philadelphia have the entrance and exit at the motorman's end. It is thought that there is less liability to accident when the passengers both board and leave the car under the eye of the motorman, and, of course, passengers are not so apt to pass behind the car in front of a car coming in the opposite direction as when they alight at the rear end. The education of those in charge of vehicles on the streets of Glasgow is very deficient when we consider what has been done in this connection in many American cities.

"The last few days of our tour were spent at Atlantic City on the Atlantic seaboard. During the week ended Oct. 18 the annual convention of the American Electric Railway Association was held at Atlantic City, and hundreds of tramwaymen had traveled thousands of miles to attend this convention. We had the feeling, in attending these meetings, that rather too many subjects were dealt with, and that sufficient time could not be given to general discussion. One important feature of this convention is the

exhibition of tramway appliances. We were very much surprised to see such a large exhibition, and, although it was entirely confined to tramway plant, the floorage occupied might be as large as the machinery hall of one of our international exhibitions. The exhibits also were most tastefully arranged, and there was ample opportunity for a thorough inspection.

"One very striking difference between New York and the other American cities and Glasgow is the number of passengers carried per car mile. In America the cars carry from five to six passengers per car mile. This figure represents what are called 'revenue passengers.' If transfers were included, the average would be somewhat higher. In Glasgow we are now carrying over fourteen passengers per car mile. We were amazed at the vast sums which have been expended on the transit systems of New York; but when we were informed that in the four chief cities, viz., New York, Chicago, Philadelphia and Boston, the capital expended for this purpose amounted to about £100,000,000, and that arrangements have been made for the expenditure of another £100,000,000, making £200,000,000, we thought it was time to say 'Good-by!'

"The above notes do not deal in any way with the main object of our visit to America. In no city did we see congestion of car traffic such as can be seen in Glasgow any day at the corner of Argyle Street and Jamaica Street. The city authorities of the United States would not submit to this state of affairs for a week without setting about to find a remedy. The citizens of the United States seem to have a better appreciation of the value of time than we have. In many cities it seemed to us as if there was a bridge opposite every street. In Chicago, for instance, there are surface lines crossing the Chicago River, also elevated lines and underground lines, and Chicago is a very busy port. The tramway traffic, like that of Glasgow, converges on the center of the city, and ample provision is made for getting across the river, and although there are twice as many cars as we have in Glasgow, there is no such congestion and loss of time as we have here.

"Many of the cities of the United States are groping for the best type of car for dense city traffic, and many changes have been made within recent years. We think, however, that the consensus of opinion now is that our light single-truck car, carrying about sixty passengers, answers the purpose best of all. Of course our type of car with the top deck has its drawbacks. It cannot be turned about and altered like a long single-deck bogie car such as is in general use in America. We cannot, for instance, make it adaptable so readily for the 'pay-as-you-enter' system. We went very fully into the question of fares, and we are satisfied that we are on the right lines, and every tramwayman in the States is now also satisfied that the graded or zone system of fares is the correct system."

Additional Rapid Transit Construction Contract in New York

The Public Service Commission for the First District of New York has awarded the contract for the reconstruction of the Steinway tunnel to the Rapid Transit Subway Construction Company, the lowest bidder, for \$383,910. This tunnel connects the boroughs of Manhattan and Queens, and is already completed as a two-track line from a point between Lexington and Third Avenues, Manhattan, under Forty-second Street and the East River to Jackson and Van Alst Avenues, Long Island City. It was built, however, for trolley car operation, and as it is to be made a part of the dual system of rapid transit and operated in connection with the existing subway, certain reconstruction is necessary. The station in Manhattan will be on the south side of Forty-second Street between Lexington and Third Avenues, and access to the tunnel will be by an escalator. The contractor will have nine months in which to complete the work. Eventually this tunnel will be connected with the existing subway by an extension westward to Times Square, and with the new rapid transit lines in Queens by an extension from its present terminus to the Queensboro Bridge Plaza. Work on the Queens extension is already under contract.

Bids for construction of Section No. 6-A of Routes Nos. 4 and 38, the Seventh Avenue subway in Manhattan, will be opened by the Public Service Commission on March 12. This

section is the junction of the new Seventh Avenue subway with the existing subway near Times Square, and covers that portion of the new line from a point 100 ft. south of Forty-third Street to a connection with the existing line north of Times Square.

The New York Municipal Railway Corporation has been authorized by the Public Service Commission for the First District to award the contract for the construction of Section No. 2 of the Lutheran Cemetery line, in Brooklyn, to F. W. Burnham, the lowest bidder, for \$143,225. The Lutheran Cemetery extension will be an elevated railroad between Wyckoff Avenue, Ridgewood, and Lutheran Cemetery.

Philadelphia's Borrowing Capacity.—The annual report of the City Comptroller of Philadelphia, Pa., submitted to City Councils on Feb. 19, 1914, shows that based on the assessed value of personal property the borrowing capacity of the city for transit facilities and other permanent improvements for this year is \$40,007,767. This is in addition to a total borrowing capacity of \$13,112,151 on assessed realty values which is available for general purposes. Loans authorized and unissued total \$13,150,000. The net funded debt is \$92,336,707.

Chamber of Commerce Committee to Consider Proposed Legislation.—An immediate result of the second annual meeting of the Chamber of Commerce of the United States was a resolution instructing the president of the chamber to appoint a special committee of not less than seven members to consider all proposed anti-trust legislation, and to make preparations for taking immediately a nation-wide referendum through the commercial organizations of the United States. The chairman of this committee is R. G. Rhett, Charleston, S. C.

Change in Motive Power in New York City.—Permission to change the motive power from horses to the underground conduit system has been granted by the Public Service Commission for the First District of New York to the Dry Dock, East Broadway & Battery Railroad for that part of its road lying in Canal Street east of the Bowery. Permission to make such change was granted by the former Board of Railroad Commissioners, and in December, 1913, the company, through Frederick W. Whitridge, its receiver, petitioned the Public Service Commission for consent to make the change. Property owners representing more than half the value of the property along the road have consented to the change.

New York Subway Equipment Contract Approved.—The Public Service Commission of the First District of New York has approved the contracts entered into by the Brooklyn Rapid Transit Company with the American Car & Foundry Company, the General Electric Company, the Westinghouse Electric & Manufacturing Company and the Westinghouse Traction Brake Company to construct 100 new subway cars, each concern providing a certain part of the equipment. Each car body will cost \$6,119, each motor equipment \$1,100, each control apparatus \$975, each set of brakes \$911, and each truck \$450, making a total for each car of \$9,555. The cars will be 67 ft. long and 10 ft. wide. The cars in the present subway are 51 ft. 5 in. long and 8 ft. 8¼ in. wide. The American Car & Foundry Company will make the car bodies and trucks; the General Electric Company will supply the motors, and the Westinghouse companies the control apparatus and air-brake equipment. Deliveries of the different parts are to begin in August, 1914, and to be completed by Dec. 1, 1914.

Westinghouse Electric Veterans Organize.—On the evening of Feb. 21 the employees of the Westinghouse Electric & Manufacturing Company who have been in its employ for a period of twenty years or more organized the Veteran Employees' Association of the Westinghouse Electric & Manufacturing Company. About 325 employees of the company are eligible to membership, and approximately 315 were present at the first meeting. The speakers were E. M. Herr, president; Charles A. Terry, vice-president, and James J. Barrett, representing the shop. Mr. Herr promised the support of the company to the organization and stated that the officials of the company were working on a pension plan for the employees, details of which will be announced later. Guy E. Tripp, chairman of the board

of directors, was present and was elected an honorary member of the association, as was also Mr. Herr. Neither of these gentlemen has been connected with the company the required number of twenty years. A standing toast was drunk to George Westinghouse, who was unable to be present on account of illness.

Montpelier Strike to Be Arbitrated.—An agreement to arbitrate the question in dispute has been reached between the officers of the Barre & Montpelier Traction & Power Company, Montpelier, Vt., and its motormen and conductors, and the men returned to work on Feb. 18. The total membership of the local division at Montpelier is reported to be twenty-seven. Only eighteen of this number are actually in the employ of the company, but all of the union men connected with the company went out when the strike was voted. The strike lasted about two weeks. During that time there was no serious trouble of any sort and no particular difficulty was experienced in maintaining the service, although traffic was light. The company offered to advance wages about 1 cent an hour and grant the men's request for a reduction in working time. The men asked for \$2 a day for the first year, \$2.25 for the second year and \$2.50 a day thereafter. The old rate was 16½ cents to 22 cents an hour, and the rate offered the men was 18 cents an hour for men employed six months, 20 cents an hour the second six months, 21 cents an hour the third six months, 21½ cents an hour the fourth six months, 22 cents an hour the fifth six months, 22½ cents the sixth six months and 23 cents an hour thereafter.

Lectures on Public Utilities.—The West Side Young Men's Christian Association of New York has announced a series of lectures on public utilities beginning on March 2 and ending on May 4. Among the speakers already announced are Frank A. Vanderlip, Governor Cox of Ohio, Arthur Williams, Harry Butler, Francis T. Homer, Howard Elliott and Samuel Insull. Among the representative bankers, engineers, manufacturers, etc., who have consented to act as a committee to co-operate with the finance forum of the association in outlining the subjects and selecting the speakers are A. H. Bickmore, of A. H. Bickmore & Company; A. W. Burchard, of the General Electric Company; Henry P. Davidson, of J. P. Morgan & Company; William B. Dinsmore, of Eikleham & Dinsmore; H. L. Doherty, of H. L. Doherty & Company; Rodman E. Griscom, of Bertron, Griscom & Company; H. R. Hayes, of Stone & Webster; Allen G. Hoyt, of N. W. Halsey & Company; A. B. Leach, of A. B. Leach & Company; S. Z. Mitchell, of the Electric Bond & Share Company; Ray Morris, of White, Weld & Company; J. H. Pardee, of The J. G. White & Company Management Corporation; Seton Porter, of Sanderson & Porter; Calvert Townley, of the Westinghouse Electric & Manufacturing Company; M. A. Viele, of Viele, Blackwell & Buck; F. C. Walcott, of William P. Bonbright & Company, Inc.; John C. Weadock, of Hodenpyl, Hardy & Company; George C. White, of W. S. Barstow & Company, and R. E. Wilsey, of H. M. Byllesby & Company.

LEGISLATION AFFECTING ELECTRIC RAILWAYS

MASSACHUSETTS

The committee on street railways will hold hearings in western Massachusetts in the near future upon seven bills drafted to increase the electric railway facilities of the Berkshire district. At a hearing in Boston on Feb. 26 City Solicitor Anderson of Worcester favored a bill requiring street railways to lay granite or wooden block paving between their tracks in the highways, the enforcement of the proposed act to be in the hands of the street commissioner. Francis H. Dewey, president of the Worcester Consolidated Street Railway, opposed the measure.

NEW YORK

A bill has been introduced in the Assembly amending the Public Service Commissions law by providing that in first-class cities the Public Service Commission may compel the interchange of transfers between surface, elevated and subway lines at intersecting points, in cases where arrangements exist for the interchange of transfers at other intersecting points between such lines and systems.

The following bills have been introduced in the Senate: An act providing for the appropriation of \$600,000 toward

the elimination of grade crossings within the jurisdictions of the Public Service Commissions for the First and Second Districts: an act to amend the highway law in relation to public street surface railroads in towns; an act to amend the Public Service Commission law in relation to the issue of stock by railways.

The following bills have been introduced in the Assembly recently: an act to amend the Public Service Commission law in relation to free transportation or reduced rates; an act to amend the Public Service Commission law in relation to the interchange of transfers between certain railroads in cities of the first class; an act to amend the railroad law in relation to the operation of trains or cars in cities of the first class; an act to amend the railroad law in relation to the protection of grade crossings; an act to amend the railroad law in relation to the protection of passengers in New York City. The two new sections of the last act follow:

"Section 197-a. Protection of passengers in New York city. Every corporation owning or operating a street surface railroad in the city of New York which shall permit more than ten passengers to stand within any car and three passengers to stand on the rear platform of any car operated by such corporation after the seats provided for passengers in such car are filled shall place a conductor on the rear platform of such car and a collector of fares on the inside thereof and prominently display on the front end of such car, at all times when more than ten persons are standing in such car and more than three are standing on the platform, a sign bearing the words 'Standing Room Only' in black letters on a red background, which letters shall be large enough to be easily read at a distance of 100 ft. and which shall be so illuminated at night that it may be plainly read.

"It shall be the duty of such conductor and collector to call out the names of all streets and transfer points in time to allow passengers to signal such car to stop at the desired destination.

"Every such corporation violating any of the provisions of this section shall suffer a penalty of \$50 for each offense, to be sued for and recovered by the city of New York, in any court of competent jurisdiction, upon the complaint of any citizen of or resident in such city.

"Sec. 197-b. *Idem.* No corporation owning or operating any elevated or sub-surface railroad in the city of New York shall suffer or permit more than fifteen persons to enter, or stand in, any car of any train operated by it after the seats provided for passengers in such car are filled with passengers. Every corporation violating the provisions of this section shall suffer a penalty of \$50 for each offense, to be sued for and recovered as provided in Section 197-a of this chapter."

PROGRAM OF ASSOCIATION MEETING

American Railway Engineering Association

The fifteenth annual convention of the American Railway Engineering Association will be held at the Congress Hotel, Chicago, March 17 to 20, 1914. The meetings will be held in the Florentine room of the Congress Hotel, beginning at 9.30 a. m. and 2 p. m. each day.

On March 17 the address of the president will be delivered and the report of the secretary, report of the treasurer and the reports of standing and special committees will be presented.

On March 18 the reports of standing and special committees will be presented and the announcement made of the result of the ballot for officers for 1914. The annual dinner will be held in the gold room of the Congress Hotel at 7 p. m.

On March 19 the reports of standing and special committees will be presented and officers will be installed.

On March 20 delegates will be free to visit the exhibit of the National Railway Appliance Association in the Coliseum and the armory.

Members are privileged to invite friends to the meetings of the association, and it is suggested that these invitations be extended by members direct, either verbally or by letter. Members are requested to register on arrival in Room 1166 of the Congress Hotel and receive a badge, program and other convention literature.

Financial and Corporate

ANNUAL REPORT

Cleveland Railway

Stock and Money Markets

Feb. 25, 1914.

A selling movement on the New York Stock Exchange to-day brought sharp declines in a large number of issues. Selling from abroad contributed to this, but the decline was aided by local trading pressure due to the Mexican situation. Non-dividend issues, including the Interborough-Metropolitan preferred, were the weakest features. Rates in the money market to-day were: Call, 2 per cent; sixty days, 2½ @ 3 per cent; four months, 3 @ 3¼ per cent; six months, 3¼ @ 3½ per cent.

The Philadelphia market showed weakness to-day. Local traction sales were limited, Philadelphia Rapid Transit certificates figuring in small amounts in the trading.

On the Chicago Exchange an easier tendency prevailed. Bonds were steady.

Pressure was exerted on the Boston market to-day and sharp declines resulted, these being particularly noticeable in the mining issues.

Dealings in Baltimore were on a larger scale to-day, sales totaling 2142 shares of stock and \$52,500 of bonds, par value.

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

	Feb. 18	Feb. 25
American Brake Shoe & Foundry (com.)	96¼	97
American Brake Shoe & Foundry (pref.)	144	144
American Cities Company (com.)	36	36
American Cities Company (pref.)	61¾	61¾
American Light & Traction Company (com.)	353	352
American Light & Traction Company (pref.)	106	106
American Railways Company	39¼	39
Aurora, Elgin & Chicago Railroad (com.)	39	39¼
Aurora, Elgin & Chicago Railroad (pref.)	79	80¾
Boston Elevated Railway	82½	82
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.)	40	39
Brooklyn Rapid Transit Company	92¾	92
Capital Traction Company, Washington	109	109
Chicago City Railway	170	170
Chicago Elevated Railways (com.)	20	20
Chicago Elevated Railways (pref.)	65	65
Chicago Railways, ptcptg., ctfr. 1	92	93
Chicago Railways, ptcptg., ctfr. 2	33¼	32¾
Chicago Railways, ptcptg., ctfr. 3	7½	7
Chicago Railways, ptcptg., ctfr. 4	2½	3
Cincinnati Street Railway	107	110
Cleveland Railway	105	105
Cleveland, Southwestern & Columbus Ry. (com.)	*5	*5
Cleveland, Southwestern & Columbus Ry. (pref.)	*26	*26
Columbus Railway & Light Company	13	13
Columbus Railway (com.)	a75	53
Columbus Railway (pref.)	a90	80¼
Denver & Northwestern Railway	71	71
Detroit United Railway	71	a85
General Electric Company	148¾	148
Georgia Railway & Electric Company (com.)	118½	120
Georgia Railway & Electric Company (pref.)	85¾	85½
Interborough-Metropolitan Company (com.)	15¼	14½
Interborough-Metropolitan Company (pref.)	61	59¼
International Traction Company (com.)	*30	*30
International Traction Company (pref.)	*85	*85
Kansas City Railway & Light Company (com.)	19½	*19½
Kansas City Railway & Light Company (pref.)	35	*35
Lake Shore Electric Railway (com.)	5	*5
Lake Shore Electric Railway (1st pref.)	82	*82
Lake Shore Electric Railway (2d pref.)	20	*20
Manhattan Railway	130	131½
Massachusetts Electric Companies (com.)	11¼	11
Massachusetts Electric Companies (pref.)	62	*61½
Milwaukee Electric Ry. & Light Co. (pref.)	95	*95
Norfolk Railway & Light Company	24½	*24½
North American Company	71¼	70
Northern Ohio Traction & Light Co. (com.)	70	60
Northern Ohio Traction & Light Co. (pref.)	101	98¼
Philadelphia Company, Pittsburgh (com.)	44¾	43
Philadelphia Company, Pittsburgh (pref.)	43	43
Philadelphia Rapid Transit Company	18¾	18¾
Portland Railway, Light & Power Company	53	*53
Public Service Corporation	112	112
Third Avenue Railway, New York	43¾	42¼
Toledo Traction, Light & Power Co. (com.)	20	20
Toledo Traction, Light & Power Co. (pref.)	80	80
Twin City Rapid Transit Co., Minneapolis (com.)	105½	106
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)	25¼	25¾
United Rys. Inv. Company (com.)	22¼	21½
United Rys. Inv. Company (pref.)	46	45
Virginia Railway & Power Company (com.)	53	53
Virginia Railway & Power Company (pref.)	95	95
Washington Ry. & Electric Company (com.)	87¼	87
Washington Ry. & Electric Company (pref.)	87½	87
West End Street Railway, Boston (com.)	72	71
West End Street Railway, Boston (pref.)	92	92
Westinghouse Elec. & Mfg. Company	70¼	70
Westinghouse Elec. & Mfg. Co. (1st pref.)	116	116

* Last sale. a Asked.

The statement of income, profit and loss of the Cleveland (Ohio) Railway for the fiscal year ended Dec. 31, 1913, as based on the actual disbursements, and on ordinance allowances, follows:

	Actual	Ordinance Allowances
Operating revenue:		
Revenue from transportation	\$7,093,836	
Revenue from operation other than transportation	55,953	
Total operating revenue	\$7,149,789	\$7,149,789
Operating expenses:		
Maintenance of way and structures	\$983,991	
Maintenance of equipment	791,381	
Traffic	739	
Conducting transportation	3,024,148	
General and miscellaneous	679,398	
Total operating expenses	\$5,479,657	\$5,187,699
Net earnings from operation	\$1,670,132	\$1,962,090
Miscellaneous income	40,977	40,977
Gross less disbursements	\$1,711,109	\$2,003,067
Taxes	435,520	435,520
Net income	\$1,275,589	\$1,567,447
Interest	1,574,008	1,574,008
Deficit	\$298,419	\$6,461
Plus reduction value of obsolete equipment	788,667	
Total deficit	\$1,087,086	

The report shows that the maintenance expenses for the year were \$1,775,373, to which was added \$68,425 for the value of discarded cars and \$720,241 for the value of discarded power equipment, giving maintenance, renewal and depreciation charges for the year of \$2,564,039. The allowances in the maintenance and operating reserves was \$5,187,699, the expense \$5,479,657, giving a deficit of \$291,958. When to this figure was added the above value for obsolete cars and power equipment, the net deficit in the reserves for the year was found to be \$1,080,624.

The total passenger car miles run in 1913 were 30,057,105; the revenue mileage was 30,295,735. Register fares were 220,511,190 in 1913 as compared to 203,349,655 in 1912; transfers, 87,596,428 in 1913 and 80,169,027 in 1912, and employees' transportation, 888,297 in 1913 and 777,137 in 1912. The ratio of transfers to register fares and employees' passes increased from 39.27 per cent in 1912 to 39.56 per cent in 1913.

The following increases took place during 1913 as compared with 1912: Passenger revenue, 7.97 per cent; gross income, 7.65 per cent; maintenance allowance, 4.22 per cent; maintenance expenses, 27.96 per cent; operating allowance, 10.18 per cent; operating expenses, 4.40 per cent; taxes, 18.80 per cent; interest, 11.12 per cent, and passenger car miles, 4.13 per cent.

The following comparative table shows the cost and income of the company per car mile in cents for the past three years:

	1911	1912	1913
Maintenance expenses	5.36	4.77	5.86
Operating expenses	12.07	12.19	12.23
Taxes	1.32	1.26	1.44
Interest on funded and floating debt	1.91	1.76	1.07
Interest on capital stock	3.22	3.11	4.12
Total cost of operation	23.88	23.09	24.72
Gross income	22.87	22.95	23.73
Deficit	1.01	.14	.99
Obsolete cars and equipment			2.61
Total deficit			3.60

The condition of the interest fund of the company is shown by the following report:

Original deposit	\$500,000
Gross income March 1, 1910, to Dec. 31, 1913	25,512,902
Total	\$26,012,902
Deductions:	
Allowances	\$18,605,919
Taxes	1,483,577
Interest	5,559,743
	\$25,649,239
Balance	\$363,663

This balance is \$136,337 less than the amount placed

in the fund originally under the provisions of the Taylor ordinance, and is accounted for as follows:

1910, Profit (earnings in excess of allowances, taxes and interest)	\$75,994
1912, Profit (earnings in excess of allowances, taxes and interest)	110,418
Total	<u>\$186,412</u>
1911, Loss (allowances, taxes and interest in excess of earnings)	\$202,129
1913, Loss (allowances, taxes and interest in excess of earnings)	6,462
Arbitration expenses in excess of \$5,000	14,562
Payments on account of award of arbitrators to apply on 1910, 1911 and 1912 deficits	99,596
Total	<u>\$322,749</u>
Net loss	\$136,337

John J. Stanley, president of the company, says in part: "During 1913 three arbitrators—C. N. Duffy, vice-president of The Milwaukee Electric Railway & Light Company; A. B. du Pont, of Cleveland, and United States District Judge John M. Killits, of Toledo—made an award increasing the operating-expense allowance from 11½ cents, the rate in 1912, to 12.1 cents, effective from March 1, 1913, and directed that the overdrafts of the operating and maintenance reserves at March 1, 1913, be made good from the company's interest fund by March 1, 1914. The overdraft in the operating reserve, which amounted to \$259,592 March 1, 1913, has been made good from the interest fund, and the city street railroad commissioner, acting under authority given by the City Council, has permitted the company to reduce the maintenance overdraft by \$106,152. The remainder, which is to be made good from the interest fund by March 1, 1914, amounts to \$217,444. By order of the board of arbitrators, the interest fund was increased in the year by \$216,003, which had been set up as accident and insurance reserves.

"The operating-expense allowance, therefore, for the year was 11.5 cents per car-mile in January and February, plus the deficits of those months, allowed by the arbitrators, and 12.1 cents during the other ten months, an average of 12.17 cents. Per car-mile the expenses were 12.23 cents, giving a deficit of 0.06 cent.

"The maintenance, renewal and depreciation reserve, in which there was a deficit of over-expenditure on Jan. 1, 1913, of \$292,315, and on March 1 of \$323,597, was overdrawn at the end of the year to the amount of \$1,080,624. Of this \$1,080,624, \$788,666 is the reproduction value of worn-out or obsolete cars and power-plant machinery. There has been considerable discussion in the newspapers and elsewhere as to this obsolete property, but there can be no question as to the right and duty of the company, the property having become useless and having lost its value, to take it off the books. The reproduction value of the abandoned property, disregarding its probable value as scrap, is equal to 2.61 cents per car-mile on the car-miles of 1913. Assuming that the present allowance of substantially 5 cents per car-mile will be sufficient to take care of ordinary repairs, renewals and depreciation, an increase of the allowance to 7 cents per car-mile would provide for the overdraft due to the discarding of this property in about fifteen months. The present allowance has never been large enough to provide for ordinary maintenance expenses, the cost of necessary renewals, and depreciation. While millions of dollars have been spent in the last four years for repairs and replacements the value added by the betterments has not been sufficient to offset the depreciation.

"The expense on account of accidents amounted to \$308,635, an increase over the amount charged to expense and set aside for an accident reserve in 1912 of \$75,761, and over the actual expenditures of 1912 of \$114,174. The increase is attributed to changes in state laws and to several other causes.

"After a careful study of the workmen's compensation law of Ohio, the officers elected to pay the State 5 per cent of the amount of the premium fixed by the Industrial Commission and let the claim department of the company make all adjustments with employees in accordance with the provisions of the law.

"Numerous franchises were granted in the year by the Cleveland Council for the construction of extensions and the Council also passed an ordinance granting to the com-

pany the right to haul freight in interurban cars at night. This was approved at the referendum election.

"The cross-town line in Harvard and Denison Avenues has been completed, and is in operation, and the tracks on West Sixty-fifth Street from Clark Avenue to Detroit Avenue are operated as a cross-town line. Both lines are unprofitable.

"There were 15,4658 miles of additional track laid in the year, and 1,366 miles of old track were abandoned. About 14 miles of track were renewed in the year.

"The company within the year purchased a large tract of land in Harvard Avenue, for a terminal for its new cross-town line in Denison and Harvard Avenues and its East Fifty-fifth Street line. The company's general shops will also be located here. The tract contains 62½ acres, about 25 of which will probably be sold. The company also purchased a strip of land about 2400 ft. in length, extending from Linwood Avenue near Addison Road northerly to Superior Avenue, at a cost of about \$140,000, to be used as a right-of-way for a new cross-town line in that part of the city. Additional land on West Sixty-fifth Street, near the L. S. & M. S. R. R., was also purchased.

"It is estimated that improvements will be made in 1914 costing \$1,837,500. The Lake View shops and the Superior-Avenue, East Fifty-fifth Street and St. Clair Avenue car-houses will be abandoned within the coming year, and will probably be offered for sale or lease."

Third Avenue Bonds Offered Directly to Public

F. W. Whitridge, president Third Avenue Railway, New York, announced on Feb. 24 a plan of financing which is a radical departure from old methods of corporation financing. Instead of dealing with a fiscal agent who in turn would dispose of the securities to the public at a commission, Mr. Whitridge proposes to sell \$4,000,000 of first refunding mortgage 4 per cent bonds of the company direct to the public.

Sealed bids will be received for any or all of the issue at the office of the company at 130th Street and Third Avenue on March 10. Accrued interest will be added and the company will reserve the right to reject any or all proposals. Stockholders of record of March 6 are to have preference.

Concerning the plan Mr. Whitridge says:

"There has lately been a great deal of criticism of bankers' commissions in the matter of corporate financing, and especially of financing by bankers who have any interest in the corporation seeking funds. The credit of the Third Avenue Railway is good, and I am sure that this plan will be successful. Of late the country has gone crazy over the matter of corporate financing, and I believe that the selling of securities direct to investors without letting them first pass through the hands of the company's fiscal agent was one of the reforms advocated."

The proceeds of the sale will be used to pay two notes amounting to \$2,939,787, representing the remainder of the purchase price of the securities of the New York City Interborough Railway and the Belt Line Railway Corporation, and for other corporate purposes. On the payment of these notes \$1,750,000 of first mortgage 5 per cent gold bonds and \$734,000 of stock of the Belt Line Railway Corporation and \$1,702,000 of bonds and \$4,221,000 of stock of the New York City Interborough Railway will pass under the lien of the first refunding mortgage of the Third Avenue Railway.

The bonds offered are part of an authorized issue of \$40,000,000, of which \$15,790,000 are outstanding. Of the purchase price 25 per cent will be payable at the Central Trust Company on acceptance of any proposal, and the remainder on call at five days' notice when the bonds are ready for delivery. Payment may be made in full when the allotment is made.

American Railways, Philadelphia, Pa.—It is stated that the directors of the American Railways are considering an offer for the company's holdings of \$1,244,000 of the 5 per cent bonds of the Springfield (Ohio) Railway due in 1935, representing the advances made by the American Railways for the betterment of the property at Springfield.

Ashtabula (Ohio) Rapid Transit Company.—The Ashtabula Rapid Transit Company has been authorized by the Public Utilities Commission of Ohio to issue \$40,000 of

bonds, from the proceeds of which it will relay 2 miles of track in the village and replace the pavement torn up in carrying out the work. Commissioner E. W. Doty dissented from the conclusion reached by the other members of the commission in the case. He contended that the company was piling up capital stock beyond the proportions necessary for a property of the kind. The Village Council had by ordinance ordered the company to make the improvements, and the other members held that the commission could not avoid allowing the company to secure sufficient capital for the work. They ruled that the company could not be penalized for possible mistakes of the past.

Birmingham Railway, Light & Power Company, Birmingham, Ala.—J. S. Pevear, William von Phul, H. W. Coffin, J. P. Ross and Hugh McCloskey have been elected directors of the Birmingham Railway, Light & Power Company to succeed M. S. Sloan, W. H. Kettig, William Mason Smith, George H. Davis and S. H. Marsh.

Boston (Mass.) Elevated Railway.—The Boston Elevated Railway has sold \$2,000,000 of 5 per cent thirty-year refunding bonds to Estabrook & Company, R. L. Day & Company, Blodget & Company, N. W. Harris & Company and Merrill Oldham & Company.

Bristol & Plainville Tramway, Bristol, Conn.—The special committee of the City Council of Bristol appointed some time ago to inquire into the purchase of a controlling interest in the Bristol & Plainville Tramway by Richter & Company, Hartford, Conn., noted in the *ELECTRIC RAILWAY JOURNAL* of Dec. 6, 1913, has reported to the Council. The committee was refused access to the corporate books of the company, and a member of the committee in the capacity of stockholder examined the list of stockholders as of Jan. 25. At the time of the transfer of the controlling interest to Richter & Company there were about fifty stockholders. When the books were examined on Jan. 25 it appeared that the number was being constantly increased through sales of shares in small lots. The committee says that "Bristol at the present time has nothing like a fair share of the membership of the board of directors." In its conclusion the committee suggests that "the charter of the company be so amended by the next Legislature as to provide that the Mayor of Bristol shall be ex officio a director of the Bristol & Plainville Tramway."

Charleston Consolidated Railway, Gas & Electric Company, Charleston, S. C.—The stockholders of the Charleston Consolidated Railway, Gas & Electric Company will vote on March 18, 1914, on the question of increasing the common stock of the company from \$2,500,000 to \$3,000,000, the proceeds to be used to pay for additions and betterments as made from year to year. The company now has outstanding \$500,000 of preferred stock.

Chicago (Ill.) Elevated Railways.—At the annual meetings of the stockholders of the Northwestern, the Metropolitan and the South Side Elevated lines, Feb. 24, 1914, the retiring directors were re-elected with the exception of Mason B. Starring, of the Northwestern Elevated Railroad, who is succeeded by W. A. Fox.

Chippewa Valley Railway, Light & Power Company, Eau Claire, Wis.—The American Public Utilities Company, Grand Rapids, Mich., has arranged to take over all the electric railway properties of the Chippewa Valley Railway, Light & Power Company, which operates the street railway in Eau Claire and Chippewa Falls, together with the interurban line between these two cities, a distance of 22½ miles; the Chippewa Falls Water Works & Light Company; the Menominee Electric Light & Power Company; the water power plant at Menominee, and rights along the Red Cedar and Chippewa Rivers, with a capacity developing approximately 100,000 hp, together with other public utilities in Menominee, Elmwood, Spring Valley and other small towns.

El Paso (Tex.) Electric Company.—A special meeting of shareholders of the El Paso Electric Company has been called for March 9, for the purpose of voting upon a proposal to increase the common stock by \$1,000,000, so that authorized capital shall be \$1,000,000 of preferred stock and \$3,000,000 of common stock. If this stock increase is authorized, \$375,000 will be offered pro rata to the preferred and common stockholders of record March 16 at par. Every eight

existing shares will be entitled to subscribe to one share of new common stock. The directors state that in order to meet the demands of a constantly increasing business it will be necessary to make various extensions and improvements to plant, including an extension to the power station, the installation of additional generating equipment and the purchase of more rolling stock.

Fort Wayne & Northern Indiana Traction Company, Fort Wayne, Ind.—The Fort Wayne & Northern Indiana Traction Company has been authorized by the Public Service Commission of Indiana to issue \$600,000 of 6 per cent collateral gold notes and \$320,000 of general lien bonds. The notes are to be sold at not less than 90 per cent of their face value, and the bonds are to be disposed of at not less than 85 per cent of their face value.

Goshen, South Bend & Chicago Railroad, South Bend, Ind.—Poe & Davies, Baltimore, Md., are offering for subscription at 99½ and interest \$100,000 of 6 per cent two-year first mortgage secured coupon notes of the Goshen, South Bend & Chicago Railroad, dated Nov. 1, 1913, and due Nov. 1, 1915, but redeemable at 102 and interest on sixty days' notice. These notes are guaranteed as to both principal and interest by the Gary & Interurban Railroad, the Valparaiso & Northern Railway and the Gary & Interurban Railway. As noted in the *ELECTRIC RAILWAY JOURNAL* of Feb. 21, 1914, page 431, Edwin W. Poe, vice-president of the Baltimore Trust Company, and Philip L. Poe, of Poe & Davies, have been elected directors of the Gary & Interurban Railway.

Grand Valley Railway, Brantford, Ont.—The prospects would seem to be improved for an amicable settlement of the differences between the city of Brantford and the Grand Valley Railway, which recently asked for an extension of time in which to meet its obligations to the city. It has been proposed now that the city of Brantford should purchase the railway. G. Watson intimated to the Second Appellate Division at Osgoode Hall, Toronto, on Feb. 16 that the city's offer was the best that had been received, and that he would apply to Justice Middleton later for confirmation by the court of its acceptance. As the purchase proposal will have to be submitted to the ratepayers the court let the matter stand over for six weeks.

Harper's Ferry Electric Light & Power Company, Harper's Ferry, W. Va.—A representative of the Harper's Ferry Electric Light & Power Company is said to have offered \$75 a share for the outstanding stock of the company, which is authorized to construct an electric railway in Brunswick. The par value of the stock is \$50 a share. The franchise has two years to run in Brunswick. About six months ago the Town Council granted the company a new franchise for twenty years. The plan is to build an electric railway from Winchester, Va., to Washington, D. C.

Hudson & Manhattan Railroad, New York, N. Y.—The directors of the Hudson & Manhattan Railroad have declared an interest payment of \$10 on each adjustment income bond of the company for the six months ended Dec. 31, 1913, payable on April 1, 1914. The first payment of \$8.34 for the five months ended June 30, 1913, was made on Oct. 1, 1913, being also at the rate of 2 per cent per annum.

Interborough Rapid Transit Company, New York, N. Y.—Lee, Higginson & Company, Harris, Forbes & Company, Kissel, Kinnicutt & Company, William A. Read & Company and White, Weld & Company have underwritten \$10,000,000 of first and refunding mortgage 5 per cent gold bonds of the Interborough Rapid Transit Company. This is the same syndicate which purchased the \$30,000,000 bonds of the company and offered them at 98½ on Oct. 10. This brings the total amount of bonds sold to the public up to \$40,000,000, although a considerable amount have been exchanged for old bonds of the company, so that the total now outstanding in the hands of the public is much larger than the figure mentioned. The bonds are dated Jan. 1, 1913, and are due Jan. 1, 1966. Several firms of brokers are offering a block of these bonds at 99 and accrued interest.

Jacksonville (Fla.) Traction Company.—A special meeting of the stockholders of the Jacksonville Traction Company has been called for Feb. 26, 1914, to act on the proposal to increase the capital stock of the company \$1,000,000, of which

increase \$500,000 will be preferred and \$500,000 common. The enlarged capitalization will be \$2,500,000, consisting of \$1,000,000 of preferred stock and \$1,500,000 of common stock. If the stockholders authorize the proposed increase, \$200,000 of the common stock will be offered pro rata to common stock holders of record Feb. 28 at \$100 per share, in the ratio of one new share for every four old shares.

Kansas City Railway & Light Company, Kansas City, Mo.—The committee representing the holders of the 6 per cent collateral gold notes of the Kansas City Railway & Light Company announces that it has arranged for the payment on March 2, 1914, at the office of the New York Trust Company interest on the notes from Sept. 1, 1913, to March 1, 1914, at the rate of 7 per cent per annum to holders of certificates of deposit representing the notes.

Manhattan Bridge Three-Cent Line, New York, N. Y.—The Manhattan Bridge Three-Cent Line wishes to issue \$260,000 capital stock to acquire property, to improve its facilities and to discharge lawful obligations. It has already issued \$190,000, and the application for permission to add to this will be heard by Milo Roy Maltbie, of the Public Service Commission for the First District of New York, on Feb. 27.

New York (N. Y.) Railways.—The directors of the New York Railways have not taken any action on the declaration of interest on the adjustment income bonds for the second six months of 1913 because of a difference of opinion in the board as to the interpretation of the language of indenture covering the mortgage. It is stated that one member of the board, representing the bondholders, takes the position that the directors have no discretion in the amount that shall be paid on the income bonds, but that all unexpended reserves in addition to surplus earnings are applicable to interest payments up to 5 per cent for a given year. In other words, it is contended that the wording of the indenture is mandatory upon this point.

Portland Railway, Light & Power Company, Portland, Ore.—At the annual meeting of the Portland Railway, Light & Power Company at Portland, Ore., on March 18, stockholders will be asked to decide whether the bonds which are reserved to be issued from time to time under the first and refunding mortgage shall be convertible into capital stock, and if so, upon what terms.

Quebec Railway, Light, Heat & Power Company, Ltd., Quebec, Que.—The Quebec Railway, Light, Heat & Power Company, Ltd., announce that interest on the \$6,120,400 of consolidated mortgage 5 per cent bonds of the company which was due on Dec. 1, 1913, would be paid on Feb. 23.

Rockford & Interurban Railway, Rockford, Ill.—E. W. Clark & Company, Philadelphia, Pa.; Babcock, Rushton & Company, Chicago, Ill., and Curtis & Sanger, New York, N. Y., are offering the 6 per cent cumulative preferred stock of the Rockford & Interurban Railway at 95 and accrued dividends, netting the purchaser about 6.30 per cent on the investment.

San Francisco-Oakland Terminal Railways, Oakland, Cal.—The San Francisco-Oakland Terminal Railways has applied to the Railroad Commission of California for authority to issue \$1,000,000 of bonds as additional security for the \$2,500,000 of notes which have been extended by the holders. Permission is also asked to issue \$500,000 of collateral trust 7 per cent notes. The proceeds will be applied to the East Bay System. A special meeting of the stockholders of the company has been called for April 7 to vote on creating an issue of \$35,000,000 bonds. A new series is planned, to be known as the "first and refunding thirty-five-year 5 per cent gold bonds."

Scranton & Binghamton Railroad, Scranton, Pa.—The Public Service Commission of the Second District of New York has entered an order authorizing the Scranton & Binghamton Railroad, a Pennsylvania corporation, to purchase, take and hold the outstanding capital stock of the Binghamton (N. Y.) Railway amounting at par to \$978,995, and approving the terms of sale of 90 per cent or more of said stock embraced in an agreement between the Scranton & Binghamton Railroad, G. Tracy Rogers and the First National Bank of Binghamton dated Jan. 8, 1914. It is the intention of the Scranton & Binghamton Railroad to extend its line to the New York State line and to effect a connection

with the Binghamton Railway by a short extension of that railway to be hereafter constructed.

Third Avenue Railway, New York, N. Y.—The Third Avenue Railway, which applied to the Public Service Commission for the First District of New York for permission to issue \$6,650,000 of bonds, has been authorized by the commission to issue \$4,000,000 of 4 per cent first refunding mortgage bonds, to run fifty years from Jan. 1, 1910, and to be redeemable after Jan. 1, 1915, at 105 per cent. The bonds must be sold to net the company not less than 82 per cent of their par value, and the proceeds are to be used to pay off notes issued mainly for the acquisition of the securities of the Belt Line Railway Corporation and the New York City Interborough Railway. Of the total amount the commission allows \$720,000 for expenses of sale of bonds and for discount, but requires that this amount shall be amortized by the payment each year into a separate fund of sufficient cash to accumulate the amount of \$720,000 by Jan. 1, 1959. Action was deferred on the remainder of the bonds applied for.

Dividends Declared

American Railways, Philadelphia, Pa., quarterly, 75 cents, common.

El Paso (Tex.) Electric Company, quarterly, 2¼ per cent, common.

Terre Haute Traction & Light Company, Terre Haute, Ind., 3 per cent, preferred.

ELECTRIC RAILWAY MONTHLY EARNINGS

BANGOR RAILWAY & ELECTRIC COMPANY, BANGOR, MAINE						
Period		Gross Earnings	Operating Expenses	Net Earnings	Fixed Charges	Net Surplus
1m., Jan., '14		\$63,687	*\$31,333	\$32,354	\$17,358	\$14,996
1 " " '13		58,793	*28,933	29,860	17,340	12,520
12 " " '14		768,979	*348,911	420,068	207,603	212,465
12 " " '13		715,373	*323,733	391,590	201,236	190,354
CHATTANOOGA RAILWAY & LIGHT COMPANY, CHATTANOOGA, TENN.						
1m., Jan., '14		\$99,233	*\$58,352	\$40,881	\$27,653	\$13,228
1 " " '13		95,633	*59,241	36,392	24,399	11,993
12 " " '14		1,208,529	*716,738	491,791	301,335	190,456
12 " " '13		1,079,302	*645,765	433,537	269,159	164,378
CLEVELAND, PAINESVILLE & EASTERN RAILROAD, WILLOUGHBY, OHIO						
1m., Dec., '13		\$33,526	*\$22,416	\$11,109	\$12,632	\$1,523
1 " " '12		31,663	*17,086	14,577	9,999	4,578
12 " " '13		425,924	*234,666	191,257	127,316	68,941
12 " " '12		402,188	*224,793	177,395	119,219	58,175
LAKE SHORE ELECTRIC RAILWAY, CLEVELAND, OHIO						
1m., Dec., '13		\$117,449	*\$67,175	\$50,275	\$35,035	\$15,240
1 " " '12		113,069	*63,585	49,485	34,867	14,618
12 " " '13		1,416,983	*837,497	579,486	421,447	158,039
12 " " '12		1,326,884	*754,821	572,063	419,451	152,612
NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO						
1m., Dec., '13		\$295,377	*\$190,295	\$105,082	\$50,283	\$54,799
1 " " '12		259,881	*\$150,778	109,103	41,506	67,597
12 " " '13		3,284,532	*2,019,654	1,264,879	561,815	703,064
12 " " '12		2,996,037	*1,702,766	1,293,271	523,068	770,203
NORTHERN TEXAS TRACTION COMPANY, FORT WORTH, TEXAS						
1m., Dec., '13		\$184,876	*\$102,571	\$82,304	\$24,052	\$58,252
1 " " '12		170,933	*89,758	81,175	24,662	56,513
12 " " '13		2,132,200	*1,179,941	952,259	286,918	665,341
12 " " '12		1,790,763	*941,690	849,073	266,076	582,997
PADUCAH TRACTION & LIGHT COMPANY, PADUCAH, KY.						
1m., Dec., '13		\$29,523	*\$16,630	\$12,893	\$7,707	\$5,186
1 " " '12		27,878	*16,632	11,246	7,334	3,912
12 " " '13		296,595	*194,093	102,472	89,962	12,510
12 " " '12		286,537	*192,674	93,863	86,353	7,510
PUGET SOUND TRACTION, LIGHT & POWER COMPANY, SEATTLE, WASH.						
1m., Dec., '13		\$790,307	*\$435,126	\$355,181	\$174,407	\$180,774
1 " " '12		725,642	*416,705	308,937	172,977	135,960
12 " " '13		8,613,599	*5,008,375	3,605,224	2,063,019	1,542,205
12 " " '12		8,313,848	*4,772,299	3,541,549	1,976,250	1,565,299
SAVANNAH (GA.) ELECTRIC COMPANY						
1m., Dec., '13		\$74,505	*\$49,864	\$24,642	\$22,968	\$1,674
1 " " '12		68,447	*49,447	19,001	17,348	1,652
12 " " '13		827,780	*557,921	269,859	262,264	7,595
12 " " '12		747,058	*551,052	196,007	194,795	1,212
TAMPA (FLA.) ELECTRIC COMPANY						
1m., Dec., '13		\$83,107	*\$49,386	\$33,722	\$5,059	\$28,663
1 " " '12		66,797	*34,361	32,436	4,791	27,644
12 " " '13		844,941	*466,499	378,442	55,749	322,693
12 " " '12		753,835	*394,629	359,205	53,756	305,449

Traffic and Transportation

Traffic Accidents in New York and New Jersey in 1913

The National Highways Protective Society has for several years kept a record of traffic accidents of all sorts in the States of New York and New Jersey. These are classified as automobile, electric railway and wagon, and include only pedestrians knocked down or run over, and occupants of vehicles who received their injury through the fault of some other person. Accidents due to failure of equipment of the vehicle, or to faulty condition of the highway, have not been included, the intention being to note only those accidents for which the driver of some vehicle can reasonably be held to blame. The only electric railway accidents counted are those to pedestrians, or as the result of collisions. Other injuries to passengers or to employees are omitted. Children include all persons under seventeen years of age. Except when otherwise noted, New York State means the State excluding Greater New York.

The total number of persons killed in New York City during 1913 by automobiles was 302, by electric railways 108 and by wagons 132. These figures are derived from the coroners' reports every month, and the totals are all somewhat below the coroners' totals for the year. This is due to the difference in classification, and to the fact that the definite report of the cause of an injury often does not come to the coroners' office until after the end of the month. The only significant discrepancy is in the figures for wagon fatalities, where it is probable that the correct figures would be about 170 instead of 132.

Outside of New York City the reports received by the society and the coroners' figures agree closely. In New York City automobile, electric railway and wagon fatalities for the past four years have been as follows:

	1910	1911	1912	1913
Automobile	112	142	221	302
Electric railway	148	109	134	108
Wagon	211	172	177	170

The percentages of children killed during those four years by automobile, electric railway and wagon, respectively, out of the total number of persons killed by each of these three classes of vehicles, were as follows: automobiles, 45 per cent; electric railways, 31 per cent; wagons, 52 per cent.

Another feature worthy of note is that while in 1910 wagon killings outnumbered those due to automobiles, in 1913 automobile fatalities were more than those due to electric railways and wagons combined.

The total number of persons in New York City who were injured sufficiently to require medical attention or were killed for the year 1913 was 1485. The number of arrests following such accidents was sixty-two, or about one in every twenty-five accidents. In one accident in about fifteen the driver of the automobile ran away without giving any aid to the victim or making his identity known. There were 102 such cases in the city of New York during the past year, or about two every week. This is a felony under the State law, yet in the few cases where the driver was subsequently caught there is no record of any subsequent conviction. In about 15 per cent of the accidents the owner himself was driving. Motorcycles figured in about 5 per cent of the accidents.

In New York State outside of New York City for the past three years the accident record is as follows:

	1911	1912	1913
Automobile	132	127	149
Electric railway	67	79	79
Wagons	31	28	32

For 1912 and 1913 the percentage of children killed has been for automobiles, 26 per cent; electric railways, 25 per cent; wagons, 42 per cent.

The total number killed or injured by automobiles in the State of New York of which the society has record during the year 1913 was 1371.

The percentage of runaways after an accident was about the same as in New York City, as was the percentage of arrests following an accident. There were a very few convictions following these arrests that carried a jail sentence. The percentage of accidents in which the owner was driving was about 20 per cent.

In the State of New Jersey for the years 1912 and 1913 the record of fatalities was as follows:

	1912	1913
Automobiles	91	124
Electric railways	41	28
Wagons	16	26

The percentages of children killed by automobile, electric railway and wagon, respectively, out of the total number of persons killed by each of these three classes of vehicles, were as follows: automobiles, 36 per cent; electric railways, 36 per cent; wagons, 50 per cent.

The total number of persons killed and injured by automobiles for the year 1913 was 992.

The percentage of cases in which the driver ran away after the accident was rather higher than in New York State, being 9 per cent against 7 per cent. There were, however, more arrests in New Jersey following accidents than in the entire State of New York inclusive of New York City, the percentage being about 14 per cent. The proportion of accidents in which the owner was driving was about one in five or about the same as for New York State.

The following table gives the number of accidents in New York City, New York State and New Jersey due to specific classes of vehicles, or to particular circumstances of interest:

	New York City	New York State	New Jersey
Motorcycles	67	190	96
No light on wagon	10	3
No light on automobile	18	..
U. S. mail	23	3	1
Taxicab	49	14	Few but not counted
Fire Department vehicles	26	5	4
Ambulances	24	2	2
Police and other official	5	2	2
Children, coasting, playing games in street, "hitching," etc.	46	12	18
Woman driving automobile	10	14	13

While there was not a single occupant of an electric railway car killed at a railroad grade crossing in New York and New Jersey, during the past year, the occupants of other vehicles contributed ninety-four victims. There is in both States a law compelling electric railway cars to stop at each crossing and the motorman to be assured that the way is clear before proceeding. The society says that could a similar law be enforced against wagons and automobiles, it would save more than fifty lives a year in the two States.

According to the society Los Angeles, with an automobile fatality rate of 153 per 1,000,000 in 1913, has the maximum rate of all the large cities of the world. Baltimore, with a rate of fourteen per 1,000,000, compares favorably with the cities of Europe. In Washington, which has one of the highest rates in the world, there has been for some time an ordinance limiting pedestrians to crossing the streets at the cross-walks only.

The rates for the foreign cities, and for American cities outside of the States of New York and New Jersey, are for the calendar year 1912, except for Los Angeles, where the figures are for 1913. The populations on which rates are based are from the United States Census of 1910 and from the report of the select committee of the House of Commons. The fatality rates per 1,000,000 of population for leading American and foreign cities in the year 1912 follow:

American Cities			
City	Automobiles	Street Cars	Wagons
New York	47	28	38
Buffalo	49	51	10
Chicago	48	89	52
Pittsburgh	52	48	43
Providence	48	35	12
St. Louis	30	64	45
San Francisco	52	61	20
Baltimore	14	25	13
Los Angeles (1913)	153		Not given
Washington	71	56	20
Foreign Cities			
London	46	5	24
Berlin	23	11	31
Paris	47	25	16
Vienna	13	2	15
Glasgow	12	15	19
Liverpool	17	4	16
Edinburgh	15	5	16
Dublin	10	10	22
Belfast	17	4	12
Leeds	19	3	11

Competition Between Teams of Car Crews to Reduce Accidents

The El Paso (Tex.) Electric Railway has adopted a plan which has created a spirit of friendly rivalry among the trainmen and proved an incentive toward reducing accidents. The trainmen, or car crews, have been divided into two teams designated as the "Red" and the "Blue," respectively. Since the teams are competing with each other for the best accident record the division was made by lot, and in order that the more experienced men might not predominate on one side the numbers of the men who had worked less than two months were placed in a hat, and as they were drawn out blindly the first man was assigned to the "Red" team, the second to the "Blue," the third to the "Red," and so on with each succeeding number. Then came the drawing of the numbers of the four-month men followed by the six-month men, the eight-month men and so on accordingly until the list had been completed. This resulted in two teams balanced as to experience.

Since Jan. 1, when the contest was inaugurated, an accurate daily account has been kept of the accident record of the members of the two teams, and at the end of February the members of the team which has made the better score will be the guests at a banquet attended by the officers of the company. The plan is to banquet the winning team at the expiration of sixty-day periods throughout the year.

The accidents have been classified and are charged up against the deserving trainmen in points, a schedule of which has been prepared by the committee on "safety first." It was anticipated that occasionally an accident would occur involving a trainman of the "Red" team and one of the "Blue" as members of the same car crew. It was therefore decided that the responsibility for the accident should be fixed upon either the motorman or the conductor. The plan has already placed the operation of the system upon a plane of higher efficiency. Since the contest was begun the two teams have been on practically even terms and there was no telling on Feb. 18 which one would be returned victorious on Feb. 28. The schedule of points charged up against the trainmen, and through them the teams, follows:

CLASSIFICATION OF ACCIDENTS AND THEIR RATING

1. Collision, head on.....	100
2. Collision, rear end.....	100
3. Collision, side.....	50
4. Collision, street railway crossing.....	50
5. Collision, steam railway crossing.....	100
6. Collision, with vehicles, except autos.....	50
7. Collision, with autos and motorcycles.....	40
8. Collision, with pedestrians.....	50
9. Collision, with animals.....	25
10. Derailments.....	15
11. Motorman lost control of car.....	75
12. Defective tracks.....	0
13. Defective car or apparatus.....	0
14. Boarding moving car.....	10
15. Leaving moving car.....	75
16. Fell in or thrown off moving car.....	35
17. Fell or tripped on stationary car.....	5
18. Fell or tripped near car.....	0
19. Disturbance on car between passengers.....	0
20. Disturbance on car between passengers and crew.....	15
21. Horse frightened at car.....	0
22. Damage to passengers' clothes.....	5
23. Employees injured.....	0
24. Not otherwise classified.....	0
25. Failure to report an accident.....	*200

*This is in addition to the points which would naturally accrue on account of the accident.

Freight on a Wisconsin Road

The Common Council of Waupaca, Wis., granted a franchise recently to the Waupaca Electric Light & Railway Company, an electric railway running from Waupaca 5 miles into the country to the Wisconsin Veterans' Home, authorizing the company to carry freight, mail and express in addition to passengers. Among the conditions prescribed are that not more than two freight cars shall be hauled in one train; that no car shall be loaded to exceed 10 tons; that the speed of such cars in the city limits shall not exceed 10 m.p.h. and that no car shall be stopped on certain business streets for the purpose of loading or unloading freight. The passage of the franchise created considerable feeling among some of the people in Waupaca, and a petition was filed with the city clerk by the requisite number of

voters to insure a vote on the adoption or rejection of the franchise at the regular spring election in April. The town board of the town of Farmington, which adjoins Waupaca, and wherein the Wisconsin Veterans' Home is located, has already granted the necessary franchise. The idea of an electric railway combining city and interurban features as does this line, and operating almost entirely over the public streets and highways, transporting freight, is something new in Wisconsin. The franchise asked for by the company and granted by the City Council provided that the privilege of receiving freight should accrue only to the Wisconsin Veterans' Home, which is a state institution. The trustees of the home were largely instrumental in inducing the electric line to apply for the franchise, as the only means for conveying the necessary freight and supplies from the steam roads at Waupaca, a distance of 5 miles, to the home has been by teams. The outcome of this innovation in electric railroading in Wisconsin has awakened the interest of many people who are financially interested in similar properties. Irving P. Lord, Waupaca, Wis., is the president and general manager of the Waupaca Electric Light & Railway Company.

Dont's in New Albany

The Louisville & Southern Indiana Traction Company and the Louisville & Northern Railway & Light Company, New Albany, Ind., have combined recently in the distribution of blotters to 7000 school children in New Albany and Jeffersonville, Ind. The blotters are part of the "safety first" campaign being conducted by James Harmon, safety agent. The following matter appeared on the blotters:

"DONT'S THAT AVERT DANGER

- "Don't play in the streets where there are tracks.
- "Don't cross tracks without looking both ways.
- "Don't cross street if you see a car near.
- "Don't get on or off a car while it is moving.
- "Don't lean out of car window.
- "Don't face the rear in stepping off the car.
- "Don't touch or allow anyone to touch any wire.
- "Don't steal rides on any cars or wagons.
- "Don't fail when leaving car to look both ways for any vehicle.
- "Don't cross street except at cross-walk.
- "Don't stand on car-steps.
- "Don't be negligent or careless.
- "Do your part to make street car travel safe."

Order on Boston Transfers.—The Massachusetts Public Service Commission has issued an order requiring the Boston Elevated Railway to establish free transfer privileges at Dewey Square between inbound surface cars from South Boston and Dorchester via Dorchester Avenue or Summer Street extension and Atlantic Avenue surface cars running north of Dewey Square.

Ohmer Register Offer Renewed.—The Ohmer Fare Register Company, Dayton, Ohio, through John F. Ohmer, president, has renewed its prize offer for 1914 to the employees of the Denver (Col.) City Tramway. The review of the Ohmer register contest for 1913 was published in the January, 1914, issue of the *Tramway Bulletin*, which is issued in the interest of the employees of the company.

Waiting for Passengers at Transfer Points.—The Denver (Col.) City Tramway has issued a warning to car crews in regard to the necessity for observing closely the provisions of rule No. 132 in regard to meeting cars at transfer points. The company, through the superintendent of transportation, says: "Nothing angers the company's transferring patrons more than to have a connecting car run away from them at a transfer point. Those who are indulging in this practice may expect to be severely dealt with unless it is stopped."

Serious Accident in Indianapolis.—Four persons were killed, five probably fatally injured and twenty-five others hurt on the night of Feb. 18, 1914, when an outbound English Avenue car of the Indianapolis Traction & Terminal Company, Indianapolis, Ind., was crushed between two interurban cars. The English Avenue car stopped at the foot of a steep grade, just behind a Columbus & Southern

Traction Company car, and a large Indianapolis & Cincinnati Traction freight car, on the grade behind the city car, crashed into the smaller car.

Hearing on Revision of Brooklyn Transfer System.—A hearing on the plan for the proposed revision of the transfer system of the Brooklyn Rapid Transit Company was held before members of the Public Service Commission of the First District of New York on Feb. 20, 1914. The company was represented by Slaughter W. Huff, vice-president, and George S. Yeomans of counsel for the company. The representatives of the commission and the officers of the company will confer further in regard to the changes and the hearing will be resumed before the commission on March 5.

Terminal Improvements Proposed at San Francisco Ferry.—Plans have been completed by City Engineer M. M. O'Shaughnessy for an elevated loop at the ferry in San Francisco, Cal., to accommodate all Market Street cars of the Geary Street Municipal Railway and the United Railroads. These will be the basis for work at a conference on the loop to be held by the Mayor and the members of the harbor commission shortly. Mr. O'Shaughnessy's plan calls for the expenditure of \$250,000 and provides for concrete causeways harmonizing with the ferry building and for ornamental arches extending over the sidewalk lines instead of in the middle of the street.

Decision in Ohio Fare Case.—The Supreme Court of Ohio has sustained the right of the Cincinnati, Georgetown & Portsmouth Railroad and the Interurban Railway & Terminal Company, Cincinnati, Ohio, to charge a 10-cent fare from Cincinnati to California and Coney Island. The terms of the franchise of the Interurban Railway & Terminal Company, secured in 1901, provided for a 5-cent fare between California and the eastern boundary of Cincinnati and from the center of the city to the eastern boundary. California and Coney Island were annexed to the city in 1909 and the city claimed that the company was obligated by statutes under which it made an operating agreement with the Cincinnati Traction Company to carry passengers within the city limits for 5 cents.

Motor Bus Suggested for Toronto.—Oliver Hezzelwood, president of the Dominion Automobile Federation, read a paper before the Ontario Motor League recently in favor of municipally owned motor buses as a solution of Toronto's transportation problem. The speaker submitted the following estimate of the cost of installing an experimental system in Toronto: Twenty buses, London B type, garage, etc., approximately \$150,000; annual charges for operation, management, insurance, depreciation and interest on outlay at 6 per cent, \$166,000; revenue from operation of twenty buses, based on 300 days each per year at a 3½-cent fare, \$195,500; profit, \$29,500. After the meeting the officers of the league decided to forward a copy of the address to Mayor Hocken and Controllers McCarthy and Simpson gave their assurance that they would move and second a resolution to have the suggestion placed before the transportation commission for consideration with the other plans that have been advanced.

Ticket Choppers in New Subways in New York.—The Brooklyn (N. Y.) Rapid Transit Company will accept as final the decision of the Public Service Commission of the First District of New York that ticket choppers shall be installed in all its new subway lines now under construction or about to be built. By this order all the stations on the Montague Street-Flatbush Avenue, Fourth Avenue and the Queens elevated roads, which are to be operated jointly by the Brooklyn Rapid Transit Company and the Interborough Rapid Transit Company must be equipped with ticket choppers. The turnstiles will be allowed to remain in the stations on the Center Street loop as an experiment. On the New Utrecht Avenue and Culver lines turnstiles will be allowed at the stations, except at Eighteenth Avenue and Coney Island on the former and Coney Island on the latter, until the traffic at the other stations becomes sufficient to warrant the commission ordering the choppers installed. Stations on lines built and owned by the company, such as the Sea Beach line, may be fitted with turnstiles if the company desires, but the commission reserves the right to order a change when it deems it necessary.

Personal Mention

Mr. J. S. Pevear has been elected a vice-president of the Birmingham Railway, Light & Power Company, Birmingham, Ala., to succeed Mr. George Bullock.

Mr. F. W. Brown has been appointed traffic manager of the San Francisco-Oakland Terminal Railways, Oakland, Cal., a newly created position with the company.

Mr. Henry W. Rowley has resigned as president and as a director of the Billings (Mont.) Traction Company, to take effect as soon as his successor has been elected. Mr. Rowley is retiring for the reason that his other lines of business require all his time and attention. He will retain his interest in the company.

Mr. W. E. Hendley has been appointed to take charge of a new department with the San Francisco-Oakland Terminal Railways known as the coasting recording department. He will have charge of the records of motormen's performances as shown by the coasting recording devices which are being installed on all of the company's cars.

Mr. Charles R. Barnes, chief railroad inspector to the Public Service Commission of the Second District of New York, has been retained by the Ontario Railway Board in accordance with the promise of the members of that body to the officials of the city of Toronto to retain the services of an independent traffic expert to report upon the street railway system with a view to suggesting new routes and re-routing.

Mr. Lewis E. Palmer has been appointed advertising manager of the Stone & Webster Engineering Corporation, with headquarters at Boston, Mass. He succeeds Mr. Barrett Smith, whose assistant he has been for the past two years. Mr. Palmer was graduated from Cornell University with the degree of A.B. in 1905, and prior to his connection with the Stone & Webster organization was a member of the editorial staff of the *Survey*, New York.

Mr. E. W. Reed, who has been general superintendent of the Chattanooga Railway & Light Company, Chattanooga, Tenn., will continue in that capacity, but with considerably widened powers. He will have complete authority in the operation of both the street railway and the light departments of the corporation. Mr. Reed has practically all the powers which were exercised by Mr. W. E. Boileau, formerly general manager, which position has been abolished.

Mr. F. W. Hoover, general manager of the Tennessee Power Company, one of the two companies which have developed 150,000 hp in the Chattanooga district, has been designated executive officer of the Chattanooga Railway & Light Company, Chattanooga, Tenn., with instructions to report to Mr. M. H. Hopkins, first vice-president of that company. Mr. Hoover is second vice-president of the Chattanooga Railway & Light Company, having been elected to that office some time prior to the resignation of Mr. W. E. Boileau as general manager. Mr. Hoover continues as general manager of the Tennessee Power Company.

Mr. Theodore Beran, New York district manager for the General Electric Company, was the guest of a number of his friends and business associates at a dinner given at the Machinery Club, New York, on Feb. 20, to mark the twenty-fifth anniversary of his advent into the electrical field. It was in 1889 that Mr. Beran became cashier for the old Sprague Electric Company, which afterward, merging with the Edison General Electric Company and the Thomson-Houston Company, became the General Electric Company. In 1893 Mr. Beran was appointed manager of its supply department and continued in that position until 1902, when he went to Rugby, England, where he organized the supply department of the British Thomson-Houston Company. After two years abroad he returned to New York and succeeded Mr. Charles T. Hughes as acting manager of the New York district office of the General Electric Company. Since 1905 Mr. Beran has served as district manager.

Prof. Lewis E. Moore, of the Massachusetts Institute of Technology, has resigned to become consulting engineer of the Massachusetts Public Service Commission. Professor Moore was educated in Chicago public and manual training schools and received the degree of B.S. in mechanical engineering

from the University of Wisconsin. In 1901 he took a course in structural engineering at the Massachusetts Institute of Technology, and after teaching in the universities of Illinois and Wisconsin he became in 1907 assistant professor of civil engineering at the first-named institution, specializing in bridge design and foundations. Since he took up his residence in Boston Professor Moore has been employed in expert work by the Massachusetts Railroad Commission, the predecessor of the Public Service Commission, and has engaged in consulting work. In his new position he will take up the consulting work formerly handled by Prof. George F. Swain for the Railroad Commission and will have supervision of some 3000 bridges in the State, together with an oversight of railroad signal installations.

Mr. Seymour Van Santvoord has been nominated by Governor Glynn of New York as a member of the Public Service Commission of the Second District to succeed Mr. Frank W. Stevens, Jamestown, whose term expired a year ago. Mr. Van Santvoord was born in Troy in 1859. At the age of fourteen he became connected with *Rough Notes*, published at Kinderhook, N. Y., and learned the printing trade. He entered the sophomore class of Union College and was graduated with honors at the age of nineteen. He then studied law at the Albany Law School and was admitted to the bar in 1881. He opened an office in Troy, where he has practised ever since. He was counsel to the Walter A. Wood Company, Hoosick Falls, N. Y., in 1893, and was made one of the receivers of the company in 1895. Upon the reorganization of the company he was elected president and held the office for nine years, when he resigned to devote himself largely to the Security Trust Company, which he helped to organize in 1901 and of which he was president until 1912. In that year he resigned to become counsel to Governor Dix. The Senate has confirmed the nomination.

Mr. E. F. Schneider, who was elected president of the Central Electric Railway Association at the meeting held in Cleveland, Ohio, this week, is secretary, general manager and purchasing agent of the Cleveland Southwestern & Columbus Railway, which operates 225 miles of inter-urban electric railway in Cleveland and vicinity. Mr. Schneider has been connected with the Cleveland Southwestern & Columbus Railway for fifteen years, for ten years of which he acted as secretary of the company and in various other capacities. In January, 1910, he was in addition appointed general manager to succeed Mr. C. N. Wilcoxon. In all Mr. Schneider has been connected with electric railway work for about twenty years. His business experience also extends to commercial fields. Mr. Schneider has made a special study of accident prevention, in which field he was one of the pioneers, and has contributed the results of his experience along these lines in articles which have appeared at various times in the *ELECTRIC RAILWAY JOURNAL*.



E. F. Schneider

Mr. E. C. Deal has resigned as vice-president and general manager of the Augusta-Aiken Railway & Electric Corporation, Augusta, Ga., to become connected with W. N. Coler & Company, New York, N. Y., who control and operate a number of electric railways, electric light plants and gas and water companies. Mr. Deal gained his early experience with the Georgia Electric Light Company, which he served in various capacities from 1894 to 1898. He then entered the employ of Stone & Webster, Boston, Mass., but left them in 1904 to enter the employ of the Gas & Electric Company of Bergen County in New Jersey as chief engineer in charge of the company's properties in more than forty municipalities in northern New Jersey. After this company was absorbed by the Public Service Corporation of New Jersey Mr. Deal was made superintendent of the electric properties of the Public Service Corporation in central New Jersey. He resigned from this company in

1908 to become connected with W. N. Coler & Company as manager and engineer of public service properties owned by them. Following the acquisition of the property of the Augusta Railway & Electric Company and the Augusta-Aiken Railway & Electric Company by a syndicate in which J. G. White & Company, Inc., New York, N. Y., were interested, Mr. Deal resigned from Coler & Company to become manager of the Augusta-Aiken Railway & Electric Corporation, the successor company at Augusta. This was in April, 1911. In April, 1913, he was elected vice-president of the company in addition to general manager.

Mr. Thomas R. H. Daniels, who resigned on Feb. 15, 1914, as chief engineer of the Birmingham Railway, Light, Heat & Power Company, Birmingham, Ala., has been appointed



T. R. H. Daniels

engineer of the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., and will assume his new duties on March 1. Mr. Daniels entered the electric railway field in 1898 as assistant engineer in charge of track and roadway of the Rhode Island Company, Providence, R. I. He left that position in 1904 to become assistant engineer for Westinghouse, Church, Kerr & Company, New York, N. Y., in the construction of the new terminal station for the Pennsylvania Railroad in New York City. He resigned from Westinghouse, Church, Kerr & Company in 1906 and took charge of the rebuilding of tracks, etc., of the United Railroads, San Francisco, as assistant engineer, after the earthquake. In 1908 he severed his connection with that company and became assistant engineer of the Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind., and was the construction engineer in charge of the erection of the new West Tenth Street power station of that company. Mr. Daniels held that position until May 1, 1911, when he became chief engineer for the Birmingham Railway, Light, Heat & Power Company.

OBITUARY

Henry Morrison, superintendent of the Sioux City (Iowa) Service Company, is dead. Mr. Morrison was born in Galena, Ill., in November, 1860, and began active street railway service in 1902 with the Sioux City Service Company. He was gradually advanced to the position of superintendent of that company. Mr. Morrison is survived by two children.

Samuel W. Allerton, for many years prominent as a capitalist in Chicago, died at his winter residence in Pasadena, Cal., recently. Mr. Allerton was at one time a large stockholder in the Chicago City Railway and also served as a director of the company. He took a large part in establishing the cable railway systems in Chicago. Mr. Allerton was born in New York State in 1828.

Charles W. Roe, assistant superintendent in charge of the Crosstown and Maspeth depots of the Brooklyn (N. Y.) Rapid Transit Company, is dead. Mr. Roe was born in Detroit, Mich., where he obtained his first railroad experience. Going East, he entered the service of the Public Service Railway of New Jersey, and in 1906 entered the service of the Brooklyn Rapid Transit Company. He is survived by a widow.

Franklin Phillips, head of the foundry and machinery firm of Hewes & Phillips, Newark, N. J., is dead. Mr. Phillips was born in Newark fifty-seven years ago and was graduated from Cornell in 1878. He immediately became connected with the firm of Hewes & Phillips, founded by his father, and soon established a reputation as a mechanical, steam and hydraulic engineer. He was a trustee of the Newark Technical School, president of the Foundrymen's Association of New Jersey and a member of the Newark Board of Trade, the Essex Club and the American Society of Mechanical Engineers. He is survived by his widow, one son and a daughter.

Construction News

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

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

RECENT INCORPORATIONS

Fresno, Clovis & Academy Interurban Railway, Fresno, Cal.—Application for a charter has been made by this company to build a 24-mile electric railway between Fresno, Clovis and Academy. Capital stock, \$500,000. Incorporators: F. S. Granger, Fresno; F. M. Blanchard, Fresno; F. E. Buckman, Clovis; T. E. Allen, Clovis, and M. A. Zuccardi, New York. [E. R. J., Feb. 21, '14.]

***Windfall & Central Indiana Traction Company, Windfall, Ind.**—Incorporated in Indiana to build an electric railway from Tipton to Marion via Windfall. Capital stock, \$10,000. Directors: Ezra N. Todd, Thomas E. Dean and Guy Dean.

Hiawasse Railway, Andrews, N. C.—Chartered in North Carolina to build a 35-mile electric interurban railway from Andrews to Hayesville, N. C., and Hiawasse, Ga. One hundred and fifty thousand dollars in bonds has been voted in Cherokee County and Clay County. Incorporators: J. W. Walker, Andrews, N. C., and G. H. Haigler, Hayesville, N. C. [E. R. J., June 7, '13.]

***Seabeach Railroad, Beaufort, N. C.**—Chartered in North Carolina to build a 14-mile electric railway from Beaufort to Cape Lookout, N. C. Capital stock, \$275,000. Incorporators: C. J. Becker, Wilmington, N. C.; George P. Westervelt, James Hodges and Herbert G. Lord, Jr., all of New Jersey. Winston & Biggs, Citizens' Bank Building, Raleigh, N. C., may give information.

***Cleveland-Pennsylvania Interurban Railway, Cleveland, Ohio.**—Incorporated in Ohio to build an electric railway between Cleveland and Sharon, and eventually to extend the line to Pittsburgh, via New Castle, Pa. Right-of-way over the present Sharon-New Castle line will probably be secured instead of building a new line. The company is to use the lines of the Eastern Ohio Traction Company from Cleveland to Middlefield and will build from Middlefield to Sharon. Capital stock, \$50,000. Incorporators: Henry P. Smith, Elijah Ashley, G. A. Mowers, Robert P. Thomas and Herbert A. Wadsworth, all of Pittsburgh.

***Madison & Janesville Traction Company, Beloit, Wis.**—Incorporated in Wisconsin to build an electric railway from Beloit to Whitewater and Elkhorn and from Janesville to Madison. Capital stock, \$25,000. Frank H. Weston, Madison, incorporator.

FRANCHISES

Los Angeles, Cal.—The Pacific Electric Railway has asked the Council for a franchise to proceed with the work on the proposed elevated railway in the rear of the station at Sixth Street and Los Angeles Street in Los Angeles.

Los Angeles, Cal.—The Lone Pine Utilities Company has asked the Council for a franchise to operate a trackless trolley line from Grava station in the Cajon Pass on the Santa Fé Railway to what is known as the Upper Swartout Valley, a distance of 18 miles. [E. R. J., Aug. 31, '13.]

San Diego, Cal.—The Los Angeles & San Diego Beach Railway has asked the Council for a thirty-eight-year extension of time of its franchise on the La Jolla line in San Diego.

San Luis Obispo, Cal.—The Pacific Coast Railway has been granted authority from the commission to exercise its franchise rights granted by the Board of Supervisors of San Luis Obispo County.

Stockton, Cal.—The Stockton Electric Railway has received a franchise from the Council to double-track some of its lines in Stockton.

East St. Louis, Ill.—The East St. Louis & Suburban Railway has received a twenty-year franchise from the Council on Main Street between Broadway and Missouri Avenue in East St. Louis.

Pekin, Ill.—The Pekin City Railway will ask the Council for a franchise in Pekin.

Peoria, Ill.—The Peoria Railway has asked the Council for a franchise for an extension of its tracks in Peoria to enter a new terminal station at Hamilton Street and Jefferson Street.

Louisville, Ky.—The Louisville Railway has asked the Council for a franchise to extend its line on Chestnut Street from its present terminal to Shawnee Terrace, near Shawnee ark, in Louisville.

Middlesboro, Ky.—The Council in Middlesboro has announced that a franchise for an electric railway will be sold at public auction April 30 to the highest bidder. Address Mayor Manning.

Kansas City, Mo.—The Metropolitan Street Railway has asked the Council for a franchise on Twenty-fourth Street from Main Street to Grand Avenue to reach the new Union Station in Kansas City. Other extensions are being planned by the company.

Butte, Mont.—The Butte Electric Railway has asked the Council for a franchise to extend its Oregon Avenue line in Butte from the intersection of Dewey Street and Hill Street across the flat toward Three Mile and into the Gilman addition.

Portland, Ore.—The Portland & Oregon City Railway has received a franchise from the City Council for the construction of its lines in Portland.

Chesterfield, Va.—The South Richmond & Chesterfield Railway has asked the Council for a franchise in Chesterfield. This is part of a plan to build an electric railway from the intersection of Broad Rock Road and Hull Street, Richmond, to Falling Creek. John C. Robertson, Richmond, is interested. [E. R. J., Oct. 11, '13.]

Richmond, Va.—The Virginia Railway & Power Company has received permission from the Council to reconstruct its tracks in West Broad Street from Foushee Street to Harrison Street in Richmond.

Seattle, Wash.—The reconstruction of the Fautleroy Park Street line and the shortening of the distance by 1 mile or more is proposed in a bill introduced into the Council recently to grant a franchise on Avalon Way and other streets to the Puget Sound Traction, Light & Power Company. It is understood this franchise will be accepted by the company and that construction work will begin immediately.

Tacoma, Wash.—The City Council has made an agreement with the Puget Sound Traction, Light & Power Company whereby the former will construct a 1-mile electric line across the tideflats at a cost of \$85,000, and the latter will operate same for the city.

TRACK AND ROADWAY

Birmingham, Ensley & Bessemer Electric Railway, Birmingham, Ala.—Work has been begun by this company on the Tidewater line from Fairfield to Bessemer. Later the line will be extended to Tuscaloosa.

Fresno, Clovis & Academy Interurban Railway, Fresno, Cal.—This company, the incorporation of which is noted elsewhere in this issue, has secured all the right-of-way on the line between Fresno and Academy and will soon begin work on the construction of several bridges. Financial arrangements have been made and plans are being considered to build an 8-mile extension to Centerville. F. S. Granger, Clovis, president. [E. R. J., Feb. 21, '14.]

San Francisco-Oakland Terminal Railway, Oakland, Cal.—This company plans to spend \$35,000,000 for the refinancing and improving of the Key Route and Oakland Traction properties and their future development. This sum does not include the proposed extension to San José or Sacramento, but it is to be used to refund outstanding bonds and to the extension and improvement of the lines within the immediate vicinity of Oakland.

Petaluma & Santa Rosa Railway, Petaluma, Cal.—A 7-mile branch will be built by this company from Graton to Camp Meeker.

San Diego (Cal.) Electric Railway.—Preparations are being made by this company to expend \$250,000 in improvements of its tracks on Fifth Street in San Diego and to replace the rails on Fifth Street from Ash Street to Univer-

city Street with "Trilby" 114-lb. rails. It is planned to repair Fifth Street with concrete base and asphalt surface. The rails on Fourth Street from Broadway to Sixteenth Street will also be replaced with 114-lb. rails.

Geary Street Municipal Railway, San Francisco, Cal.—The Board of Public Works has given notice of a call for bids to be opened on May 4 to build the Chestnut Street branch of this railway from Van Ness Avenue along the exposition grounds. This will be the first portion of the extension to be built under the recent bond issue.

Pacific Gas & Electric Company, San Francisco, Cal.—Plans are being formulated by this company which will necessitate the complete remodeling of the downtown system, establishing belt lines in the business district and constructing new lines on I Street and L Street in Sacramento.

San Ramon Valley Railway, San Francisco, Cal.—This company, a subsidiary of the Oakland, Antioch & Eastern Railway, plans to place its line in operation on March 1. This line will join the main line of the Oakland, Antioch & Eastern Railway 1 mile west of Walnut Creek and extend 11 miles southward through Danville and Alamo to the foot of Mount Diablo.

United Railroads, San Francisco, Cal.—Grading will be begun at once by this company on the extension of the Polk Street line from Lombard to the bay and the transport docks in San Francisco.

***Colorado Springs, Col.**—The Chamber of Commerce and other civic bodies in Colorado Springs, Pueblo and Denver have been asked to co-operate in the construction of an electric line to connect Colorado Springs, Pueblo and Denver, a total length of 115 miles. Frank R. Dusen, Denver, represents the promoters.

Washington Railway & Electric Company, Washington, D. C.—Surveys have been completed and grading has been begun by this company for its 2.94-mile extension from Wisconsin Avenue via Macomb Street and Massachusetts Avenue to the District of Columbia line.

Jacksonville (Fla.) Traction Company.—Work has been begun double-tracking this company's line to the baseball park in Jacksonville.

***Griffin, Ga.**—Surveys are being made to build an electric railway in Griffin. No names are yet given of those interested in the project.

Galesburg Railway & Light Company, Galesburg, Ill.—This company is asked to consider plans for extension of its lines in Galesburg in three directions.

Evansville (Ind.) Railways.—Surveys are being made for a line from the Rockport traction line at Kincaid station and extending to a point opposite Owensboro.

Terre Haute, Indianapolis & Eastern Traction Company, Indianapolis, Ind.—Plans are being considered to extend the South Eighth Street line in Richmond into Beallview.

Southern Iowa Traction Company, Centerville, Ia.—This company, whose entire stock was recently purchased by the Centerville Light & Traction Company, will be made into an electric line as soon as material can be obtained. Contracts have been let for all equipment as announced previously in the *ELECTRIC RAILWAY JOURNAL*.

Union Traction Company, Independence, Kan.—Right-of-way has been secured by this company for the proposed extension from Coffeyville to Nowata.

Central City, Greenville & Drakesboro Railway, Central City, Ky.—J. A. Steiner, Central City, has been appointed engineer in charge of preliminary plans for the construction of the proposed interurban line between Central City and Greenville, Ky. [E. R. J., Feb. 14, '14.]

Alexandria (La.) Electric Railway.—Work has been begun by this company on the reconstruction of its tracks in Alexandria.

Cumberland County Power & Light Company, Portland, Maine.—Right-of-way has been secured by this company for a 7-mile line to extend from its present line at Dunstan, Maine, to the steam power station of the York Light & Heat Company in Biddeford.

Cumberland (Md.) Electric Railway.—Plans are being made by this company for an extension to Mapleside.

Bay State Street Railway, Boston, Mass.—Work will be begun at once by this company double-tracking its Chatham Street and Chestnut Street line in Lynn.

Muskegon-Casnovia Land & Development Company, Muskegon, Mich.—Right-of-way has been secured by this company for its line to connect Muskegon, Saginaw, Egelston, Moorland and Casnovia. Norman B. Lawson, Muskegon, is interested. [E. R. J., Jan. 31, '14.]

St. Paul Southern Electric Railway, St. Paul, Minn.—This company is asked to consider plans to extend its line from Hastings to Red Wing in the near future.

Meridian Light & Railway, Meridian, Miss.—The Asylum and College line is to be double-tracked from Eighteenth Street and Thirty-fourth Avenue to the end of the line. Work will begin within a few weeks. Work has already begun on a concrete bridge spanning the brook which extends through the park over which the car lines will pass. A part of the line from Eighteenth Street on Thirty-fourth Avenue is already double-tracked, but this will be reworked and the rest of the track, to the end of the line, a distance of about ½ mile, will be double-tracked.

Caldwell County & Southern Railway, Kingston, Mo.—This company has been organized to build a 9-mile electric railway from Hamilton to Kingston. Capital stock, \$100,000. F. L. Bowman, Kingston, and D. Miller, Kansas City, are interested. [E. R. J., Dec. 27, '13.]

Omaha & Council Bluffs Street Railway, Omaha, Neb.—This company has been asked to consider plans to extend its lines from Forty-sixth Street and Cuming Street in Omaha to Benson.

Brooklyn, N. Y.—The New York Municipal Railway has been authorized by the Public Service Commission, First District, to award contract for construction of Section 2 of the Lutheran Cemetery line, Brooklyn, to F. W. Burnham, 30 East Forty-second Street, New York. The Lutheran Cemetery extension will be an elevated railroad, to connect the Myrtle Avenue line at Wyckoff Avenue, Ridgewood, with Lutheran Cemetery. The contract calls for the construction of an elevated railroad structure about 1050 ft. in length and an approach about 315 ft. long, together with concrete retaining walls, earthfill, removal of a boiler house, switch plant, signal tower, etc.

Dry Dock, East Broadway & Battery Railroad, New York, N. Y.—This company has received permission from the Public Service Commission to electrify that part of its line which lies along Canal Street east of the Bowery. At present it is operated by horse-power.

Frontier Electric Railway, Niagara Falls, N. Y.—This company, which is surveying for an electric railway line between Buffalo and Niagara Falls and has completed part of the work of laying the track, will start construction in the vicinity of the Buffalo city line and North Tonawanda early in the spring. Almost all of the right-of-way has been secured. It will be a three-track line, two for passenger traffic and one for freight trains. James S. Simons, vice-president. [E. R. J., Nov. 1, '13.]

Suffolk Traction Company, Patchogue, N. Y.—During the next eight weeks this company will award contracts to build 11 miles of new track.

Charlotte (N. C.) Electric Railway.—Work has been begun by this company on the extension of its line in Myers Park from the present terminus at Providence Road to the site of Queens College.

Canadian Pacific Railway, Montreal, Que.—Plans are being considered by this company for the ultimate electrification of a 5-mile, double-track cut-off tunnel through the Selkirk Mountains in British Columbia. The bore of the tunnel will be 17 ft. and the grades encountered will reach about 2 per cent. It is planned to have the tunnel approached by an electrified section of 7 miles of double track and that the third-rail 2400-volt d.-c. system will be employed. Power will probably be supplied from a future power station to be installed near the electrification.

Saskatoon (Sask.) Electric Railway.—The Municipal Council plans to spend \$100,000 on extensions of this company's lines during 1914.

Hull (Que.) Electric Company.—The extension of this railway to Gatineau Point is being considered.

Shelbyville, Petersburg & Decatur Railroad, Shelbyville, Tenn.—It is reported that this company will award contracts in March to build its line between Shelbyville, Tenn., and Decatur and Athens, Ala. The work will include 250,000 cu. yd. earth excavation, 75,000 cu. yd. rock excavation, three 60-ft. and three 40-ft. steel bridges, 1,000 lin. ft. trestles and 2500 cu. yd. masonry. G. B. Howard & Company, Franklin, Tenn., engineers. [E. R. J., Jan. 31, '14.]

El Paso (Tex.) Electric Railway.—Since the first of the year this company has completed two additional lines of new track and it is now building a third. With the completion of the new line now under construction the company will have added to its trackage approximately 5 miles.

San Antonio (Tex.) Traction Company.—Work has been begun by this company relaying track and double-tracking some of the lines in San Antonio.

Ogden (Utah) Rapid Transit Company.—Plans are being made to extend the Wall Avenue and Twenty-fifth Street lines in Ogden.

Seattle, Wash.—The City Council has appropriated the sum of \$25,000 and directed the Board of Public Works to proceed at once with the repairing and construction work as may be necessary to place the roadbed, tracks, etc., of the Lake Burien & Highland Park Electric Railway line in condition for efficient operation. This railway was recently deeded free to the city of Seattle.

Wenatchee, Wash.—Estimates are being made and a company will be incorporated shortly to build an electric railway from Wenatchee to Leavenworth and from Wenatchee to Clockum, 40 miles. Hyman Harris, Wenatchee, is interested. [E. R. J., Jan. 24, '14.]

*Baraboo, Wis.—A corporation has been formed with a capital stock of \$1,000,000 to build two electric railway lines through Baraboo. One will extend from Cashton to Baraboo and Portage and the other line from Plain to Devils Lake, Baraboo and Kilbourn, making more than 100 miles of electric railway with Baraboo as the central quarters. Among those interested are T. Edward Mead, T. F. Risley and W. H. Marriott, all of Baraboo.

SHOPS AND BUILDINGS

British Columbia Electric Railway, Vancouver, B. C.—Plans have been completed by this company to build a new freight car repair shop in the new Sixteenth Street freight yards at New Westminster, B. C. The structure and plant is to cost about \$25,000 and will include a blacksmith shop equipped with an electrically driven drill press and other machines.

Geary Street Municipal Railway, San Francisco, Cal.—Bids are being received by this company to build an addition to its carhouse in San Francisco.

Illinois Traction System, Peoria, Ill.—Plans are being made to begin work soon on the construction of a new passenger station at the corner of Hamilton Boulevard and Jefferson Avenue in Peoria.

Greenville, Spartanburg & Anderson Railway, Greenville, S. C.—Plans are being made by this company to build three new four-story brick warehouses in Spartanburg at an aggregate cost of \$25,000. The structure to be located on Spring Street will be 30 ft. x 60 ft., and the two buildings to be constructed on Wofford Street will be 48 ft. x 83 ft. Bids have been submitted for the work, but no contract has been let yet.

Southern Traction Company, Dallas, Tex.—This company plans to build a new passenger station at Reagan Street and Oak Street in West.

POWER HOUSES AND SUBSTATIONS

Cumberland County Power & Light Company, Portland, Maine.—This company has acquired right-of-way for a pole and tower transmission line to extend from its present line at Dunstan, Maine, 7 miles to the steam power station of the York Light & Heat Company in Biddeford. The line will be single-circuit, three-phase, and the current transmitted will be of a frequency of 60 cycles at a pressure of 38,000 volts. Contracts have already been let for the pole fixtures, electrical apparatus, etc. It is planned to have it completed during the spring.

Manufactures and Supplies

ROLLING STOCK

Youngstown & Southern Railroad, Youngstown, Ohio, expects to purchase one combination baggage and passenger car during 1914.

Toledo & Western Railroad, Toledo, Ohio, expects to purchase one electric locomotive and electrical equipment for two package freight cars and two passenger cars.

Badger Railway & Light Company, Milwaukee, Wis., will order ten or twelve gasoline cars for its new 22-mile road. Specifications will be let in about six weeks.

Trenton & Mercer County Traction Corporation, Trenton, N. J., noted in the ELECTRIC RAILWAY JOURNAL of Feb. 21, 1914, as being in the market for ten passenger cars, has ordered these cars from The J. G. Brill Company.

Wisconsin Public Service Company, Green Bay, Wis., noted in the ELECTRIC RAILWAY JOURNAL of Feb. 21 1914, as being in the market for four cars, has ordered four 28-ft. double-truck semi-steel city cars from the St. Louis Car Company.

Chicago (Ill.) Elevated Railways, noted in the ELECTRIC RAILWAY JOURNAL of Jan. 3, 1914, as having ordered 128 center-door cars from the Cincinnati Car Company, has specified the following equipment for these cars:

- Seating capacity.....44
- Weight of car body, 28,200 lb.
- Bolster centers, length, 38 ft. 8 in.
- Length of body..37 ft. 10 in.
- Length over vestibule.48 ft.
- Width over sills, 8 ft. 8 3/16 in.
- Width over posts at belt, 8 ft. 6 3/4 in.
- Height from top of rail to sills..... 3 ft. 2 in.
- Bodysteel
- Interior trim.....Agasote
- Underframesteel
- Air brakesWest.
- Axles.Standard Steel Works
- Bolsters, body..Cin. Car Co.
- Brakeshoes, Am. Brake Shoe & Fdy.
- Bumpers, Ry. Improvement Co.
- Center bearings...Baldwin
- Control systemWest.
- Couplers...Stearns & Ward
- Curtain fixtures, Cur. Sup. Co. and Ry. Supply & Curtain Co.
- Curtain material..Pantastote
- Destination signs, Elec. Serv. Sup. Co.
- Gears and pinions, Gen. Elec. Co.
- Hand brakes, Blackall brake ratchet
- Heating system.....Consol.
- Journal boxes, T. H. Symington Co.
- Motors.two G. E.-243
- Paint..Chicago Varnish Co.
- Sash fixtures.....Edwards
- Seats.....Hale & Kil. and J. G. Brill Co.
- Seating material....rattan
- Side bearings, Joliet Ry. Supply Co.
- Springs, Standard Steel Works
- Trucks, M. C. B. equalizing bar
- Varnish, Chicago Varnish Co.
- Ventilators....Vacuum Car
- and Auto Utilities Co.
- Wheels, Standard Steel Works

TRADE NOTES

Hall Switch & Signal Company has taken a contract for the installation of an electric interlocking plant for the New York Municipal Railways Company at Myrtle Avenue and Broadway Junction, Brooklyn, N. Y.

Edward H. Chapin, of the National Car Wheel Company, at Rochester, N. Y., has also been appointed special representative of the Ohmer Fare Register Company to look after the welfare of this company in the territory east of Buffalo, including the New England States. This arrangement is being made with the consent of the car-wheel company so that it will not interfere with his interests in that corporation.

Esterline Company, Indianapolis, Ind., reports that the San Antonio Traction Company has placed an order for 240 "Golden Glow" headlights to completely equip its cars. This order was placed through the Grayson Railway Supply Company, St. Louis, Mo., after some exhaustive tests had been made in San Antonio. This headlight has a 23-watt bulb. In tests an object could be seen on the track a block and a half away. In one case with a 36-watt bulb, the "Golden Glow" headlight gave a beam illumination for between seven and eight poles on a suburban line.

Bertram Smith, Chicago, Ill., has been appointed assistant manager of the Edison Storage Battery Supply Company, San Francisco. Mr. Smith started in the storage battery business in 1899 with the National Battery Company, Buffalo, N. Y. He was secretary and treasurer of that company for three years, but since its absorption by the United States Light & Heating Company, Chicago, he has been manager of the latter company's battery department.

Barrett Smith, Boston, Mass., for five and one-half years in charge of advertising for the Stone & Webster Engineering Corporation, Boston, Mass., has opened an office at 20 Central Street for the practice of advertising and advertising management. Mr. Smith was graduated in 1904 from the College of Mechanical Engineering, Cornell University, having had experience in various manufacturing plants and shops before taking his degree. Soon after graduation he went to China, joining the staff of Mackenzie & Company, Ltd., of Shanghai, as mechanical and constructing engineer, with headquarters at Tientsin, Province of Chili. Upon his return from the Orient he entered the new-business department of J. G. White & Company, Inc., taking charge of the firm's advertising in 1907-8, following which connection he joined the Stone & Webster organization as head of the publicity department of the Engineering Corporation. Mr. Smith is advertising consultant to the Stone & Webster Engineering Corporation and others.

ADVERTISING LITERATURE

Railway Track Work Company, Philadelphia, Pa., has issued a catalog describing the operation of its reciprocating track grinder.

Mesta Machine Company, Pittsburgh, Pa., has issued a catalog describing and illustrating its pickling machines for pickling metals of any shape.

Pawling & Harnischfeger Company, Milwaukee, Wis., has issued a catalog illustrating the words of its title, "Difficult Drilling and Boring Made Easy."

Northern Engineering Works, Detroit, Mich., have issued Catalog No. 26, illustrating its electric traveling cranes, hand power traveling cranes, electric and pneumatic hoists, overhead track systems, bucket handling cranes and railway cranes.

Okonite Company, New York, N. Y., is circulating a testimonial letter from the Commercial Cable Company containing a sample portion of a submarine cable which was installed in 1900 and 1904 between New York City and Coney Island, and which when recently withdrawn was found to be in perfect electrical and physical condition.

T. L. Smith Company, Milwaukee, Wis., has issued Catalog No. 300, describing and illustrating its concrete mixers. An improvement over last year's machine has been made in the design of water tank, which is inclosed and equipped with air valve and three-way inlet and outlet valve. The catalog also describes side-loaders and side-gate cars.

Titanium Alloy Manufacturing Company, Niagara Falls, N. Y., has issued a folder showing comparative sulphur prints of the cross-section of twelve untreated rails and twelve titanium-treated rails. These prints constitute a summary of prints shown in Bulletins Nos. 1 to 5 inclusive of this company, and show excessive segregation in the cross-sections of the untreated rails.

Chicago Pneumatic Tool Company, Chicago, Ill., prints in the February, 1914, issue of *Ideal Power* an illustrated description of the sinking into position of the Harlem River tunnel subway tubes. One compressor, manufactured by this company, with a listed capacity of 450 cu. ft. of free air per minute, furnished air at 100 lb. pressure for a maximum of eleven No. 80 Boyer riveting hammers, eight Boyer calking hammers and two No. 2 Little Giant reamers.

Thew Automatic Shovel Company, Lorain, Ohio, has issued Catalog No. 9 describing and illustrating its full circle swing steam shovels with horizontal dipper crowding motion. A special design is made to meet the requirements of electric railway service. This design is particularly suited for the shallow trench work in track construction and reconstruction of city and interurban electric lines. Circular No. 15 describes the successful use of this shovel on the Brantford & Hamilton Electric Railway.

NEW PUBLICATIONS

Economics of Interurban Railways. By Louis E. Fischer. 116 pages. McGraw-Hill Book Company, New York. Cloth, \$1.50 net.

This book is devoted to a study of the proper elements to be considered in establishing an electric interurban railway. The first two chapters deal with the inception and development of electric traction and with classifications and definitions. Chapter III, based on typical existing lines, shows how revenue is related to the number and class of population served. Chapters IV and V give the minimum and average operating expenses and construction costs for typical selected lines, and Chapter VI is devoted to special hypothetical cases and their profitableness as judged by the foregoing conclusions. Mr. Fischer clearly shows that most electric interurban railways fall within fairly definite limits and that in the case of a normal road the results of its operation can be predicted with a reasonable degree of accuracy. The abnormal roads, of course, present problems that only the expert can solve, but the general principles of electric interurban railway construction and operation are opened up for the layman and investor. Mr. Fischer's book is intensely practical and his conclusions are well fortified with illuminating statistics and curves.

Bases for Freight Charges. By C. L. Lingo. 62 pages. La Salle Extension University, Chicago.

The value of a traffic man's service is measured not only by his technical knowledge and understanding of railway tariffs, but also by his comprehensive application of such rules and practice to the business in which he is engaged. He must know how to put these rules into effect legally, and how to make use of all the means that are available or can be devised for the betterment and development of traffic. Information regarding such things is contained in Mr. Lingo's book. While it deals more specifically with steam railroads it serves as a good basis of study for electric railway officials of lines doing a freight business. Among the topics discussed are freight tariffs, rates, weights and special charges. This treatise is one of a series of transportation publications which will form the basis of the LaSalle Extension University course in interstate commerce and railway traffic. Another book of the series which may well be read together with Mr. Lingo's is "Freight Rates: Official Classification Territory and Eastern Canada," by C. C. McCann and W. A. Shelton. This treatise endeavors to show that not only is the rate structure in the eastern part of the United States definite, but also that it approaches very closely a scientific basis that is capable of analysis and explanation.

American Red Cross Text Book on First Aid. By Major Charles Lynch. 146 pages. P. Blackiston's Son & Company, Philadelphia. Paper, 30 cents net.

This is a very complete, well-organized and sensible book, similar to other small books on the subject of "first aid" that have been put out under the auspices of the American Red Cross, but intended to contain material more specifically applicable to railroad men. General information concerning first aid, bandages, sprains, fractures, wounds, bleeding, burns, electric shock, poisoning, transportation of the injured, etc., is given, as well as a special chapter on railroad and shop first aid. The book is intended to supplement the visit of American Red Cross cars to the different railroads and to furnish material for practical and useful courses for the employees under the charge of a competent instructor. Every chapter in so far as possible is made complete in itself so that employees can with benefit attend first aid meetings held anywhere on the line. The book is well summed up by questions and practical exercises at the end of each chapter and is also well supplied with illustrations that are a clear and forceful augmentation of the text. The book for obvious reasons is non-technical and does not take one far into the realm of medicine and surgery, which is commendable. It would perhaps have been well where statements such as "No germs float in the air and there is no danger in exposing wounds to the air" appear, to present definite explanatory information. The book as a whole, however, is an excellent text-book for the employee, and it should be a valuable aid in furnishing the necessary curative element in work along safety-first lines.