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DATE ON WRAPPER shows the month at the end of which the subscription expires. The sending of remittances for renewal prior to that date will be much appreciated by the publishers.

During 1907 the Street Railway Journal printed and circulated 427,250 copies, an average of 8216 copies per week. Of this issue 8000 copies are printed.

Export Trade

The development of the export business, to which many manufacturers are now giving special attention, lends importance to the work being conducted by the Department of Commerce and Labor in instructing manufacturers on the custom requirements and best methods of shipping goods for foreign trade. Errors or carelessness in packing, addressing and invoicing become rapidly multiplied in their effects when a package or crate is sent across the ocean and is subject to many transshipments, and when sev-

eral weeks or months may be required to remedy a mistake. We do not believe that many manufacturers within this country are offenders in this respect, especially among the electrical and mechanical trades where a large export business has bred familiarity with its laws. But neglect in a few instances is apt to create an impression of more general laxity than really exists, even when it extends to such a petty but common failure as that of putting insufficient postage on letters and circulars. This particular error is not confined to this country. We know from sad experience that considerable correspondence from abroad is under prepaid. But where a manufacturer wishes to do his best to create a good impression on a foreign buyer, his efforts may be largely counteracted in the opinions of those who allow such matters to ruffle their composure, if his office boy is careless in this respect and so subjects the recipient of his correspondence to the payment of double postage on his letters and catalogues. When to this is added a slap-dash method of addressing important consignments, or inadequate packing, considerable unnecessary annoyance may be caused. As already stated, we are confident that neglect in these matters is rare, but with the large and growing trade abroad which American manufacturers now enjoy, they cannot be too careful in observing all customs and complying with all instructions sent them relating to shipments.

Compound Boiler Feed Pumps

In the attempt to secure the maximum possible economy in power production several of the later power plants have installed the compound type of pump for boiler feeding. At first sight it seems an advantage to substitute for the simple pump incapable of using steam expansively a combination that easily produces an economy in steam from 30 per cent to 40 per cent better than is possible with the former, but in view of the additional cost of the compound outfit it is desirable to figure carefully the heat unit requirements of the plant in the matter of boiler feed-water service before deciding to have nothing more to do with the simple pump. No sensible engineer can be opposed to the use of the compound feed pump in cases where its superior efficiency is clearly an advantage, but here, as in many other questions of power-plant design, the off-hand decision is likely to give poor results in comparison with what might be accomplished after proper investigation of the situation.

In practically all modern steam plants, the feed water is heated by exhaust steam derived from the auxiliaries. There are, therefore, in many cases few advantages in installing very economical steam auxiliaries, notably motor-driven feed pumps, condenser pumps and other apparatus that can be arranged to discharge all their exhaust when steam driven directly into the feed-water heater. If all

this exhaust steam is needed in giving up its heat units to the feed water, there is not much to be gained in going to the expense of using any other than the simplest kind of reliable equipment in the pump line. The case is radically different from that obtaining in office building elevator service, where pump capacities must be very large and where economy of space demands the most compact and powerful types of pump that can be designed for efficient operation.

A compound feed pump will naturally require a little more attention than a simple pump of the same capacity, and while more pump capacity for the same space on the floor can be had in the case of the compound, it is doubtful if it is not a better plan on the score of reliability of service to install several simple pumps than to put in two or three very large and high-powered compounds. The service that can be obtained from several moderate capacity simple duplex pumps arranged in multiple on the water delivery lines and maintained with care by the powerhouse organization, is thoroughly satisfactory on the ground of reliability, and unless the space is unusually limited, the flexibility of several units is more desirable than the steam economy and higher capacity of the compound outfit. If it is necessary to throw away any considerable portion of the exhaust steam then the choice of a compound feed pump may be a thoroughly wise one. In most of the compound installations which we have lately seen, however, it is doubtful if the additional efficiency of this type of pump is worth its cost.

Through Travel

As the summer time approaches we are again moved to lift up our voices in adjuration and to beseech our street railway friends to look out for their long distance excursion work. Properly developed this should for a couple of months be a greater gold mine. Amusement parks and the like are well tried attractions to build up traffic, and if through connections to points of interest were really well managed they would be equally productive at far less initial cost. Many of the street and suburban railways, so far as this feature of travel is concerned, are in the state of steam roads a half century back, when passengers spent their time and exhausted their patience and vocabularies on inconvenient changes at uncomfortable points along the route. The steam railroad traffic of this country has been built up on the doctrine of consolidation of service if not of securities. The difficulties in the way of this policy were probably thought in their day to be quite as formidable as those that are now the bugaboos of the street railway manager. But the fact is that in the open-car season there ought to be much heavier excursion traffic than there now is, and it would exist were it not for the fact that people will not stand for frequent changing and waiting. And what is true of excursion traffic is true of other long distance riding. Traffic arrangements are essentially no more serious a problem with electric than with steam roads and until they are very generally made the electric lines of the country will fail of both their opportunities and their duties.

Of course the distances covered in a convenient time by electric cars are far less than those covered by ordinary

railroads, but still with decent connections one should be able to cover 150 or 200 miles in a long day pleasantly and economically. A man came through from Chicago by trolley the other day having spent a week or so and crossed several gaps by rail. Such a program is not attractive from any point of view, but one should be able at least to make an all-day run at fair speed and without constant trouble from loss of connections. In the Central States a good start has been made and the trolley lines have a degree of usefulness in this matter that cannot be matched elsewhere. Every good through connection means an added chance for profitable traffic and the lines mentioned have been quick to appreciate the situation. Along the Atlantic coast there are rather fewer chances for regular long distance connections, as the steam service is better and cheaper, but a greater opportunity for excursion work probably exists. The traffic to and along the seashore is already large, but if the connecting lines learned to pull together it would be vastly greater. The sea and the mountains are Nature's great amusement parks which require no investment on the part of the management save in cooperative effort. As drawing attractions they are unequalled, and the only thing necessary to profit by them is so to arrange connections that people will not be repelled to the railroads. These save somewhat in time, but in summer the slower progress of the electrics could be made much the pleasanter. It is high time to get busy and develop the traffic that is within reach. There have been hard times, but as warm weather comes on people will begin to move about the more frequently as the moving is made easier and pleasanter.

The Iowa Street Railway Convention

The fifth annual convention of the Iowa Street and Interurban Railway Association which was held in Des Moines last week was characterized by the keen interest taken in the proceedings by representatives from nearly every electric railway system in the State. There are few large properties in Iowa, but the managers at the head of the numerous small city and interurban systems are alive to the many problems which they are facing and appreciate the value of these annual gatherings to talk things over. The program of the two days included papers on the four most important questions which concern electric railway men all over the country, namely, the handling of claims, collection of fares, depreciation and the proposed classification of accounts. The last two have a particular import to Iowa roads, for they are facing the prospect of legislation during the coming year which will enlarge the powers of the State railroad commission, which already has jurisdiction over the interurban roads, so as to include the city street railway systems and all other public utility properties.

The present commission is an able body of fair-minded men and in general the sentiment among electric railway officers in the State is in favor of enlarging their powers. In this they base their attitude largely on the experience of roads in other States having strong commissions, such as Massachusetts, Connecticut and Wisconsin, nearer home. The commission, if it is clothed with the authority, will undoubtedly take a hand in the regulation of rates and accounting systems and demand that some provision be made

for depreciation and the adoption of a standard classification of accounts.

The discussion on the paper on "Depreciation" indicated a general tendency toward acknowledging the principle to be correct, with some wide differences of opinion, however, as to the amount which should be charged off annually and the basis for determining this amount. The list of roads given in the paper as already making provision for depreciation showed wide variations, indicating that the allowances made were based not on the actual depreciation of the property, but on what the earnings would bear. The question at once arises, whether in case a depreciation reserve is required under order of a strong railroad commission it would not be better to follow instructions literally, regardless of the surplus or deficit remaining. If the resulting balance shows a deficit then there is available the strongest argument for an increase in rates.

Mr. Crafts' paper on handling fares on interurban railways described a system of duplex check fare receipts which is designed to prevent conductors reissuing checks which have been thrown away by passengers. The system appears somewhat complicated, but in fact requires very little auditing in the office and entails no more work on the conductor than any other duplex check system. Its complication is more apparent than real and the results are good in preventing fraud. Mr. Crafts raises the question of whether or not passengers observe the registration of fares by conductors. He is of the opinion that they do not and that knowing this, dishonest conductors have a greater opportunity for "knocking down" than when duplex checks are used. The discussion of the paper emphasized the well-known fact that no system of registration or fare receipts has yet been devised that will absolutely prevent fraud and dishonesty. The question is just as serious on interurban roads as on congested city lines; perhaps more so, for one fare "knocked down" by the interurban conductor is equivalent to half a dozen nickels taken by the city car conductor.

Recent Progress in Power Transmission

High-tension power transmission is advancing rapidly these days both as regards design and operation. The most important step of the last few years is undoubtedly the development of insulators for operation at potentials in excess of 60,000 volts, with the perfection of steel tower design as a close second. Side by side with these advances in design are found improved methods of studying the phenomena of very high voltages under artificial and actual service conditions, including the use of the oscillograph and the tell-tale paper.

The insulator is the key to success in very high potential work, and the recent development of the underhung type promises much for the future of service above 80,000 volts. Composed of a number of multiple petticoated porcelain insulators suspended by metal eyes in series, the new underhung apparatus appears to meet the most severe mechanical requirements, and if it stands up well under the assault of rain storms, particularly of the slow, drizzling kind, the use of potentials of 100,000 volts and over will be a matter of but a few months. A point of great practical value in the suspended type of insulator is the feasibility of keeping the insulator in service even after one or more sections

are broken. With the pin type now generally in use the failure of a single insulator in a line may result in the complete shutdown of thousands of kilowatts of commercial machinery, and any device which can thus cut down the cost of service interruptions and line maintenance has an assured future.

Even with the insulator problem solved for some years to come, there remain important questions to be settled in the design and operation of very high-tension lines. The best protection against lightning is in need of constant study, and the examination of various surges and discharges in connection with special types of fuses and switching apparatus, resonance of lines and cables, short circuiting of alternating current equipment, etc., is being prosecuted to-day in a more systematic way than ever before. In the April number of the *Public Service Journal*, J. F. Vaughan presents a brief description of the methods of studying protection against lightning on the 40-mile 40,000-volt line between Taylors Falls and Minneapolis during a season in which there was a large number of storms. Different types of protective devices were provided with tell-tale papers, including the arresters, choke coils, shielding wires and insulator pin ground wires that were installed to enable the discharges at different points to be recorded. The conclusions reached after the systematic collection, tabulation on a plotted curve sheet, and analysis of the tell-tale records were that the best protection for the line is shielding by overhead grounded wires and the use of lightning rods at exposed points liable to direct stroke; that the line insulators are the weakest part of the system and should be of ample size and selected for electrostatic balance to prevent local strain on any particular part; that the aluminum cell type of arrester was the most satisfactory for station protection, in conjunction with choke coils; and that multi-gap horn arresters are of value in supplementing the station equipment and relieving them of abnormal discharges. It did not appear to be practicable to drain the line by distributed insulators.

Methods of this kind are of the greatest value in the study of line phenomena, for they substitute for haphazard observations and imperfect generalizations accurate records of just what happened at each part of the line that sustained a given discharge. The value of the overhead grounded wire, whether located above or beside the line, has been much disputed by transmission engineers, but investigations like those Mr. Vaughan describes are rapidly clearing up the uncertainties of the problem. In a paper before the American Institute of Electrical Engineers which will probably be presented in May, the full technical details of the Taylors Falls work will be presented, and it is to be hoped that the discussion of this question in the different sections will be highly productive of more definite information about the best methods of line protection. High voltages are essential for the broadest progress of power transmission, not only for their transmission economy, but for the greatly increased market and better adjustment of loads among stations supplying a net work. The area that can be profitably supplied with power increases as the square of the voltage employed, for the same loss, and a reduction in station cost and increase in efficiency mean brighter commercial prospects.

WAY DEPARTMENT OF THE PUBLIC SERVICE RAILWAY COMPANY

BY MARTIN SCHREIBER,
Engineer Maintenance of Way

The Public Service Railway Company operates 675 miles of track through 140 towns and municipalities in Northern and Southern New Jersey. There are 200 bridges and trestles, including 2 miles of double-track steel elevated structure, some of which is 90 ft. above the ground, and 15 drawbridges. All of the latter are located on tide water, consequently their operation is unrestricted. The operating terminals are 25 in number, besides the storage barns, shops and other buildings. Then there are two wagon elevators, each having a lift of 150 ft., that are utilized by those engaged in trucking in transporting their vehicles and horses from the comparatively low lands of Hoboken to the heights of Jersey City and West Hoboken. Two ferryboats are operated across the Kill von Kull and 10 miles of turnpike are owned.

On account of the variety of scope and conditions to be met on this particular property, the writer has been requested by the publishers of this paper to describe some of the methods pursued in the construction and maintenance work of the company, and it is the purpose of this article to deal particularly with the track and building departments.

When the underlying companies were taken over by the present owners some five years ago, it is needless to say that about every known method of construction and of handling track and building details could be found somewhere on the property. One example, serving as a fair illustration, was the fact that 55 different kinds of rail sec-

was practically impossible to keep the accounts straight.

The management has now succeeded in simplifying and standardizing the entire system so that its operation is comparatively simple. In fact, the system constitutes one of



FIG. 1.—PEOPLE'S WAGON ELEVATOR AT WEEHAWKEN

the examples of what may be accomplished by consolidation and proper direction.

The map, Fig. 3, shows the divisions and the locations of the lines of the company. The table on the next page gives



FIG. 2.—PASSAIC WHARF, HEADQUARTERS MAINTENANCE OF WAY DEPARTMENT

tions were used. Numerous storerooms and supply yards existed, as well as many shipping centers and standards of various kinds. It was difficult to get proper inventories, and when correct returns of material were brought in it

the miles of track, the number of terminals and the largest city in each division. This table, when taken in connection with the map, will give a good idea of how the territory is divided.

PUBLIC SERVICE RAILWAY COMPANY

Name of division	Miles of single track	No. of operating terminals	Largest city	Distance from New York
Hudson	143	5	Jersey City	1.0 miles
Essex	186	12	Newark	8.7 "
Passaic	80	2	Paterson	17.0 "
Central	151	5	Elizabeth	14.1 "
Southern	115	1	Camden	91.0 "
Total	675	25		

The number of men embodied in the Way Department

it is necessary in estimating to anticipate just what is required. This arrangement is valuable, as it places definite responsibility for all work carried out. The analyses of costs of different jobs also serve as a rating for those who execute them.

A chart showing the organization directing the maintenance of way department is given below.

Generally all track construction and maintenance are carried out by the company's own men. Some paving is given out by contract. In the case of the company's buildings,

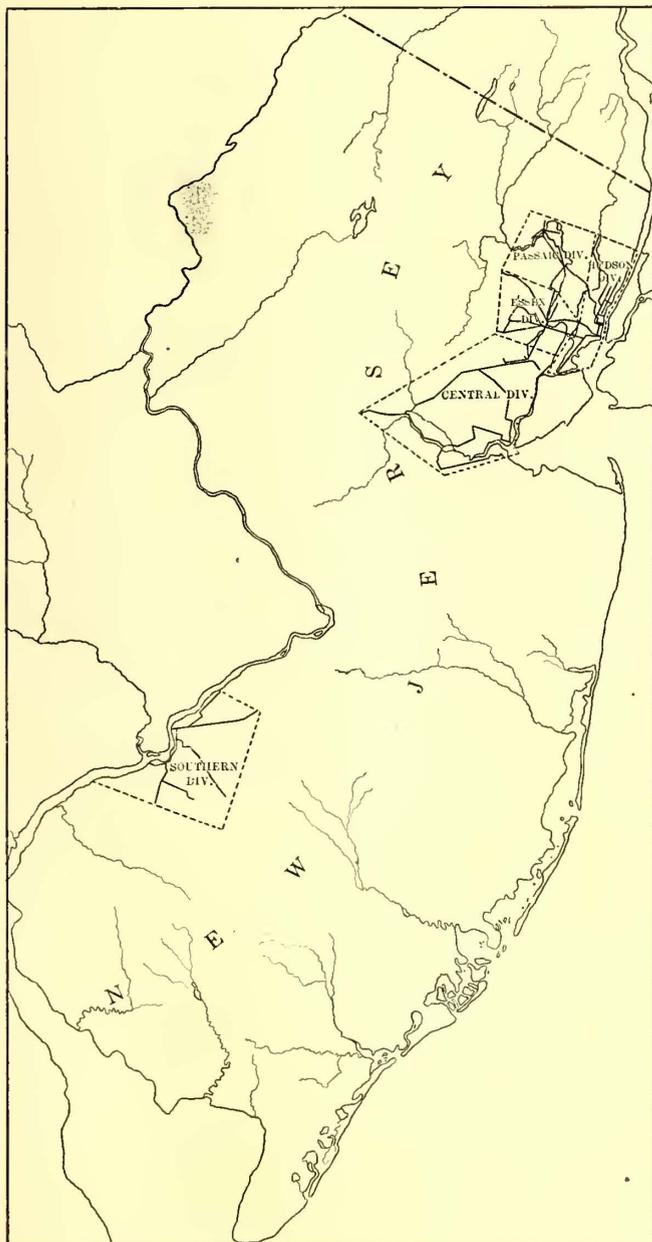


FIG. 3.—MAP OF NEW JERSEY SHOWING STREET RAILWAY LINES OF THE PUBLIC SERVICE RAILWAY COMPANY

fluctuates from 200 to 3000, exclusive of those employed by contractors. All work that costs over \$25 cannot be carried on without making out a detailed estimate and sending a standard job order in to the general manager. The order, if authorized, is then returned and stands as authority for the expenditure in question. All labor and material necessary for the particular job are accurately accounted for, so

GENERAL MANAGER	Supt. M. of W.	Roadmaster of Hudson Division	Clerk Foreman of Sub-Div. No. 1 Foreman of Sub-Div. No. 2 Foreman of Sub-Div. No. 3	Section-Foreman and Trackmen
		Roadmaster of Passaic Division	Clerk Foreman of Sub-Div. No. 4 Foreman of Sub-Div. No. 5	Section-Foreman and Trackmen
		Roadmaster of Essex Division	Clerk Foreman of Sub-Div. No. 6 Foreman of Sub-Div. No. 7 Foreman of Sub-Div. No. 8 Foreman of Sub-Div. No. 9	Section-Foreman and Trackmen
		Roadmaster of Central Division	Clerk Foreman of Sub-Div. No. 10 Foreman of Sub-Div. No. 11 Foreman of Sub-Div. No. 12	Section-Foreman and Trackmen
		Roadmaster of Southern Division	Clerk Foreman of Sub-Div. No. 13 Foreman of Sub-Div. No. 14	Section-Foreman and Trackmen
		Engineer M. of W.	General Foreman Fairview Quarry	
		Chief Clerk	Material Clerk Bill Clerk Storekeeper Stenographers	
		Chief Timekeeper	Division Timekeepers and Assistants	
		Yardmaster	Crews Operating Work-Trains and in Charge of Material in Transit	
		Engineer Hudson Division	Instrumentmen	Rodmen
		Engineer Southern Division	Inspectors	Chainmen
		Assistant Engineers		
		Chief Draftsman	Draftsmen	
		Supt. of Buildings	Inspectors Clerk Foreman Carpenter Foreman Mason Foreman Plumber Foreman Painter General Foreman Southern Division	Mechanics and Laborers

the maintenance and small construction are also done by the company through its building department, but large building work is carried out by contract, after plans and specifications have been prepared by the engineering department.

The headquarters of the maintenance of way department is at the Passaic Wharf, on the Plank Road Line, between Newark and Jersey City. Fig. 2 presents a good general view as the yards appear when approached from the west. This property contains about 12 acres of meadow land that

were made up principally by filling in from excavations of track work in the vicinity of Newark and Jersey City. nance and construction work that has proved very satisfactory. Work trains leave the Passaic Wharf regularly every day, so that it is possible to anticipate the movement of material to each particular job and location. Cars are generally loaded when they leave the yards and on their return bring some material back. By this arrangement the freight charges are reduced to a minimum.

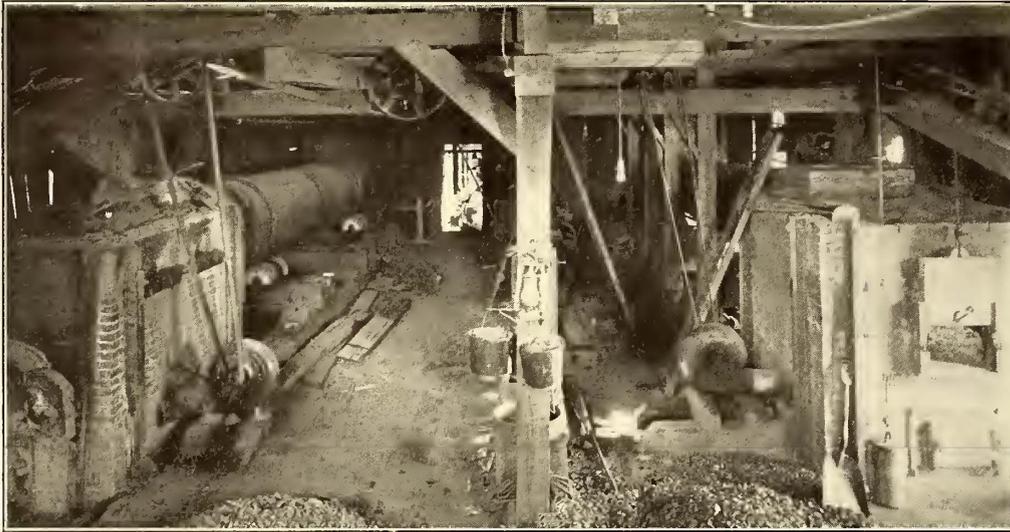


FIG. 4.—INSIDE VIEW OF SAND DRYER

It is a desirable location inasmuch as the position is rather central to the entire northern portion of the railway system. It is also convenient on account of its affording a shipping center for tide-water boats, as well as having a railroad connection from the Pennsylvania Lines.

The Passaic Wharf yards are the central point of distribution for all of the track and building material used on the system, except the Southern Division, which, on account of its being disconnected from the major part of the property and at so great a distance, is also a shipping and distributing center.

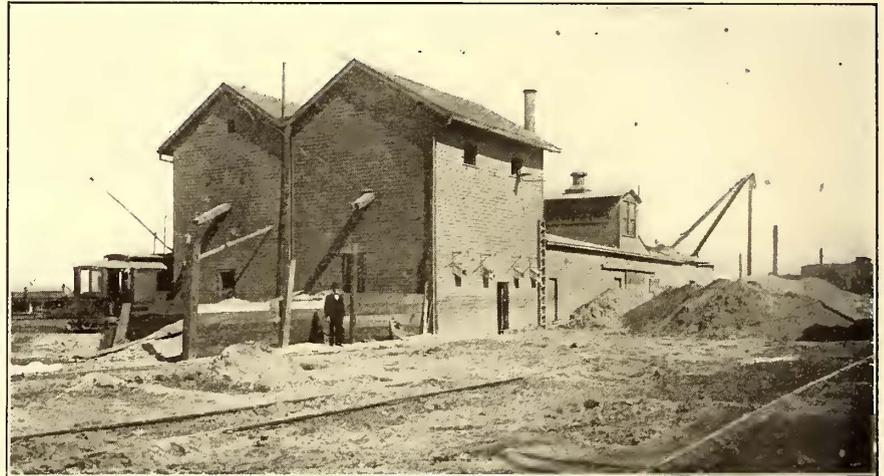


FIG. 5.—EXTERIOR OF SAND DRYER, PASSAIC WHARF



FIG. 6.—ELECTRIC LOCOMOTIVE CRANE LOADING TIES

runs parallel to the face of the dock upon which a locomotive crane may be operated for unloading purposes. The principal materials brought in to this wharf are coal, sand, ties and crushed stone. A very small quantity of the latter is delivered in this way because the railway company now has its own quarries and crushing plants. About 4000 tons of coal are delivered in the fall season in barges, which are unloaded with clamshell buckets attached to the stationary dock crane or to the electric locomotive crane. The coal is stored and delivered to the car houses by the supply trains as it is required. Formerly it was the custom to have it delivered by wagons or trucks. It was found the first year coal was handled in bulk and

The shipment of material from one point gives an ease of supervision and direction in carrying on both maintenance and construction work that has proved very satisfactory. Work trains leave the Passaic Wharf regularly every day, so that it is possible to anticipate the movement of material to each particular job and location. Cars are generally loaded when they leave the yards and on their return bring some material back. By this arrangement the freight charges are reduced to a minimum.

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delivered by supply trains that considerable saving was effected. The coal referred to is used for car stove fires

dried by machinery 16 to 20 sand-drying stoves with as many men were necessary to do the work. Now only two men are required to run the sand dryer. The storage bins

of the repairs to be made. His report goes in to the superintendent of buildings, who turns it over to the mill man and the planks are quickly sawed and shaped by power

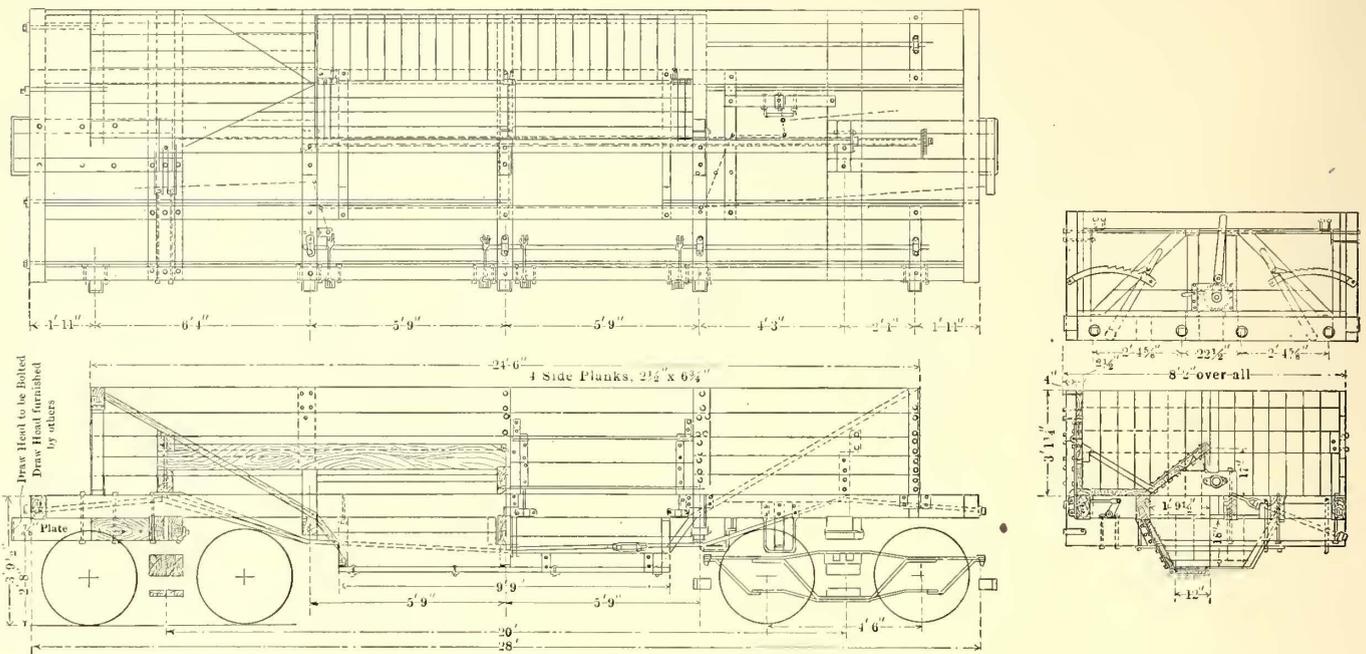


FIG. 10.—WORK CAR USED AS A TRAILER

have a capacity of 500 cu. yd. to take care of an exceptional call for dry sand or any anticipated trouble from delivery of the wet material; the latter difficulty is also provided for by the storing up during the early winter season of 4000 yd. or 5000 yd. of wet sand on the dock.

One of the most useful machines owned by the department is shown in Fig. 6—an electric locomotive crane. This machine is pressed into service for a variety of uses. At one time it may be in one part of the yard unloading from freight cars, rails, ties or special work; again the machine may be working on the dock with the clam-shell bucket disposing of sand, stone or other material.

The crane will lift 7000 lb. at a radius of 35 ft. and was built by the Brown Hoisting Machinery Company. It also has an extra drum for operating a grab bucket. A long boom was decided upon because it was necessary that the crane could work from scows on the face of the dock and handle 60-ft. rails. In the latter work the crane has to pick the rails out of a steam car and place them on the work cars in one operation. This procedure reduces the freight delivery charges on rails to a minimum. The time required to take eighteen 62-ft. rails from a steam railroad car on siding and place them on the work cars is ordinarily not more than 20 minutes.

Fig. 7 is a general view of the shop of the building department, which is provided with rip saws, boring machines and various labor-saving devices for wood working. Whenever a job is undertaken by this department all of the material, so far as possible, is got out and worked in the mill so that when it arrives on the job it is only necessary to erect it. By this method a great deal of the cost of labor is eliminated and it is possible to construct work in the field at reasonable cost.

There is a great number of bridges on the system where planking must be maintained between rails and tracks. Previously it was the custom to send the lumber on the ground and have it sawed and fitted into place in the field. Now a foreman is sent to the work to take measurements

machines. Then the yardmaster sends out the material in regular routine on the supply trains to be installed.

All the shop work for the track, except smithy work, drilling plates and rail bending is done at the Plank Road shops, which are located only about one-quarter mile away. Here, besides having the conveniences of all the regular tools, there is installed an extra large planer for planing points and other parts of builtup special work.

EQUIPMENT

It is a well-known fact that there is no tool connected with the maintenance of way department that has the im-



FIG. 11.—SPECIAL WORK CAR.

portance of the work car, especially when trucks and horses are not used, and the company in adopting a standard work car took every precaution to select one that would be suited for very heavy service and all requirements.

Fig. 8 well illustrates the type that was adopted and Fig. 9 gives the construction of the car. This work car is

pressed into service for any material that is to be handled, such as 60-ft. rails, pieces of special work, sand, lumber, coal, crushed stone, cement, dirt or any other track material. The car is 40 ft. long, weighs 37,000 lb., and has a capacity of 50,000 lb. The trucks are of the arch bar or Peckham-100 type with 5-ft. 6-in. wheel base and 20-ft. centers. Schoen steel wheels with 3-in. tread and $\frac{7}{8}$ -in. flange are used. The motors are four in number, GE-80 C's, and there are independent air and hand brakes, arc headlights and double trolleys. Common loads handled by this car are: 18 62-ft. 9-in. Trilby rails, 350 8-ft. x 8-in. x 6-in. ties, 20 yd. of sand, 20 yd. of crushed stone, 500 bags of cement, 20 tons of coal.

Where conditions permit the work car also pulls a trailer with load. Fig. 10 shows one of the trailers that are used. It is arranged with side and center dump and has a 28-ft. body. This car has been found particularly useful in handling crushed stone where it is loaded from the chutes at the stone bins of the quarry along with the motor car and dumped on the track.

SPECIAL WORK CAR

A good idea of the special work car is obtained from Fig. 11. This is a standard work car 40 ft. long and carries a standard 3-ton Brown hoisting crane. The steel boom is long enough to work at a radius of 20 ft., and will handle a load of 4000 lb. at a 15-ft. radius; the crane will lift 7000 lb. In case a heavier lift is required out-

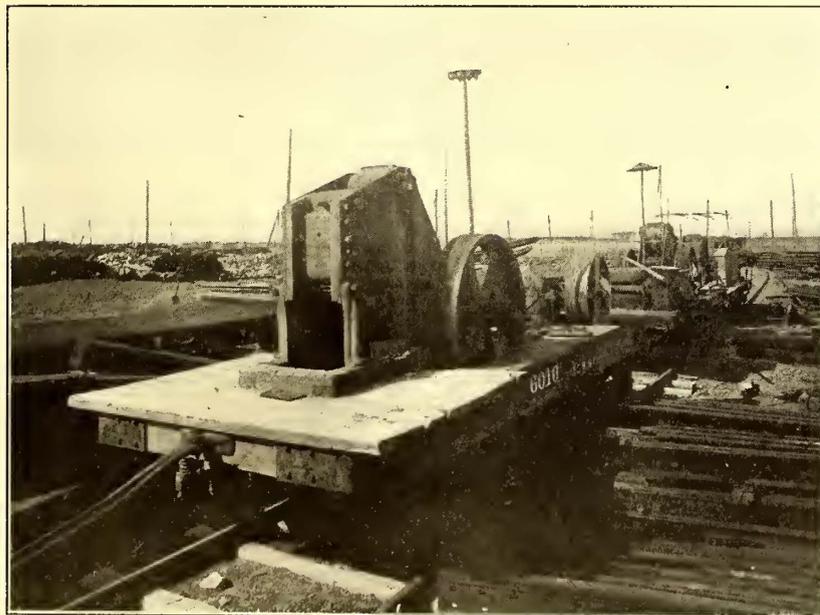


FIG. 13.—PORTABLE STONE CRUSHERS

riggers may be placed on the frame and the machine will handle considerably in excess of the amounts given. With the arrangement shown it is possible to operate the car in either direction from the cab as well as put the hoist in commission. The special work car has proved an exceedingly useful tool. If it is necessary to put in, say, for example, a switch and mate in a busy district, a gang will dig out the old special work and loosen up the joints so that the work may be easily removed. The new special work is

loaded on the car with the crane and brought to the site. When everything is ready for renewal the crane picks up the old work and places it on the special work car, then the operator hooks on the new work on special work car and drops it in place. It is then only necessary for the track gang to connect up the work again. This routine is economical as compared with the old method of putting in a

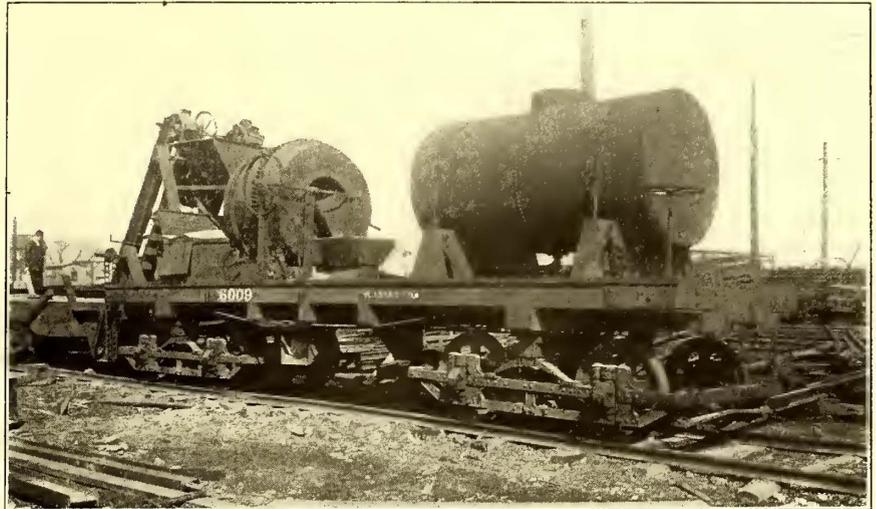


FIG. 12.—CONCRETE MIXER

job. To begin with, it was generally necessary to have twice as many men as were needed to take out the old work and put in the new, and often in removing special work by hand a laborer was hurt—a very common occurrence, especially with slippery pavements in the winter time. Then the new car gives the advantage of greater speed, which often means money when traffic is interfered with.

CONCRETE MIXER

Fig. 12 illustrates a new concrete mixer. This machine was especially designed by the company and is intended for mixing concrete in the field. When a piece of track is ready for concrete work the cars usually come in and distribute stone on one side of rail and sand on the other. The mixing machine is then brought upon the track and the stone is shoveled in hopper from one side of the track and sand from the other. The material is delivered to the rear of the car. Water is then taken from a tank and the whole is mixed and discharged through chutes on to the track. The mixer proper is a No. 2 Ransome batch concrete mixer and has a measuring hopper divided into such proportions as to give the required capacity of stone and sand for each batch

of concrete mixed. The hopper is furnished with a lever and door for discharging material at the right time into the mixer. At the discharging end of the mixer is a chute which discharges the concrete into a three-way hopper having narrow doors or gates which can be controlled at will for shooting the concrete on to either side of the track or between the rails. The elevators are erected on channel irons substantially supported and braced to the rear end of a 28-ft. x 7-ft. x 6-in. flat wooden car. The concrete

elevator bins that have a combined capacity of 500 cu. yd.

As soon as the stone is obtained in the bins it is only necessary to bring a car alongside and open the chute, and the car is loaded by gravity. The bins are very substantially constructed; the sides, which are 3-in. x 12-in. plank,

At present the rock drills are being driven by steam, but the company expects to run the three 3½-Ingersoll rock drills and two hammer drills by air. This will require an electrically driven air compressor with a capacity of 520 ft. of air per minute, and 16½-in. x 10-in. x 14-in. cross-compound compressors to be installed at a later date. The



FIG. 17.—STANDARD TRACK CONSTRUCTION IN WOOD BLOCK PAVEMENT, BAYONNE, N. J.

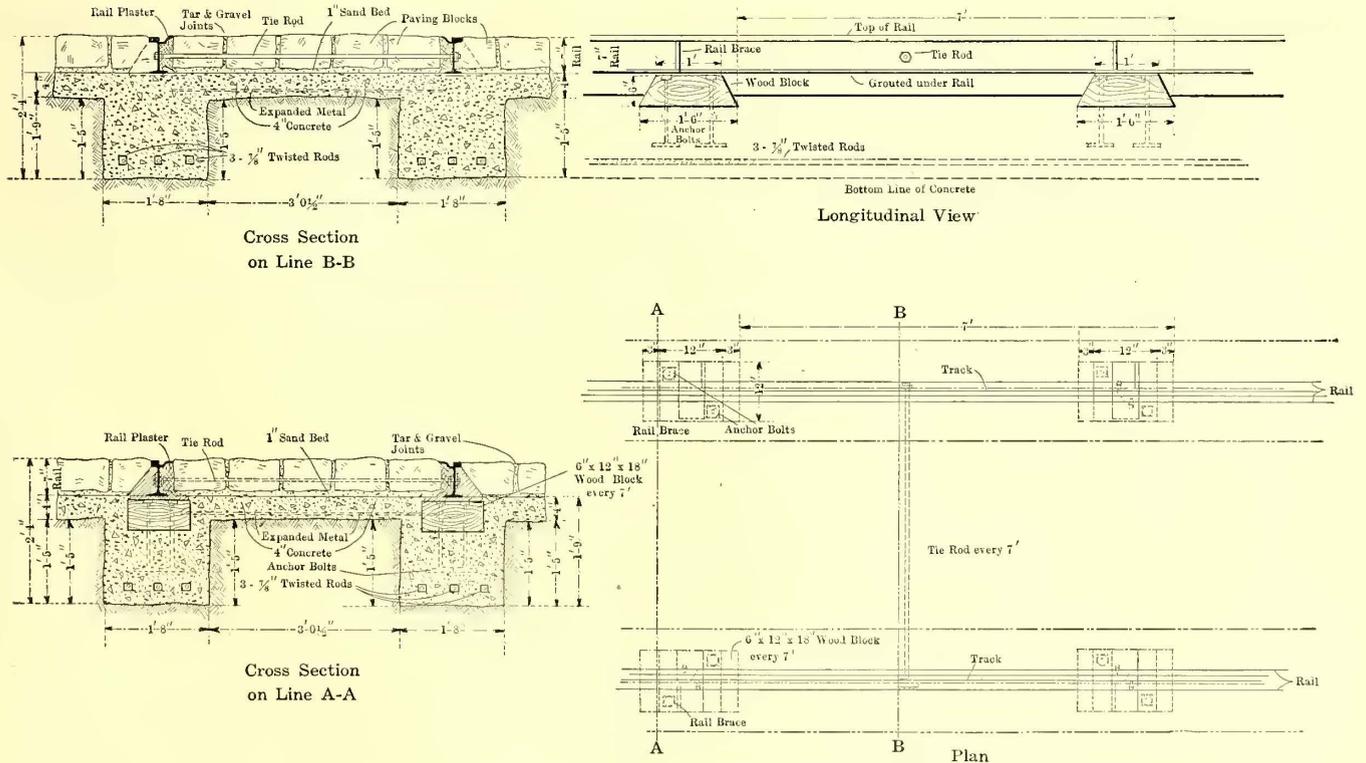


FIG. 18.—SECTIONS AND PLAN OF TRACK CONSTRUCTION ON CONCRETE WITHOUT TIES

are supported by 8-in. x 10-in. posts. The rejections of the crusher are carried to the ground through a chute and re-crushed with a No. 4 portable Champion machine. Ordinarily the new plant will deliver 360 cu. yd. of stone in 10 hours, so that the total capacity of the Fairview quarry is 450 yd. per day.

company also intends to replace the present carts for delivering stone to crusher from bank with a narrow-gage railway and storage battery locomotive, so the quarry will be an up-to-date and economical plant in every particular.

The property has a railroad connection from the Erie Railroad, so that when there is a lack in demand for stone

from the company's work it may be shipped by rail to outside parties. The crushing plant has not only proved itself very valuable in getting out stone at a low cost, but has

the job per day. The stone is handled by the company's own cars where conditions will permit trailers to accompany the motor cars, and it is a common occurrence to bring 45 yd. of stone to the work in one trip.



FIG. 19.—GENERAL VIEW OF NEW CAR HOUSE, CAMDEN, N. J.

also made it possible rapidly to complete large track jobs, which would have been impossible if the stone was obtained from outside. Previous to acquiring the Fairview quarry the amount of track construction was practically

electrically welded joints. The ties, 8 ft. x 6 in. x 8 in., are to be creosoted either by the pressure system or

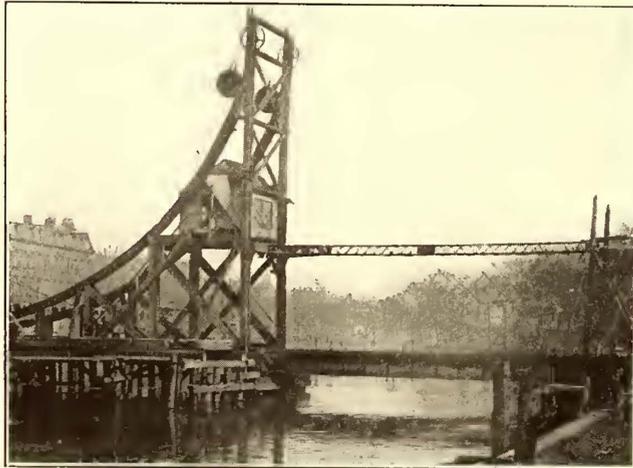


FIG. 20.—TEMPORARY DRAW SPAN SHOWING SPECIAL TROLLEY DEVICE



FIG. 21.—RECREATION ROOM FOR CONDUCTORS AND MOTORMEN, NEW CAMDEN CAR HOUSE

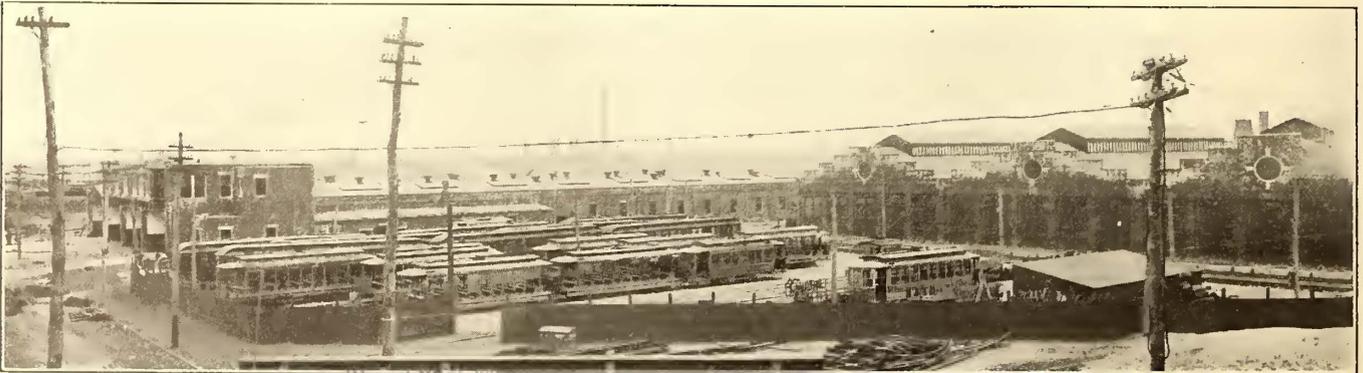


FIG. 22.—GENERAL VIEW OF THE NEW CAMDEN TERMINAL, CAR HOUSE ON LEFT, REPAIR SHOPS AT RIGHT

limited by the delivery of stone. Now if it is particularly desirable to finish a piece of track work in a very short time it is possible to send 400 yd. or 500 yd. of stone to

open-tank method. There is no question about the economy of using a creosoted tie for street work. The open-tank method increases the first cost of a tie only 25 cents, and

there are steam roads in this country where creosoted ties have been installed 10 years, but show no deterioration. In the open-tank and brush methods of lumber preservation tests results have been so favorable that it appears worth while to creosote in some form all wood structural work.

Fig. 17 gives a clear conception of a track construction with wood block paving as laid in Bayonne, N. J. The wood is laid with rolled trap rock foundation and has been in place four years. The track and paving are as smooth as a table and there is no indication of settlement.

If it is possible to get away from the concrete foundation under track such a result is certainly to be desired, even if the cost is not considered. When renewals have to be made on urban properties it is often very difficult to keep the cars in operation in congested districts. With the



FIG. 23.—PIT CONSTRUCTION OF NEW CAMDEN CAR HOUSE

method outlined above the cars may be run as soon as the track is laid on the ties, and concrete foundation for the paving can be placed at any time between the ties. Again, the narrow streets on the system of the Public Service Railway Company are continually being torn up for the construction of sewers, conduit lines, gas and water mains, etc., so it is often necessary to shift the tracks. This is not so serious a matter when a concrete foundation is not used.

Fig. 18 illustrates a concrete stringer construction as proposed by the writer for absolutely permanent service. The concrete stringer is of sufficient volume to give a substantial foundation, also affording the introduction of creosoted bearing blocks. The bearing blocks not only give an opportunity to line the rail any time after the concrete is laid, but also allow a cushion of the same effect of any rail on the ties. The reinforcements of twisted rods greatly add to the tensile strength of the beam carrying it over bad sub-foundations. The expanded metal serves a similar purpose for concrete under the pavement, although the latter could very well be omitted in many instances.

BUILDING CONSTRUCTION

Figs. 19 and 22 illustrate the new 100-car terminal recently placed in commission at Camden and the new repair shops completed about a year ago. These buildings form the headquarters of the Southern Division.

The general plan of the car house is of mill construction type. Brick walls are used with heavy wood roof and flat wired glass skylights. The building is made up of separate compartments for fire protection. The pits are open construction with steel plate walks between the tracks, and the pit rails are placed on creosoted blocks supported by reinforced concrete piers. A general view of one of the bays is presented in Fig. 23 which shows clearly the pit construction described.

The offices of the Camden terminal are on the second floor at the front of the building and include lavatories, locker and employees' rooms. The latter, illustrated in Fig. 21, are comfortably furnished and equipped with pool tables, games and a library for the men.

TEMPORARY DRAW SPAN

Fig. 20 illustrates one of the special problems undertaken during the last few years by the engineering department of the company. It shows a temporary draw span that has proved a very practical arrangement for the operation of cars over a river during the construction of the permanent structure. The trolley wire is carried on the auxiliary truss shown and is, of course, the special feature. The span illustrated has served at two locations and has been in service for 3½ years.

ELECTRIC RAILWAYS IN THE ORIENT

The readiness of Japan and China in adapting themselves to Western methods of electrification is to-day amply evidenced in the work going on in the large cities of these two countries. Yokohama has its electric tramways. Tokio, the capital of Japan, with its population of more than 2,000,000, is practically gridironed with electric railways, though there are a number of busy streets so narrow that to build even a single track would be impossible. The railway engineers and directors are Japanese. Shanghai has recently completed a splendid system of railways. Hongkong has operated street railways for several years with good results. Singapore and Penang are two Chinese cities with successful lines. There are many other cities in Japan and China which have received the impulse of modern means of transportation and will undoubtedly follow the above-named cities and install electricity.

CHANGING REGISTER CARDS

The plan of carrying a special card on each car on which the register readings are entered every time the crews are changed was described on page 870 of the *STREET RAILWAY JOURNAL* for May 13, 1905. It is followed by a number of companies and is intended as a supplement to the entries on the day card. The Easton Transit Company, of Easton, Pa., has recently adopted a method which much simplifies the work of reading these records. It consists simply of substituting a new card for the old one every time the register on a car is taken out for repairs or for any other purpose. This confines all records on each card to a particular register and avoids any confusion.

NEW SHOPS OF THE CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY COMPANY

The shops of the Cleveland, Southwestern & Columbus Railway Company, put in operation some months ago, are located just south of Elyria in the angle formed by the junction of the Oberlin and Grafton branches of this railway, about one mile south of the Elyria station and the Cleveland-Norwalk line. This place was chosen, as it is



ELYRIA SHOPS OF THE CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY

almost in the center of the system and near the large power station of the company. At the present time 165 miles of track are served by these shops and will be increased to 210 when the work now done at the Ohio Central shops is transferred to the new plant.

The main building or car house section is of red brick

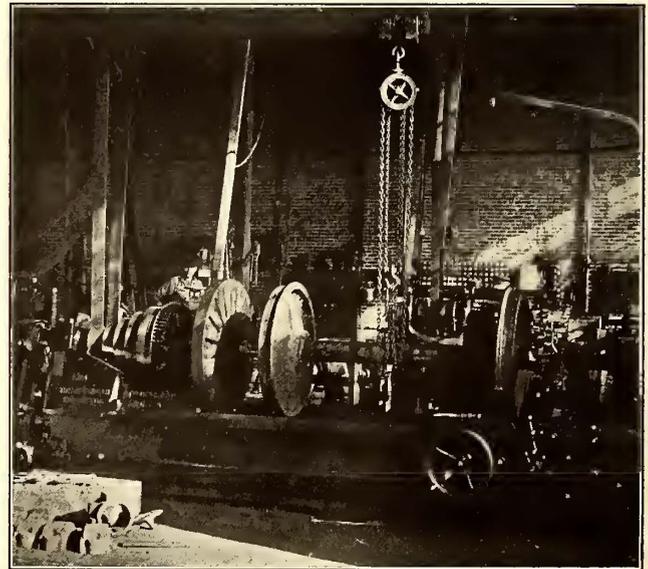


CARPENTER SHOP AT ELYRIA

with stone coping, with the center higher than the wings. All the walls are set in concrete foundations; those in the front and rear are 17 in. thick, while the division and side walls measure 13 in. The roof is carried on steel trusses placed on 30 in. x 21 in. pilasters, which also serve as supports for the beams of the side roofs. The roof is laid with slate at a pitch of 6 in. per foot. The wings house all the shop departments and offices except the machine shop, which is in the rear of the center structure. In con-

struction these are similar to the main building, but the roof is of composition laid on boards, with a pitch of $\frac{3}{8}$ in. per foot. The floors throughout are of wood covered concrete on a cinder bed. All door openings in the brick partitions are protected with fire doors. Further fire protection is secured through stand-pipes connected with the city water system.

The total installation is 250 ft. x 179 ft. 4 in., and the four-track car house proper is 164 ft. x 79 ft. 11 in. The latter contains four pits; one for wheel changing, two for car inspection and repairs and one for washing. The inspection and repair pits are of the closed type, 5 ft. 6 in. deep, built of brick laid in concrete. The timbers carrying these tracks rest upon the wall on one side, but on the other are supported by uprights. A feature of this plan is that the timbers are not framed in, but are held together by bolted angle irons. Having one timber project over the space in the pit gives plenty of room for tool and material shelves in the pit and also for the steam pipes. One of the pits is served by a pneumatic hoist for carrying motors and motor shells along its entire length, while armatures are handled by a hand-operated chain hoist. Plans have been completed for an air-operated traveling crane to transfer car bodies and trucks from one track to another. Pneumatic jacks are now used for lifting car bodies to release the trucks. Two 10-hp air compressors, feeding a cylindrical tank of 125 cu. ft. capacity, furnish power for the hoists and jacks, as well as for car cleaning purposes.



WHEEL LATHE SERVED WITH HAND HOIST

The car washing track, 120 ft. long, is located on the east side of the building and has a concrete pit which is exceptionally well drained. A hose connected to a pipe from the city water system is used for cleaning car bodies. The rails are laid on timbers 6 in. x 10 in. resting on the concrete walls. Compressed air is used to clean car seats as well as motors, controllers, rheostats, etc.

The machine shop (76 ft. x 79 ft. 11 in.) is in the rear of the center building and hitherto has taken care of the

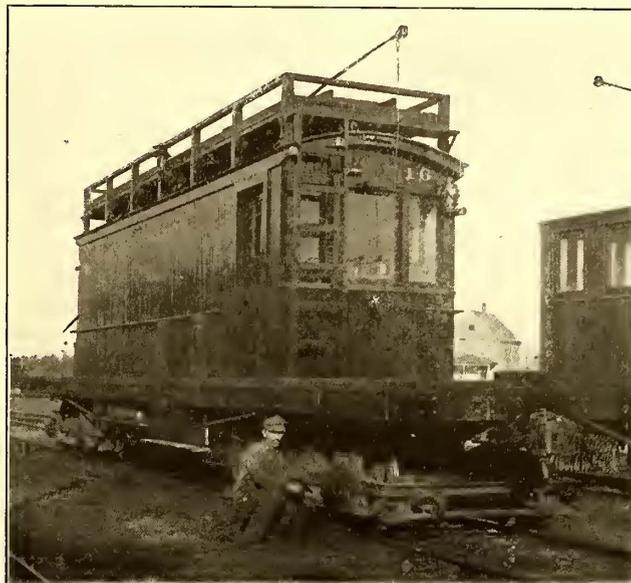
armature department as well as the machine equipment proper. The truck repair track from the car house extends back through this shop and to the rear yard, where it connects with a switch track from the main lines. All machines are driven by a National Electric Company 500-volt, 20-hp motor. Among the principal tools used is a Niles-Bement-Pond 48-in. wheel lathe on which four pairs of wheels a day are turned. This lathe is served by a hand-operated chain hoist. There are also a 50-ton Niles-Bement-Pond press, an old 40-in. wheel lathe, now used for boring wheels, turning axles, etc., a Niles radial drill press, a LeBlond milling machine, a Niles shaper for brush holders and other parts, a Strong, Carlisle & Hammond 20-in. lathe for armature work, a 24-in. machine lathe for bearings, and a 2-in. Acme threading machine. The armature work is being done with other winding in a separate room.

The blacksmith shop (35 ft. 1 in. x 40 ft.) adjoins the machine shop and is fitted with two forges, a Bradley trip hammer and one or two other smaller machines. A 15-hp, 500-volt Westinghouse motor runs all the machines and blowers for the forges.

The carpenter shop (126 ft. 7 3/4 in. x 64 ft. 4 in.) is in the annex on the east side of the main building. Work cars, line cars and other rolling stock used in the maintenance of the tracks are built complete in this shop in addition to making running repairs. A 15-hp d. c. motor runs the band saw, shaper and universal woodworker. Six cars at a time may be taken care of on the three tracks in the carpenter shop. The tracks extend back through the paint shop, at the rear of the carpenter shop, so that cars may be set back for the painters as soon as repairs are completed.

In the north or front part of the west annex a room with the usual conveniences for rest and recreation has been reserved for the trainmen. One of the two offices in this annex is occupied by the master mechanic and engineer of maintenance of way and the other by the storekeeper and stenographers.

The storeroom is back of the offices and communicates directly with the car house. The system of keeping stock



LINE CAR OF THE CLEVELAND, SOUTHWESTERN & COLUMBUS RAILWAY

**KEEP CLEAN
Armature Tag.**

Armature No.
 Out of Car No.
 Date out
 Cause of Removal

Put in Car No.
 Date in
 Motor No.

ARMATURE TAG

Cleveland & South-Western Traction Co
WHEEL REPORT.

Car No. Date 19...

Wheels Taken Out.

Wheel No.	Circum.	Cause of Removal

Asle No. Gear No.
 Make

Wheels Put In.

Wheel No.	Circum.	Pressure	Tread Turned

Asle No. Gear No. Motor No.
 Make

WHEEL RECORD

One of them extends on to the outside and connects with a switch track in the rear yards. Cars may thus be taken out without disturbing those in course of repair in either the carpenter or paint shops.

The paint shop is about the same size as the carpenter shop and is arranged to be heated up to 80 deg. by steam pipe radiators extending along the walls. The large openings between the paint and carpenter shops have sliding fire doors.

CLEVELAND & SOUTH-WESTERN TRACTION CO.

ARMATURE RECORD. Armature No. Type Date New

Car No	Motor No.	Date In	Date Out	Reground	Cells put in	Cells Rep.	O. C. Rep.	Leads Rep.	New Commutator	Commutator Rep.	Com. Cr. Rep.	Mica Rings	Oil Rings	New Heads	Bands	Bearings	Com. Turned	Shaft Straight	New Shaft	New Pinion	Keyway	CAUSE OF REMOVAL	MILEAGE	NAMES OF WORKMEN

HEADINGS OF A COMPLETE ARMATURE RECORD

ORIGINAL.

SHEET No.

THE CLEVELAND SOUTHWESTERN & COLUMBUS RAILWAY CO.

DAILY REPORT OF STOREKEEPER AT

AUDITOR: THE FOLLOWING MATERIAL WAS RECEIVED 190... AND ADDED TO STOCK.

SIGNED

GROER No.	STOCK No.	CHARGE TO ACCT No.	QUANTITY	ARTICLES	FROM

ORIGINAL COPY OF STOREKEEPER'S DAILY REPORT

includes a checking system that makes it possible to know at all times just what is in the storeroom. The boxes and bins are numbered, the figures being placed on the front of each, either in black paint or on a card used for the purpose. These numbers correspond to the stock numbers of the articles purchased or taken from the storeroom for use. A daily report is made to the auditor of all material purchased and put in stock. On this blank, as will be seen by the reproduction, appears the order number, the stock number (as shown on the bins), the quantity, name of the article, name of maker and the account number. A dupli-

cate of the report is retained for reference in the shop office.

A detailed report of all articles taken from stock each day is also made in duplicate. It contains the stock number and other information needed for keeping an accurate record. These reports are typewritten, as no blank has been prepared for the purpose. By comparing the reports and keeping the totals up to date, the amount of stock or the number of articles of any kind on hand may be ascertained on short notice. Reference to the reports will also show the rate at which different articles are used. They form a check on carelessness and misuse of material. Comparison by months or corresponding weeks or months of the year may also be made, after the system is well under way.

Another feature of shop practice is the manner of keeping armature records. When an armature is removed a tag, like the one reproduced, is attached and remains there until the armature is returned to service. The first part is filled out when the tag is attached, showing the date and cause of removal, the number and the car from which the armature was taken. When put into service again the remainder of the blank is filled out, showing the motor number, car number and the date. The tag is then taken to the office where these data are transferred to a large card, called the armature record, which if kept correctly will show the complete history of each armature from the time it is put into use until it is discarded. The number, type and date the armature was put into service are given and in the body of the card the nature of the repairs is shown each time it is removed from the motor. These items are given at the head of the columns, so that the work of keeping the record is very small. Similar records are being kept of the wheels, and others are being worked out.

All castings are made in the local foundries at Elyria, the company having made contracts by the year for the work. A pattern maker is employed especially for the shop work and as good service is secured as if the parts were ordered from the manufacturers. The plan has features that cannot be overlooked in the successful operation of an electric railway; one is that the parts may be secured in the shortest possible time, and another is that the necessity of keeping large stocks on hand is eliminated. A casting may be had within two days under this arrangement and the expenses for freight amount to nothing. Local industries are also favored and the management has found that this practice is good financially.

Acknowledgment is due to W. E. Ralston, master mechanic of this company, for assistance in preparing this article.

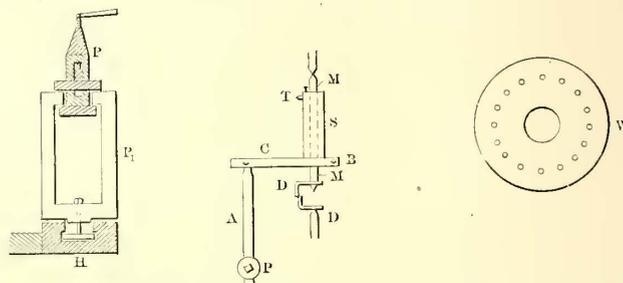
BORING WHEELS WITH A LATHE

A novel method of boring car wheels in an ordinary engine lathe is illustrated in the accompanying sketch. The scheme was developed by Geo. F. Poor, master mechanic of the Asheville (N. C.) Electric Company, and has proved thoroughly successful. *P* is the ordinary tool post of the lathe and *H* the regular compound head rest. An extension tool post *P*₁, 9 in. high, is used to raise the ordinary tool post above its usual position. This extension piece is 5¼ in. wide over all and 3 in. wide inside the frame. It is attached to the compound head rest by the ⅝-in. bolt, nut and plate shown.

In place of the usual tool bar *A*, 6 in. long, is clamped into the tool post *P*, and at the end of this bar a clamp *C*

is attached by a set screw fastening. This clamp is secured around a sleeve *S* with a bolt lock at *B*, so that *S*, *C* and *A* are one rigid member. *M* is a stationary mandrel fitting at one end into the head center of the lathe and being held rigidly against the tail center of two dogs *D D*, which are clamped together to prevent the turning of the mandrel, the latter acting simply as a guide for the sleeve *S*. The sleeve *S* is 2¾ in. outside diameter, the mandrel *M* having a sliding fit of 1⅝ in. diameter. Attached to the mandrel near its head end is a cutting tool *T* of high-speed steel, which is secured in a hole in the mandrel by a ⅜-in. set screw. The lathe is also provided with a head stock extension 9 in. high and a tail stock extension of the same dimension, and the lathe is driven by a short belt from the usual overhead pulleys.

In operation the wheel is placed in the lathe by being



SKETCH OF METHOD OF BORING WHEELS WITH A LATHE

attached to a 35-in. face plate *W* in which are 14 ¾-in. holes drilled on a circumference. The face plate fits the lathe spindle and the wheel is attached to the face plate by the clamps. The tool *T* is then adjusted in the sleeve, the latter being rigidly fastened to the tool post. When the latter is started the wheel revolves with the face plate, and the tool post, bar clamp *C*, sleeve *S* and cutting tool *T* feed along the lathe parallel to the mandrel or line between centers. The adjustment thus permits the tool *T* to advance along the bore of the hub inside, as the latter revolves, and all lost motion is prevented by the fit of the sleeve on the mandrel and the fastening of the latter to the tail stock center. In this way the lathe (an 18-in. machine) is given a 36-in. swing and the travel of the cutting tool *T* can reach a maximum of 6 in. parallel to the center line of the lathe. A wheel can be bored out in about an hour with this device and the cost of fitting it up was considerably less than \$200. Aside from the saving in the cost of a boring mill there is a saving in the cost of having the job done outside and in the time required.

INTERNATIONAL ROAD CONGRESS AT PARIS

An international road congress will be held at Paris this year, under government auspices, to consider the construction of roads and their adaptation to the different new means of locomotion. This congress, to which the governments of other nations have been officially invited to send representatives, will open Oct. 11 and continue in session for seven days. An excursion during the session has been arranged for delegates to visit Nice, enabling them to inspect the specially constructed roads in that district, and those now in course of construction which are being built especially to suit motor-car requirements. Particulars of the congress can be obtained from the general secretary's office of the First International Road Congress, the Ministère des Travaux Publics, 244 Boulevard Saint Germain, Paris.

THE PRESENT STATUS OF HIGH-TENSION D. C. AND A. C. RAILWAYS ON THE CONTINENT OF EUROPE

BY A GERMAN ENGINEER.

The a.c.-d.c. contest, which from all accounts has been waged in America during the past three years, has had its counterpart in Europe. There has been this difference, however: The three-phase system has been a more active competitor, as a number of important lines have been built using this system of traction, and examples have not been lacking of direct-current roads with potentials from 1000 to 2400 volts. All of the more important of these installations have been described in the columns of the

circuits in cables to avoid interference from the railway currents and to decrease the maintenance troubles due to having such wires on the poles. The freight service on this railway is still handled by steam locomotives.

The Salzburg-Berchtesgaden Railway is a high-tension, direct-current line owned by the Bavarian government and the Salzburg Tramway Company, of Austria. The Bavarian section is operated at 900 volts and the Austrian division, which is mainly in the city of Salzburg, at 750 volts. Bow collectors are used. The freight business is still carried on with steam locomotives.

The Filder Railway is a Siemens & Halske line running from Stuttgart, the principal city of Bavaria, to the Filder plateau. This is a 600-volt line using an ordinary trolley



TERMINAL YARD AND STATION AT BRIEG, THE SWISS END OF THE SIMPLON TUNNEL

STREET RAILWAY JOURNAL, but it may not be without interest to touch briefly upon a few points which have not been widely published.

HIGH-TENSION OR OTHER SPECIAL DIRECT-CURRENT RAILWAYS

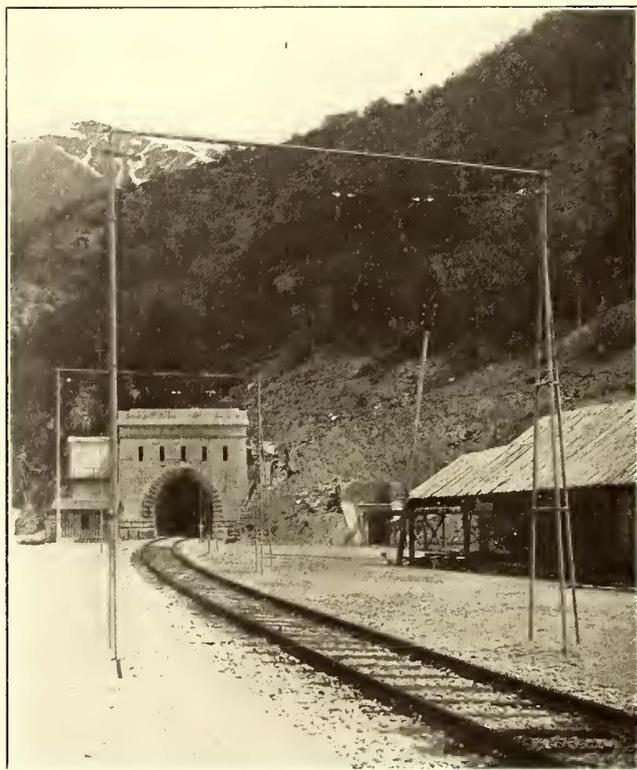
The Rhcinuferbahn, running between Cologne and Bonn, Germany, is an interurban railway, 28 kilometers (17.3 miles) long, with a trolley potential of 990 volts on the interurban division and 550 volts in Cologne. A general description of this line was published in the May 5, 1906, issue of the STREET RAILWAY JOURNAL and a detailed description of the motors in the issue of Feb. 1, 1908, but the illustration on the next page of the catenary construction on the double-track division is presented because of its artistic and substantial design. A novel feature is the carrying of telephone block signal and other low-amperage

for about 2 kilometers (1.24 miles) between Stuttgart and Degerloch. There are also five other divisions on the plateau comprising a total of 30 kilometers (18.6 miles), one of which is a rack railway on account of the severe grades. Shunt-wound motors are used to secure regeneration. The saving in current is given as follows: 50 per cent of the current required in going up a grade of 10.8 per cent; 56 per cent on a grade of 13.2 per cent; 59 per cent on a grade of 15 per cent; 62 per cent on a grade of 17.2 per cent.

The Mt. Vesuvius Railway, which was described in the issue of this paper for May 7, 1906, is owned by Thos. Cook & Sons, the well-known tourist agency. This system is an interesting combination of the ordinary overhead trolley, rack and cable systems. This line also uses shunt-wound motors to secure regeneration.

SINGLE-PHASE RAILWAYS

An interesting test line has recently been built by the management of the Prussian State Railways at Oranienburg, about 50 kilometers (31 miles) north of Berlin, the purpose being to study ballast, rail joints, ties, etc., in a shorter period than would be possible under ordinary oper-



ENTRANCE TO THE SIMPLON TUNNEL AT BRIEG, SWITZERLAND

ating conditions. It is also intended to use this section for trying out motors, electric control systems, etc., as to their availability for trunk line service. The track, which is built in a forest, is circular, 1.75 kilometers (1.08 miles) long and without grades. Cars can be operated on it up to 50 kilometers (31 miles) an hour. Up to the present time experiments have been conducted with two 52-ton motor cars, each equipped with two Winter-Eichberg single-phase motors having an hourly rating of 110 horse-power, a continuous rating of 45 horse-power and a maximum rating of 125 horse-power. The trolley current is 6000 volts, 25 cycles, collected through pneumatically operated sliding bows. The trolley wire is suspended as a catenary. An unusual feature about the tests is the control of the car from a small building along the route and the automatic numbering of round trips.

In the STREET RAILWAY JOURNAL of April 6, 1907, a detailed description was published of the overhead construction adopted for the Blankenese-Hamburg-Ohlsdorf single-phase line, 16.4 miles long. Particulars are now available regarding the power house, transmission and car apparatus. The power house, located in Altona, contains four 1250-kw, 6300-volt, 25-cycle, single-phase generators. The current delivered by these machines is stepped up and transmitted at 30,000 volts and is reduced at five substations to the trolley potential of 6300 volts. There are 60 motor cars, of which 54 were electrically equipped by the Allgemeine Elektrizitäts Gesellschaft and six by the Siemens-Schuckert Works. Ordinarily current is collected through pantograph collectors operated by compressed air,

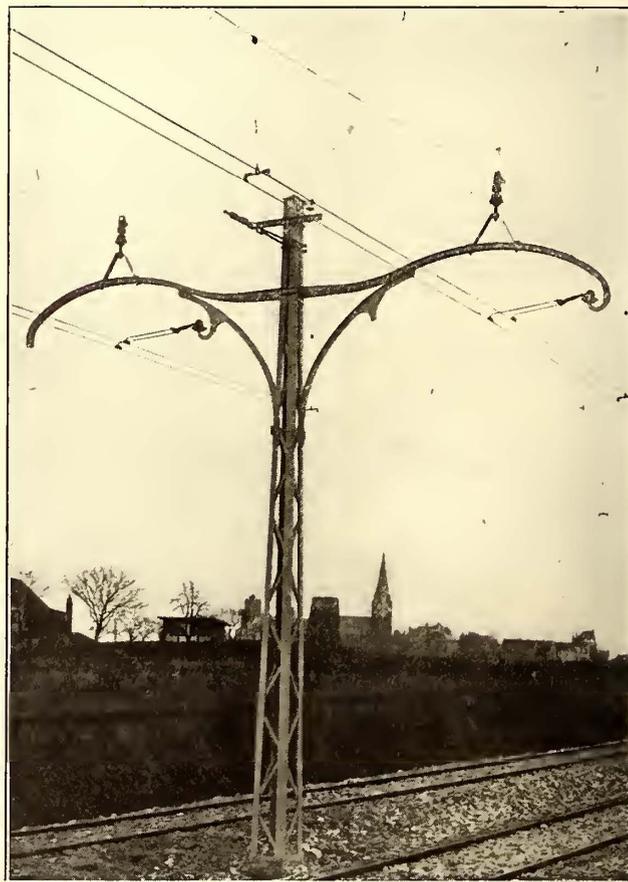
but in the yards, where the trolley potential is 300 volts, current is taken through a roller on the side of the car.

The Valle-Maggia line is a 27.5 kilometer (17 miles) Swiss section of an Italian railway. It is of meter gage, has a maximum grade of 3.3 per cent and is arranged for trains up to 55 tons in weight. The trolley potential is 5000 volts, single-phase, collected through the Huber-Oerlikon side contact system. The motor cars carry four 40-hp motors. The car equipment and generating machinery of the hydro-electric station was furnished by the Oerlikon Company.

THREE-PHASE RAILWAYS

The Valtellina three-phase railway system now comprises a total length of 106.3 kilometers (66 miles). It has been found that one man is sufficient to run the electric locomotive, but to have a man ready in emergencies the conductor and motorman alternate positions, so that there are two capable men on a train at all times.

The 16-cycle, 3300-volt, three-phase line through the famous Simplon Tunnel, which is 19.8 kilometers (12.3 miles) long, now receives power from two stations near the terminals of the line, one at Brieg, Switzerland, and the other at Iselle in Italy. These stations originally were used to supply current for the drills and other tools used in boring the Simplon Tunnel, and as they are not as up-to-date as desirable, it is planned eventually to generate all



CENTER POLE CATENARY SUSPENSION ON THE RHEINUFER RAILWAY, BETWEEN COLOGNE AND BONN, GERMANY

the power in one station. One of the accompanying illustrations shows the overhead work in the large railway yard at Brieg, from which it will be noted that a separate pole line is used for every track so that a breakdown on one track will not interfere with train operation on the others. In the tunnel the trolley is carried from span wires at-

tached to bronze anchors cemented in the walls. The tunnel trolley wire is carried 4.8 m (15 ft. 9 in.) above the roadbed and in the open 5.2 m (17 ft.) above the roadbed. The trolley is suspended at intervals of 25 m (82 ft.) on tangents and 12½ m (41 ft.) on curves. One interesting difference between the Simplon locomotive and the Valtellina is that the speed variation in the former machine is obtained by changing the number of poles and not by making cascade connections.

CORRESPONDENCE

THE INTERSTATE COMMERCE CLASSIFICATION

THE CONNECTICUT COMPANY

NEW HAVEN, Conn., April 20, 1908.

Editors STREET RAILWAY JOURNAL:

Replying to your inquiry as to the tentative classification of accounts of the Interstate Commerce Commission, we feel, in general, that it is desirable to distribute the operating and construction expenses of steam railroads and electric railways in a way that will avoid lap-overs and other conflicts whenever there is joint operation and that the operating and construction classifications of steam roads should be taken as a basis, covering the special items peculiar to electric operation by proper sub-divisions. But it should be borne in mind that an electric railway is designed primarily for the conduct of local passenger business, a large portion of its tracks is located in public ways and its relation to municipalities is consequently much closer than that of a steam railroad.

So far as the proposed classification of operating expenses is concerned, we think it is too elaborate for electric railways and that it provides for too many primary accounts. While it is an improvement, in some respects, upon our present electric railway classification, which was not sufficiently in detail, it has gone to the other extreme as it requires the companies to keep 116 accounts, which would necessarily increase the expense in the accounting department without any corresponding benefit to the company. One of the great differences between the present classification and the proposed classification is the treatment of such items as "Loss and Damage," "Printing and Stationery," "Insurance," "Wages of Clerks," etc. The proposed method divides these expenses up among the various departments affected while the present classification lumps them all together under "General Expense." While it may be desirable and practical to divide certain of these expenses between the various departments, we do not believe it is practicable or desirable to divide "Loss and Damage" and "Insurance" in this way.

Regarding the specific accounts the following might be said:

I. MAINTENANCE OF WAY AND STRUCTURES

A. "Maintenance of Way":

This sub-general account is sub-divided into 15 primary accounts, which are entirely too many for our needs, and it would be impossible to obtain such a sub-division without increasing the expenses materially.

Account No. 1 directs that to this account be charged all labor of handling and distributing the ballast, which is apparently all right, but on referring to Account No. 2, "Ties," and Account No. 3, "Rails," the labor of unloading and distributing ties and rails is charged to Account No. 8, "Roadway and Track." There does not seem to be any

good reason why the expense of distributing ballast should be charged on a different basis in the accounts than the expense of distributing ties and rails.

The classification provides under the caption "Train Service" for charging to various accounts, Nos. 1, 10 and 14, the supplies for work trains, locomotives and cars and the power consumed by them while engaged on a particular kind of work. It is impossible to obtain this information for the reason that work trains on an electric railway will start out in the morning hauling ballast for, say, two hours, and distribute rails, ties, etc., for two hours more; they may then be used on bridge, trestle and culvert repairs for a couple of hours more; on telegraph and telephone lines, on the repairs of electric transmission lines and electric feeders and trolley wires as well as for hauling material for the repair of buildings. In winter they will be used in clearing snow. In fact, they will be engaged in one day in such a variety of work that six or seven accounts will be affected. In order to carry out the idea of the classification as we read it all the supplies furnished to that work train, such as lamps, trolley ropes, etc., would have to be divided among those various accounts and a lot of unnecessary bookkeeping would be entailed based upon inaccurate estimates.

B. "Maintenance of Electric Lines":

This sub-general account is divided into eight primary accounts and provides for a segregation of the maintenance of high-tension transmission lines, overhead feeders and overhead trolley lines. It is almost impossible to make such a separation, as in many cases the high-tension transmission line, the over-head feeders, the brackets supporting the overhead trolley lines and the telegraph and telephone lines are carried on the same poles and in many cases on the same cross-arms; if one of these poles had to be repainted it would be impracticable to sub-divide the cost between the various accounts. In our opinion these three items should be consolidated into one account, since the sub-division of this account as it stands is too elaborate to obtain proper results. The suggestion is made that the sub-general account be called "Maintenance of Electric Conductors" and be sub-divided as follows:

Account 17—Maintenance of Overhead Electric Lines; to comprise Accounts 17, 18 and 21.

Account 18—Maintenance of Underground Electric Lines; to comprise Accounts 19, 22 and 23.

Account 19—Track Bonding.

Account 20—Miscellaneous Electric Line Expenses; to comprise Account 24, remodeled somewhat as to the items of injuries and insurance.

C. "Maintenance of Buildings and Structures":

There are too many sub-divisions of this account.

Account No. 29 directs that the cost of repairs to power houses and shops, including power plants, be charged to this account, but the cost of repairs to power plants is already provided for in Account No. 26.

D. "Maintenance of Service Equipment":

It does not seem that this should come under the general account "Maintenance of Way and Structures," as proposed, but that it should be a sub-division of general account "Maintenance of Equipment," as service equipment is used not only in maintenance of track, line and buildings, but also to remove snow from track, to clear wrecks, etc., and in hauling coal to power stations. The primary accounts under "Maintenance of Service Equipment" provide for the charging of the maintenance of electrical equip-

ment of snow plows and other work cars to Accounts 34, 35, 36 and 37, as the case may be. This is hardly practicable for the reason that it is the common practice to strip the snow plows, etc., of their motors and other movable electrical equipment in summer and put them under open passenger cars—in short, to interchange the movable electrical equipment between passenger and work cars, and it is not feasible to separate the maintenance of electric equipment as between revenue and non-revenue cars.

E. "Availability Maintenance Expenditures":

Some of the primary accounts under this sub-general account we think could be consolidated with other accounts, for instance, Account No. 39, "Care of Track." This account is but very little used on electric railways, and when employed the work called for is done by the regular track and roadway gang. This account we think should be consolidated with Account No. 8, "Track and Roadway."

Account No. 40, "Removal of Snow, Sand and Ice," and Account No. 41, "Cleaning, Sprinkling and Oiling Roadbed," we regard as transportation and not maintenance expenses; the work is performed by the operating force and relates to the movement of cars solely, having nothing to do in trolley practice with the upkeep of the property.

II. MAINTENANCE OF EQUIPMENT

This account provides for a segregation of maintenance of revenue equipment and non-revenue equipment. So far as the electrical equipment is concerned, this separation is not feasible for the reason that equipment, such as motors, armatures, etc., are interchangeable and as a matter of common practice are used either under revenue or non-revenue equipment as the necessity arises. In our judgment, maintenance of electric equipment of all cars, revenue and non-revenue, should be charged to one account.

A separate account is provided, No. 51, for repairs of revenue freight cars, the non-revenue freight cars being chargeable presumably to Account No. 35, "Maintenance of Service Equipment." It is not practicable to make this separation for the reason that the same cars are used in revenue and non-revenue service at different times in the same day.

Under Account No. 53, for example, and elsewhere, it is suggested that the accepted nomenclature for electrical parts as adopted by the American Institute of Electrical Engineers, by manufacturers and by users of apparatus generally, be followed, instead of the somewhat strange and unfamiliar terms employed in the tentative classification.

Account No. 60 should be sub-divided to provide for hydraulic plants, reservoirs, dams, canals, flumes, penstocks, spillways, etc., and the steam maintenance separated from electrical maintenance with Account No. 61, as proposed treated as a sub-primary account.

III. TRAFFIC EXPENSES

Under "Traffic Expenses" there should be a primary account provided for "Operation of Parks" with permission to sub-divide into sub-primary accounts.

IV. TRANSPORTATION EXPENSES

Account No. 90, "Telegraph and Telephone Operation," provides for the pay of telephone operators and messengers. As a matter of fact, one operator will probably do the work for various departments, Maintenance of Way and Structures, Maintenance of Equipment, Power Stations, Superintendent of Transportation and possibly some general officers, consequently a large part of his work has nothing to do with the operation of cars.

Under Account No. 96, "Power House Employees," provision is made for the charging of a proportion of wages paid power house foremen and their clerks to this account, but the basis of division is not given, so we presume an arbitrary division will have to be made.

In our opinion the treatment of Insurance, Loss and Damage, Damage to Property and Injuries to Persons, more properly belong to "General Expenses."

To require electric companies to carry out the idea expressed in the treatment of "Joint Facilities" would be a hardship, as it would mean that they would have to go through a lot of bookkeeping to sub-divide the certain items received from or paid to other companies among a lot of accounts, the sub-division being based upon an arbitrary basis which would probably be incorrect and misleading.

The same comment applies to Accounts 79, 80 and 81, power purchased, etc.

As a whole the classification has some very good features, but as stated before, we think the treatment in the proposed classification of Insurance, Loss and Damage, Damage to Property, Joint Facilities, Power and Rent of Equipment is objectionable and should be given more careful consideration before a classification is finally promulgated.

No comment is made in regard to the subject of depreciation, as I understand a special committee of the representatives of the electric lines has been appointed for the consideration of that question.

H. M. KOCHERSPERGER, Vice-President.

[Mr. Kochersperger's letter is of especial interest because in addition to being vice-president of the Connecticut Company he is vice-president in charge of accounting and treasury, of the New York, New Haven & Hartford Railroad Company. He was also president of the Association of American Railway Accounting Officers in 1898 and was for some time a member of the committee on corporate, fiscal and general accounts of that body.—Eds.]

GERMAN STREET RAILWAY STATISTICS

The German ministry of public works has recently issued street railway statistics covering the German Empire for the year ending March 31, 1907. The number of undertakings was 235, an increase of 10 over the preceding fiscal year, while the length of all the lines was 3745.6 kilometers (2332.3 miles), an increase of 213.8 kilometers (132.5 miles), or 6.05 per cent. The total number of cars in Prussia was 11,918, equivalent to seating and standing room for 390,630 passengers; the corresponding figures for the rest of Germany were 5152 and 160,427.

In Prussia 32.5 per cent of the lines are of 1.435 meters (4 ft. 8½ in.) gage, 61.1 per cent of meter (3 ft. 3 in.) gage and the remainder are of less gage; in the rest of Germany the corresponding percentages are 10.3 per cent, 64.7 per cent and 25 per cent. Of the street railways which have not yet been electrified 17 are operated wholly or in part by steam locomotives, 27 by horses and eight by cable. Most of these lines are only 1 to 2 miles long, but there is one line in Magdeburg 14.15 kilometers (8.7 miles), which also is unique in using oxen as well as horses for motive power. Seventy-two railways handle both freight and passengers, 149 are for passengers exclusively and 4 only for freight.

There were 47,667 permanent employees, equal to 13 per kilometer (8 per mile), in Prussia and 13.9 per kilometer (8.6 per mile) in the rest of the Empire.

MEETING OF THE IOWA STREET & INTERURBAN RAILWAY ASSOCIATION

THURSDAY AFTERNOON SESSION

The fifth annual convention of the Iowa Street & Interurban Railway Association was held at Des Moines, Ia., April 23 and 24, in connection with the eighth annual meeting of the Iowa Electrical Association. The attendance at the meetings of both associations was the largest in their history and much interest was manifested in the discussions on the papers presented. Two of the papers, on "Depreciation" and "Handling Fares on Interurban Railways," were printed last week. The remaining papers presented at the Street & Interurban Railway Association meetings are printed in another column in this issue. The exhibits at the convention were exceptionally numerous and elaborate, about 40 exhibitors being present. The display of lighting and railway supplies and devices was arranged in the banquet hall of the Severy Hotel, where the meetings were held.

THURSDAY MORNING SESSION

The convention was opened with an address of welcome by A. J. Mathes, mayor of Des Moines, which was responded to by C. E. Walters, of Toledo. Mr. Walters dwelt upon the spirit of friendliness to the street and interurban railways displayed by the merchants and city authorities of Des Moines and generally throughout the State. The encouragement has resulted in the construction of more than 600 miles of street and interurban railways in Iowa at a cost of \$50,000,000.

The president, F. J. Hanlon, of Mason City, read his address summarizing the work of the association during the past year. There was nothing of vital importance arising since the last meeting to engage the attention of the officers and executive committee, but the near future promises some developments of interest to all companies in the State. The proposed uniform system of accounting, and the consideration in connection with it of provision for depreciation, were considered to be of sufficient importance to warrant the two excellent papers covering them which were included in the program. The past year has witnessed a remarkable growth in electric railway mileage and activity in spite of the financial situation. In a few years Iowa's interurban railways will rival her 9000 miles of steam railways. The people in the cities and in the country did not assume a hostile attitude and as long as the electric railways continue to show the people that they are striving for the best, they need have no fear of molestation or harassing legislation.

Mr. Stark's paper on reinforced concrete arch bridges, which is printed in another column, was illustrated by a number of photographs of typical electric railway bridges which were shown.

The morning session concluded with an informal talk by Mr. Williamson, of the Rooke Automatic Register Company, Providence, R. I., on the method of using Rooke registers on the lines of the Des Moines City Railway Company, where they have recently been introduced. He explained the construction and operation of the registers and described the manner of preparing the public and the conductors for their introduction.

A resolution was introduced and adopted unanimously by the association recommending the selection of Denver, Colo., as the next place of meeting of the American Street & Interurban Railway Association. The secretary was instructed to forward a copy of the resolution to the secretary of the national association.

The first paper read was on "Depreciation," by Daniel Royse, Chicago (*STREET RAILWAY JOURNAL*, April 25, page 687).

P. P. Crafts, Clinton, asked if the methods of fixing depreciation charges outlined in the paper were based on an average of the estimates of depreciation of each separate class of equipment.

Mr. Royse in answering described the method of arriving at the depreciated value of the property of the Chicago Railways Company prior to the drafting of the rehabilitation ordinance. Each item in the property account was appraised separately, taking the original cost as nearly as could be ascertained in each case, adding expenditures for betterments and then appraising the present value by subtracting the estimated depreciation. Continuing, he suggested that where depreciation had reached an appreciable amount it was better to begin charging off a sufficiently large percentage each year regardless of the effect on the showing of net earnings. If after this had been done there remains a deficit on the books instead of surplus, it is better frankly to acknowledge the fact and use it as an argument for increasing rates if necessary.

Mr. Crafts expressed the opinion that the common method of charging for depreciation a fixed per cent of the gross earnings was unscientific. A road having earnings of \$4,000 a mile would have just as great an annual depreciation on much of its equipment as a road having earnings of \$10,000 a mile. He believed the correct method was to charge off a percentage of the first cost of the equipment regardless of the earnings.

W. F. Raber, Ottumwa, raised the question of the need of a depreciation reserve where an adequate sinking fund is provided for the retirement at or before maturity of the bonds covering the cost of the equipment.

Mr. Royse explained that if the bonds represented the entire cost of the equipment, and the term of their redemption coincided with the estimated life of the equipment, then there was no need of a depreciation reserve provided arrangements were made to retire the bonds through a sinking fund taken from earnings. On the other hand, if the depreciation term was 15 years and the bond term 30 years, the property would be worn out before half the term of the bonds covering it had expired and a depreciation reserve would be necessary.

I. B. Smith, Cedar Rapids, related an experience with a depreciation reserve fund begun in 1895 in connection with an electric light property. It became necessary to enlarge the plant and to enlist outside capital. The bankers to whom application was made for funds were opposed to such methods of accounting and forced the company to discontinue the reserve fund as a condition of loaning the money needed. The attitude of bankers and the investing public has changed since then and at the present time they recognized the necessity of maintaining such a fund separate from maintenance charges. He favored depreciation reserves now as he did ten years ago.

L. D. Mathes favored making a provision for depreciation and had already begun to set aside annually 20 per cent of the gross earnings for a joint maintenance and depreciation fund. He believed that the time was soon coming when the street railway and lighting companies would be placed under the jurisdiction of the State railroad commission, as the interurban railways have already been, and that the commission would insist on a uniform method of accounting which should include means for pro-

viding for depreciation. He believed in publicity of public utility companies' affairs and advised that the necessary action should be taken voluntarily and not under orders of the commission.

G. B. Hippee and H. H. Polk, Des Moines, supported the views of Mr. Mathes.

Mr. Crafts opposed any generalization of the amount of depreciation charges and believed that if the commission attempted to say what an adequate depreciation percentage was it should be given as between broad limits to suit individual cases.

F. L. Diserens, Cedar Rapids, pointed out that depreciation on city lines was higher than on interurban lines on account of the greater wear and tear due to more frequent stops. He agreed with Mr. Crafts that no fixed percentage would be fair for all roads.

A committee consisting of P. P. Crafts, H. H. Polk and L. D. Mathes was appointed to draft a resolution expressing the sentiment of the association in the matter of providing for depreciation and this resolution was adopted at the executive meeting of the association on the following afternoon.

A. W. Gross, Omaha, after reading his paper on "Claims," which is printed elsewhere in this issue, introduced the subject with a few general remarks. He referred to the value of reflecting mirrors placed on the side of the front vestibule at such an angle that the motorman can see the side of the car and the rear step without leaving his position at the controller. The Omaha & Council Bluffs Street Railway, borrowing the idea from Des Moines, where they are used on all cars, has adopted them and is now equipping its open cars as well as closed cars. They prevented many accidents and were a help to the motorman in other ways. As part of his routine duties as claim agent for the Omaha & Council Bluffs Street Railway he frequently took out a car as an extra motorman in order to keep himself familiar with the actual conditions of traffic, weather and equipment under which the regular motormen had to operate. When in court with a case he was thus competent to advise the company's lawyers on operating points without calling in other employees.

Mr. Mathes asked what method he pursued in handling cases in which the company was clearly not liable, and in reply Mr. Gross said that when it was apparent that no liability existed on the part of the company the injured person was not approached in any manner for a statement or release. The reports are made out in complete detail and all the necessary evidence gathered in case a claim is made later, however.

Mr. Mathes also asked what value as evidence was attached to signed statements of witnesses taken at the time of the accident. Mr. Gross answered that they could not be submitted as direct evidence in the absence of the witness at the trial, but that they sometimes served as a basis for discrediting a witness whose testimony on the stand differs from the signed statement. He proposed as a further precaution to add on the printed forms used for taking these statements the words "I have read the above statement and it is correct" preceding the signature.

M. W. Hovey, Marshalltown, asked if crews were required to make a report of an accident under oath to prevent their changing their stories on the witness stand. Mr. Gross explained that no detail statement was required of the trainmen until a claim was presented, when a complete report was made out and sworn to before a notary by the trainmen.

FRIDAY MORNING SESSION

P. P. Crafts, Clinton, read his paper on "Handling Fares on Interurban Railways" (*STREET RAILWAY JOURNAL*, April 25, page 685).

H. H. Polk, Des Moines, opened the discussion by endorsing the duplex check system as the most satisfactory for interurban roads. His road discourages paying cash fares in cars by charging an excess fare of 10 cents if the passenger boards a car at a station where a ticket agent is on duty, which it is entitled to do under the law, being a Class B railway. He uses four forms of duplex checks, single and round trip, of two colors for northbound and southbound trips. In addition he sells mileage books and 30-ride commutation books good for points within 12 miles of Des Moines.

Mr. Crafts said the rates on the Iowa & Illinois were based on 2 cents a mile per single-trip tickets with a minimum of 10 cents. He did not believe it paid to stop an interurban car for a 5-cent passenger. Where the rate at 2 cents a mile came to odd cents the price was fixed at the nearest even 5 cents above or below except where the even figure gave a rate exceeding 2½ cents a mile, which is the maximum legal rate of fare for Class B roads in Iowa.

J. F. Porter, Davenport, asked if the same traffic could not be obtained and additional revenue derived by doing away with reduced rates for round-trip tickets and special parties. In reply Mr. Crafts said that it was necessary on most new interurban roads to induce traffic by giving reduced rates. He sold all round-trip tickets at a reduction and induced round-trip travel from country stops by giving the same reductions on cash fares paid on the train, the duplex ticket issued being good for the return trip. The minimum round-trip rate, however, was 25 cents based on a single-trip rate of 15 cents.

F. J. Hanlon, Mason City, had tried duplex checks for more than a year and had gone back to the register. He found that conductors would pick up passengers' stubs issued and thrown away and would reissue them to passengers and keep the fare paid. Most of his heavy traffic was to a park 12 miles from the city, the fare being 25 cents. Large crowds were handled in six-car trains and one conductor collected all the fares. He did not believe it was practicable on his road to charge excess fare for passengers not holding tickets. He believed that duplex checks, as a general proposition, were open to more manipulation and practice of fraud than the register. His experience had been that passengers do watch the register and he cited reports made to him by citizens who observed conductors ringing short.

Mr. Polk explained that in Des Moines no excess fare was charged passengers boarding cars at street crossings. This was done only in the smaller towns where only one stop is made. He thought it would be a difficult matter for a conductor to sort duplex checks picked up and to be able to give a passenger a check from his pad which would be properly punched.

Mr. Crafts admitted that no scheme of duplex checks had yet been devised which could not be beaten by a dishonest conductor, but he believed that by using checks of different colors for each direction and requiring conductors to turn in stubs at the end of each trip it would not be possible for a conductor to reissue his own checks thrown away by passengers.

C. D. Jones, Marshalltown, questioned the statement in Mr. Crafts' paper that passengers did not observe the register and asked on what investigation the assertion was based. In reply Mr. Crafts said that he had studied the

matter for a long time and had observed the attention of passengers to fare registration not only in small cities and on interurban roads, but in Chicago, Boston and other large cities. He had made it a point to get the experience of friends and had frequently questioned traveling men riding on the cars of his own road. Asked if he believed passengers paid any more attention to the punching of duplex checks than to ringing up fares on registers, he replied no.

J. B. Smith, Cedar Rapids, used Ohmer registers, but he did not believe they gave as complete a record of traffic between stations as the duplex check. With the demand on the part of railroad commissions for more complete and detailed traffic statistics he thought they might have to abandon registers in favor of some system which would give more complete traffic records of passenger-miles and similar data.

Mr. Mathes said that his experience had been that passengers do observe registers and he had been receiving an average of 40 to 50 reports a year of dishonest conductors, some of them anonymous. This had been the means of disclosing some important information. The railway manager in a small city has a better opportunity to keep in close personal touch with the patrons than in a large city and frequently gets information and advice of value from friends. The railway system in a small city was at a disadvantage, however, in covering up checkers and inspectors.

Mr. Polk referred to conductors carrying passengers free and referred to a case in which a good man was reported for this offense by an inspector. He admitted he had done so and explained that the passenger was an ex-employee in hard luck who had no money to pay fare. His intentions were honest, but it is essential that trainmen must understand that when they use the discretion which is tacitly conferred upon them, they should not be afraid to report to the manager. A man is not ordinarily discharged or disciplined for making mistakes in judgment.

The subject of "Advertising by Electric Railways" was selected for an informal discussion following Mr. Crafts' paper. The discussion was opened by A. W. Gross, Omaha, who described the advertising campaign conducted during the past year by the Omaha & Council Bluffs Railway Company and the results obtained. The company contracted for a large amount of space in the several papers published in the two cities in which it operates and paid cash for it. This space is used to present short talks telling how to prevent accidents. A number of well-worded advertisements were gotten up and alternated, always keeping the one idea prominent and ending with the campaign motto, "Assist us in preventing accidents." Some of these advertisements are directed to the men, telling them to instruct the women and children in their families how to get on and off the car properly. Others appeal to parents to keep their children off of the middle of the street where there are car tracks. The people have been reading them steadily and the effect is noticeable. Men read them to their families at night. They have also had an effect on the minds of juries. Some 120 jurors are drawn every three weeks in the several courts where cases affecting the company are tried and the prospective jurors, having seen and understood that the company is doing all it can to prevent accidents, are disposed to incline somewhat in its favor in the consideration of injury cases. Occasionally some of the space is used for making announcements of changes in rules or schedules affecting the public. Before the policy of advertising was inaugurated every change occasioned complaints from passengers and frequently fights with trainmen. Only

a few months ago new regulations prohibiting smoking or carrying of dogs on cars were put into effect. The change was advertised freely several days in advance and when put into effect no complaints were received or trouble experienced in enforcing the new rules.

Before adjournment Mr. Botsford, secretary of the Commercial Club of Des Moines, announced the plans now being made for conducting an electrical show in connection with the meetings of the Iowa Electrical Association and the Iowa Street & Interurban Railway Association in 1910 if they are held that year in Des Moines. A coliseum building is to be erected this year having an exhibit space 220 ft. x 100 ft. with galleries to seat 4000 people and three large meeting rooms. Space in this building for exhibits will be provided free of charge and admission to members of the associations and their guests will be free. A large number of exhibitors could be accommodated. The association approved the plan on motion and promised its co-operation and support in making it a success.

FRIDAY AFTERNOON SESSION

The paper by C. L. Wight, Des Moines, on "Interstate Commerce Commission Statistics and Accounts," which is printed in another column this week, was considered first. There was no discussion on it, but a motion was carried that the members of the association as individuals enter their formal protest against the proposed classification as requested in Circular No. 20.

The meeting then went into executive session and transacted its confidential business, including the election of officers and selection of place of meeting for next year.

The following were elected officers for the ensuing year:

President, P. P. Crafts, general manager, Iowa & Illinois Railway Company, Clinton, Ia.

Vice-president, R. A. Leussler, assistant manager, Omaha & Council Bluffs Street Railway Company, Omaha, Neb.

Secretary and treasurer, L. D. Mathes, manager, Union Electric Company, Dubuque, Ia.

The next meeting will be held at Cedar Rapids, Ia., on the third Thursday in April, 1909.

REINFORCED CONCRETE IN ELECTRIC RAILWAY CONSTRUCTION*

BY N. M. STARK

Bridges for street and interurban railways in Iowa have in the past consisted mainly of wooden trestles or steel girders or trusses. Both steel and wooden bridges, however, are lacking in two important requisites, permanence and a continuous solid roadbed. Wood decays quickly, and when used in open trestles unprotected can hardly be expected to endure for more than six or eight years. The wooden trestle may play an important part, however, in the construction of new lines to be put in operation quickly at low first cost with the intention of later replacing the trestles with more permanent structures. But such a method of construction must be dictated by great necessities, as the waste due to building with wood and later replacing with masonry far exceeds the usual return on investments in such properties.

When spans of greater length are required, steel bridges have been used, but the life of a new steel bridge on masonry, even with careful inspection, can hardly be considered to be more than 20 to 25 years, and even then with

*Paper read at the Des Moines meeting of the Iowa Street & Interurban Railway Association, April 23.

continual outlay for repairs and painting in addition to the inspection. The erection of such a bridge requires, first, the building of the masonry substructure, then purchasing the metal from the mill to be fabricated at a bridge shop and subsequently erected at the bridge site on the masonry substructure. This requires a considerable amount of time that may in some cases prove to be of great value.

Reinforced concrete bridges avoid the objections named, and, in fact, possess nearly all the qualities that are desirable in a bridge for railway traffic. Reinforced concrete bridges are absolutely permanent. Concrete is more durable than stone itself. Concrete is the best preservative that has ever been discovered for steel. A reinforced concrete bridge therefore, built of concrete with all steel reinforcement thoroughly imbedded, comes as near to being a permanent structure as it is possible to devise with materials at present known and used. In addition to this feature of lack of deterioration, this type of structure has a still more important advantage over other kinds of bridges; steel and wooden bridges grow weaker from rust and decay from the very first day of erection. Traffic on our steam railways has increased in weight so rapidly and steadily that many bridges built not more than ten years ago are now too light for traffic. Electric railways are proving no exception to this rule, and the prospects are that loading for street and interurban railways will increase even more rapidly. The day must come very quickly, then, when the bridge of decreasing strength will be overloaded by the rapidly increasing traffic and will either collapse or require strengthening or replacing. The reinforced concrete bridge, on the other hand, grows stronger with age and in a more rapidly increasing ratio than the increase of traffic, so that a bridge of this type is not only free from deterioration, but actually provides for future contingencies of travel and is therefore permanent in the highest sense.

Concrete bridges are erected with great rapidity and with minimum delays. Cement and reinforcing bars are purchasable from stock; construction can be begun therefore as quickly as the tools and men can be shipped to the location. As an illustration, we erected a 40-ft. span, reinforced concrete arch in the fall of 1907 in 12 working days and opened it for travel immediately.

If reinforced concrete bridges were built with open floor systems similar to those of steel and wooden bridges, and which are quite as feasible in the concrete bridge, the cost of such a structure would be less than that of steel of the same carrying capacity. But to build such a permanent structure as a concrete bridge with an open floor system seems hardly consistent. The concrete bridge is so readily adapted to continuous solid roadbeds and the advantage of such a roadbed is so great that a concrete bridge is rarely built in any other way. Steel and wooden bridges are readily designed with solid continuous roadways, but their use so increases the cost of inspection and repairs in addition to the increased weight of the bridge that their adoption with such structures is impracticable.

A bridge of this type ought therefore not to be compared with the more temporary structures as to first cost, because it is a much more satisfactory structure in every way and requires nothing for repairs or maintenance. In order to give some idea of cost, however, it may be said that such concrete bridges do not ordinarily run more than 10 to 20 per cent higher than steel in first cost, a difference which is far more than offset by saving in maintenance, by the advantage of solid roadbed and by speed of erection.

Wooden trestles and steel bridges are rapidly being replaced on steam railways and on the older electric lines by concrete bridges. Such reconstruction is readily accomplished without interfering with train service, as the concrete bridges can be built around the old trestle, to be cut out later, when the concrete bridge is filled and ballasted.

Concrete bridges have become so popular that their construction has been undertaken by almost every contractor that ever attempted to build a masonry substructure, although their experience in this line of work may have been extremely limited. Satisfactory bridges cannot be erected in concrete by such methods. There is perhaps no material that is more susceptible than concrete to the hand of a master workman, nor any that is more easily disfigured and defaced by the unskilled amateur. To become a skilled foreman in this line of work, it is not alone sufficient that a man should learn by costly experience at the expense of bridge after bridge, but each should learn by apprenticeship under a skilled foreman of wide experience. It is as much a business for experts as any other type of bridge erection. To assume that an engineer who has never had experience in the design of such structures will be able to design a satisfactory structure by referring to textbooks written by men who have never had experience in such lines, is to expect the impossible. And even granting that a satisfactory design is secured, to entrust the erection to a contractor who has no interest in the design save to execute it at lowest cost, is to invite disaster. The design and erection should be entrusted to men experienced in such lines who will do their work with the intention of backing it up and making right anything that may prove unsatisfactory.

A reinforced concrete bridge properly designed and properly erected is the best investment a railroad can make. It avoids accidents to trains and passengers, reduces maintenance to a minimum and adds to the beauty of a road as no other type of bridge can do. Such bridges are therefore of interest to the stockholders, a relief to the management from the president down to the section foreman and a source of pride to every one connected with the road.

In seven years past we have constructed some 75 to 100 reinforced arches and culverts of various sizes, employing various forms of reinforcement to suit the purchaser, and after extended experience, we have drawn the conclusion that what is known as the Luten system of reinforced arches offers the greatest advantage to the purchaser in economy, rapidity of construction and rational design with consequent safety. This system of construction consists of reinforcement of plain rods placed in the tensional regions of the arch. Coupled with this are numerous improvements in bridge construction, as, for example, the flood-proofing pavement laid across the bed of the stream. Another feature particularly adapted to small arches and culverts for railways, especially under heavy fills, is the horse-shoe arch, so called from the form of its end. This type of arch, instead of being provided with wings and spandrel walls, as has been the usual design of arches, has the barrel of the arch extended until it meets the plane of the side slope of earth filling. The barrel of the arch is cut to fit this slope and the sharp edge that would result is avoided by squaring the end of the arch ring, normal to the intrados or soffit of the arch. A shoulder is provided over the top of the ring to hold the toe of the earth slope.

An arch of this type can be built for about 25 per cent less first cost than the usual spandrel and wing type because of the saving in forms and materials. The centering

for the arch is extended to the ends of the excavation and the horse-shoe end trowelled to the desired surface without the expense of placing any more forms than those for the centering. An arch of this kind represents the maximum of efficiency for locations where a cheap and effective structure is desired and where considerations of appearance do not require a more handsome type.

From this type of culvert to the immense bridge built across the Maumee River, near Toledo, Ohio, last year, is a big step, yet it represents a structure which is quite as readily adapted to the Luten system. This bridge has 12 spans of 75 ft. to 90 ft. each, making a structure of 1200 ft. long. The grade of roadbed is 45 ft. above low water. The bridge is a single-track structure with 16 ft. of roadbed between copings and was built for the Lima & Toledo Traction Co. It will be open to traffic in May of this year.

These various bridges are typical of hundreds that have been erected the past seven years under this system and are now being used by electric railroads in Indiana and Ohio, where electric railroads have had their greatest development. The Indianapolis & Northwestern has over 50 arches of the horse-shoe type, in as many miles of track.

These bridges have been adopted by these lines because they represent the most efficient bridge that can be procured of these permanent types of construction. Compared with the ordinary forms of plain concrete culverts or masonry arches, these bridges represent a saving of 25 to 50 per cent. Add to this the fact that they are flood proof and practically indestructible, little more could be asked in the ideal railroad bridge.

METHODS OF HANDLING CLAIMS BY ELECTRIC RAILWAYS*

BY ARTHUR W. GROSS,

General Claim Agent Omaha & Council Bluffs Street Railway Company

There is a well-defined course for a claim agent to pursue—not only to hold settlements down to a minimum, but have a thorough and competent investigation made of every claim, and, furthermore, constant and earnest support and co-operation with the transportation or operating department to the end that every effort is put forth to prevent accidents.

The method of handling claims by the Omaha & Council Bluffs Street Railway Company begins with the occurrence of the accident. When the accident is of ordinary character, reports are made by the trainmen during that day on blanks kept at the car-house office and turned in to the car-house foreman, who forwards them to the claim department.

Vertical files are made for each set of reports, entered numerically in a record book and filed away to correspond in a cabinet holding four years' business, which is the period of the statute of limitations in Nebraska. Everything is before us at all times.

Our superintendent of transportation immediately investigates the accident from an operating standpoint for the purpose of determining whether it was caused through the carelessness of the conductor or motorman, and if so, the delinquent one is given a heart-to-heart talk. It is explained to him just where he was negligent and what the result of his negligence was, or might have been, and it is impressed upon his mind that injuring men, women and children is a serious affair.

Unless the accident is one of liability, or partially so, no investigation is carried on until a claim or demand is made. Then an investigator will interview the witnesses, obtaining written signed statements from them. He will also procure a detailed signed statement from the claimant whenever possible.

In cases of liability, such as collisions, derailments, etc., resulting in serious injury, the trainmen are required to report to the claim department. Our policy is to get in touch with the injured or members of the family. If the condition of the injured person is such as to permit of making a settlement, we attempt to do so at once, always guarding against the fact, however, of taking a release which could be attacked and invalidated on the ground of incompetency. Where it is deemed inadvisable, or a settlement cannot be effected, our efforts are directed toward keeping the lawyers out and bringing about an adjustment at the first opportune time.

One of the most successful pieces of work accomplished by us was in connection with the most unfortunate accident the company has ever had. Two cars came in head-on collision, the southbound car getting beyond control of the motorman while running down a steep grade, leaving the track and plowing through the northbound car on the parallel track, killing three persons and injuring, more or less seriously, 48 others. It required considerable time and labor to effect settlement in all of these cases, yet only one got away and into the hands of a lawyer, and that because the amount claimed was unreasonable and we were willing to risk a lawsuit.

We do not employ a regular company surgeon, but call upon various doctors when desiring examinations, thereby eliminating, to some extent, the feeling that the report or testimony is given with a view of unduly aiding or assisting the railway company. There is very little opposition to our obtaining written medical reports upon blanks furnished by us from attending physicians, paying a \$2 fee therefor.

The claims considered by all as most difficult to handle are those where reports have not been made by the trainmen, and the claim department has no record nor knowledge of the accident except as received through the claimant or his attorney. That class of cases require an endless amount of work before you get results, if at all. We attempt to locate the crew, using the time schedule of cars and such other facts as have come into our possession. In some instances we send a tracer to the car houses, setting forth the details of the accident and the crews working on certain lines. The men are required to answer "Yes or no" opposite their respective names. Occasionally we draft separate affidavits to be signed and sworn to individually. Every avenue of information is penetrated, commencing at the scene of the accident and following it to the injured person's home, throughout the neighborhood in which he lives and places frequented by him. Where the claim appears to be "plugged" or, rather, has the ear marks of fraud, we will fight to the end. I am glad to say few of these cases come under our observation.

Let me say a few words on the effort we are making toward the prevention of accidents. It means so much and the mutual benefit derived is so great, that I am firmly inclined to the belief of its being the only method through which the red-ink entries, now so glaring upon the records of a claim department, can be made a thing of the past.

That part of our anti-accident campaign which consists of talks made by the general manager or assistant general

*Abstract of paper read at the annual meeting of the Iowa Street & Interurban Railway Association, Des Moines, April 23.

manager, superintendent of transportation, assistant superintendent of transportation and myself, to the conductors and motormen of the various divisions of our system includes the following lines of appeal:

That trainmen see and know but one side of an accident.

That they do not realize that accidents carry with them a world of sorrow, grief and hardship.

That the saving of life, limb and property should be uppermost in their minds.

That they would be staggered by the enormous outlay and expense made necessary in the settlement and handling of claims.

That it is the duty of a conductor or motorman to prevent, if possible, every accident, including those resulting from the carelessness of passengers and pedestrians.

In addition to the talks to our conductors and motormen we are also taking other steps looking toward the prevention of accidents, as, for instance, publishing in the newspapers a series of talks to the public cautioning them to be careful on and about street cars; placing in all of our cars a picture illustrating the right and wrong way of getting off a car, which we had made from photographs taken from life and on which we designated the right way as "safe and graceful" and the wrong way as "dangerous and awkward."

We have also enlisted the support of the principals and teachers of schools and the probation officer and his staff in keeping boys from jumping on cars and children from playing in the streets on which there are car tracks and also enlisted the aid of the physical director of the Young Women's Christian Association in educating the young women in the proper way to get on and off cars.

Our men show a fine spirit in this educational campaign and are just as eager to prevent accidents when the matter is put before them in the proper light as we are ourselves.

INTERSTATE COMMISSION STATISTICS AND ACCOUNTS *

BY C. L. WIGHT

Auditor Interurban Railway Company, Des Moines

The present system of classification of accounts of electric railways is the result of over eleven years study by the responsible heads of the accounting departments connected with the various street and interurban railways of this country. At each annual meeting of the Accountants' Association revisions of the classification have been made after much debate, and as the result of extended correspondence its classification became the "standard" method of accounting and has been adopted by nearly all of the electric railways throughout this country and Canada. So thorough and comprehensive has this work been done, the various State railroad commissions have adopted our system of accounting for their annual reports.

At the last annual meeting of the Accountants' Association, held at Atlantic City in October, 1907, representatives of the Interstate Commission were in attendance and participated in the discussion of each item of our classification, and a tentative classification was agreed upon. This was believed to be applicable to all city street railways and the passenger and freight departments of all interurban railways, and one which it was confidently thought would be adopted by the Interstate Commission, who were to meet at a later date. On Feb. 26, 1908, we were treated to a surprise in the reception of a new tentative classification from

the Interstate Commission, which raised the number of main accounts from the original 59 to 116, together with sub-accounts and sundry clearing and adjusting accounts, and which materially differs from what has been considered the "standard," thus making comparative reports difficult, if not of doubtful value.

As this new classification was doubtless intended to cover the accounts of steam railroads as well as of city and interurban railways, express companies, etc., it follows that only such of the items that are applicable to each enterprise can be used. The commission also makes a division between large and small companies, fixing gross receipts for the small roads at \$50,000.

The subject of "Depreciation" is also under discussion—a subject of such importance that no reference is made to that account in the tentative classification, although in the Circular of Jan. 10, 1908, considerable attention is given the matter. On the first page of Circular No. 20 the commission makes it plain that an enforcement of its system of accounting is to be the only standard. It reads: "In the first instance, it should be distinctly understood that the Interstate Commission represents the interest of the States as well as its own interests. * * * There are at the present time 30 States whose laws give to State railway commissions, or other legally constituted bodies, jurisdiction over electric railways, and this circular is issued after correspondence with and approval of the representatives of the State governments." In view of such a statement, what recourse can we have from any decision the Commission may officially proclaim regarding the classification of accounts?

The conditions attending the operation of electric railway companies are so varied that it has been found impossible to make a classification entirely suitable or satisfactory to every road, and in the attempt to arrive at even a fair degree of uniformity in accounting, many concessions were made which resulted in our present classification.

The same conditions do not obtain among interurban railways, some doing a purely passenger business, others adding a package express, while others carry large quantities of local freight, and very few, excepting the Interurban Railway of this city, enter into interline passenger and freight connections with steam railroads, which necessitates largely increased expenditures in all departments. This road is therefore obliged to conform to all the established rules, methods and blanks used by the steam roads, and must conduct its accounting department exactly as they do, inasmuch as we are doing the same kind of business.

We sell passenger tickets to all parts of the country and ship car loads of merchandise or live stock to any point, making "joint rates" with connecting lines. We use their cars and they use ours, therefore items of "Demurrage," "Car Service," "Tariffs," "Absorption of Charges" and a multitude of other terms and accounts are added to the ordinary interurban system. While these are familiar to steam road accounting experts, let no one imagine that to the usual city or interurban accounting force it is an easy matter to "absorb" this sort of education.

In following the instructions of the Interstate and State commissions, the accounting department must rely largely on the superintendents and foremen for accurate reports of the labor and material used under their supervision. It therefore follows that men of experience, good judgment and fair education must be employed for such positions, with salaries to correspond.

The text allotted the writer is one which may be produc-

*Paper presented at meeting of Iowa Street & Interurban Railway Association, Des Moines, April 23-24, 1908.

tive of extended discussion. Some will believe that the proposed change in our accounting will be sure to cause confusion and increased expenditures without corresponding benefit; others will consider that the impossibility of comparative statements with former years is a vital defect.

FIRE PROTECTION DISCUSSED IN NEW ENGLAND

The regular meeting of the New England Street Railway Club was held at the American House, Boston, on April 23, with President M. C. Brush in the chair. The speaker of the evening was F. E. Cabot, supervising engineer of the Boston Board of Fire Underwriters, his subject being "Fire." Mr. Cabot pointed out that the annual fire loss in the United States since 1900 has averaged about \$200,000,000, which is the largest per capita loss in the civilized world. Possibly 87.5 per cent of these losses are spread over the entire community by insurance, but the loss is none the less real, if distributed. A large portion of this loss is surely preventable.

The main portion of the address was devoted to the consideration of fire hazards in street railway car houses, as seen from the standpoint of the insurance expert who realizes at the same time that protective measures must not interfere with the operation of the road. Most car-house fires are caused by lack of care in construction or maintenance. Mr. Cabot urged every street railway man to study more carefully the causes of even the slightest fires occurring on his cars or in his fixed property. He should know whether they are due to bad wiring in shops, running heaters on too high current, or the accumulation of loose stuff around the heaters in the cars. If a trolley connection to the motors corrodes and causes a fire it should be given as much attention as any failure in wheels or moving parts.

Car houses are now much better risks than formerly. There is a tendency to get away from the old peaked roof type of construction, which burned so well, and which was so hard to save on account of the difficulty of getting water into the building before the roof fell. Mr. Cabot emphasized the value of concrete in pit construction, but urged the closer inspection of concrete mixing, and in the house that has wooden pit floors the condition of the wooden joints in the pits is of great importance. It is very easy for a pit fire to start in the joint where the oily bottom of the pit has decayed, especially after the men have been using gasoline torches in the place.

To some extent protection and operating convenience are antagonistic, but closer co-operation on the part of the electric railway men and the insurance people will result in their meeting on a common ground. Small defects can be looked after first and gradually more complete protection can be designed without interfering seriously with the turning of cars, the operation of summer cars in and out quickly, and the general convenience of the car house service. The car house is not, in Mr. Cabot's opinion, half as hazardous as a cotton mill. He recommended the formation of a committee by the club, which should gather the results of fires and their causes for the purpose of co-operating in their reduction by the analysis of definite data.

On account of its being constructed of kiln-dried stock and highly varnished, a street car is an admirable thing with which to start a fire. Because of being boxed in it is hard to put out a fire once started in a car, but in any car house where men are on duty and have a reasonable supply of hose and buckets, there is very little reason why any fire except one occurring under extraordinary circumstances

should not be controlled. The automatic sprinkler is on the job all the time, but it must have care like any other machinery; it must be supplied with plenty of water at a sufficient pressure, and must not be allowed to get knocked out of shape or otherwise injured by trolleys or other moving parts of cars. The sprinkler pipe sometimes becomes valueless because of being burned through by a trolley contact from it to the ground. About 50 gal. of water per head per minute are needed, and a pressure of at least 25 lb. per square inch. As several heads may go off at once, it is well to allow enough capacity, say for 15 or even 20 heads in a single car house. It is not a very difficult matter to supply 750 gal. of water per minute at 25 lb. pressure, though it takes a little planning. The valve must be open, and all protective apparatus must be well maintained.

More important than any apparatus for protection is *esprit de corps* among the pit men. The car house foreman should be required to see that the men under him are as well posted on the care and operation of the fire protection apparatus as they are to maintain the rolling stock. Good feeling, system, inspection and the cordial co-operation of the car house force are absolutely essential to the best results in protection against the occurrence of fires, and their prompt suppression. It is the first few minutes after a fire begins that tell the story. Definite fixing of responsibility is important, and even though the city fire department be relied upon, it almost always happens that if three or more cars in a house become well ignited, it is impossible to save the house. Plenty of sand pails, hose and water are fundamentally necessary. Mr. Cabot cited a recent case in which a disagreement between a motorman and a pit foreman resulted in a very serious fire loss to a large company. The motorman ran into the car house with a car which was on fire from a ground or short circuit, and during the altercation which followed with the pit foreman, the fire got beyond control, and many thousands of dollars worth of rolling stock was destroyed.

In the matter of buildings it is a great mistake to assume that because a material will not burn, it is fireproof. A steel roof truss will melt and fall into the house, to the resulting destruction of the cars and complication of the water service. Plain asbestos board will absorb water, even if it will not burn, and, in connection with an electric circuit in a damp place, is a serious risk. It is not generally known that asbestos board will transmit heat one-fourth as well as iron or steel. Combustible materials properly controlled are safer than non-combustibles that are not well cared for. The modern oil switch is one of the safest devices in the field of electrical service.

A brief discussion followed the address. John Lindall, of the Boston Elevated, stated that his experience had demonstrated the value of the sprinkler if properly maintained. He cited one curious case of a car house fire which appears to have been caused by the removal of rail bonds in some track construction outside the house. The evidences were that some difference of potential existed between a steam pipe and the ground, the former having been in contact with a track spike in the house at the time when the outside return circuit was temporarily in very poor shape. The spike became red hot and charred the surrounding wood enough to produce an obscure fire that could only be put out by tearing out part of the floor. Mr. Low, of the Boston Elevated, cited a recent unexpected fire drill that was made in 25 car houses of his company's system. The officers in charge of the investigation went to all the houses without warning, in an automobile, and called upon

the foreman to muster his men and turn on water as soon as possible. In almost every case, although the water had been turned off all winter, a stream was flowing in less than 3 minutes after the gong sounded. The best record was 1 minute 20 seconds. A monthly fire drill is held in the car houses and at this time the transferway and the fire doors are all closed.

Mr. Cabot closed the discussion with the statement that wood can be charred dry enough to burn at a lower temperature than 250 deg. Fahr. He favored the use of aisle sprinklers, and discussed successful experiments made in Newark with automatics in the putting out of artificially started car body fires. If it cost an average of \$7 per hundred square feet of car house area to protect the cars, and if only 15 sprinklers are required to save a car worth, say, \$7,000, it would seem as though the balance were in favor of the sprinkler. Incidentally, it is usually the case that the cost of sprinklers is saved in eight or ten years by the reduction of insurance premiums, but that is a narrow view of the matter. A standpipe represents something of an investment, but it may save 50 cars worth \$350,000 some morning or night when the traffic demands of the next day are anticipated to be unusually heavy. Every man on a road, from the executive officer down, should know something about fire protection in his department. It is far better when a fire starts inside a car house for the men on hand to devote all their energies to control and extinguish it than to attempt to save a few cars by pulling them out of the house. Wired glass monitors may be helpful in reducing accident claims, but they seriously interfere with the proper performance of aisle sprinklers. The dry pipe system, in which the water is not kept in the pipes all the time on account of cold weather, has given very good results, and the losses on this class of risk have been only a few cents more than on car houses and other insured buildings equipped with the wet pipe system.

CENTRAL ELECTRIC RAILWAY ASSOCIATION CONSIDERS STANDARD CLASSIFICATION

Upon call of President F. D. Carpenter, of the Central Electric Railway Association, and Chairman M. W. Glover, of the Central Electric Accounting Conference, the representatives of 21 electric railway companies of the Central States met at Lima, Ohio, April 23, to consider the tentative classifications of accounts for electric railways contained in circular No. 20, accounting series, issued by the Interstate Commerce Commission. The companies represented were:

Cleveland, Southwestern & Columbus Railway Company.
 Columbus, Delaware & Marion Railway Company.
 Dayton & Troy Electric Railway Company.
 Detroit, Jackson & Chicago Railway Company.
 Detroit United Railway Company.
 Fort Wayne & Springfield Railway Company.
 Indiana Union Traction Company.
 Indianapolis, Columbus & Southern Railway Company.
 Indianapolis & Louisville Traction Company.
 Lake Shore Electric Railway Company.
 Lebanon & Franklin Traction Company.
 Lorain Street Railroad Company.
 Mahoning & Shenango Railway & Light Company.
 Marion, Bluffton & Eastern Traction Company.
 Ohio Electric Railway Company.
 Scioto Valley Traction Company.
 Tiffin, Fostoria & Eastern Railway Company.
 Toledo & Chicago Interurban Railway Company.
 Toledo Railways & Light Company.
 Toledo Urban & Interurban Railway Company.
 Western Ohio Railway Company.

Among the other remarks W. H. Forse, Jr., secretary and treasurer of the Indiana Union Traction Company, said that he had made an effort to divide the 1907 operating expense of the company with which he is connected into the 116 primary accounts provided in the classification of the Interstate Commission. He had found, however, that of the total number of accounts he was able to use only 72. Of the total amount distributed between the 72 accounts, 89.2 per cent was charged to 26 accounts, 5.5 per cent to 9 accounts and 5.3 per cent to 37 accounts. Stating the result in another way, 94.7 per cent of the total was confined to 35 accounts. Charges to some accounts were as small as one ten-thousandth of 1 per cent.

Mr. Glover then made the following statement:

Circular No. 20 states that it should be distinctly understood that the Interstate Commerce Commission represents the interests of the States as well as its own interests in the effort to develop a uniform system of accounts for electric lines, and goes on to say that, at the present time, 30 States give jurisdiction over electric railways to their State railway commissions and intimates that the classification adopted by the Interstate Commission for electric railways will be adopted by the State commissions throughout the country. While a number of electric railways in this territory may not now be subject to the supervision of the Interstate Commission, if the classification under discussion is adopted by the State railroad commissions of the central States, every line will become vitally interested in and will be required to use the classification.

The American Street and Interurban Railway Association, recognizing the importance of a full discussion of Circular No. 20, has issued several circulars urging electric railways to comply with the request of the commission to consider carefully the tentative classification submitted, making criticisms and suggestions which in their opinion might bring the classification into a more satisfactory form. It is, therefore, appropriate for the electric railways of the Central States to criticize the proposed classification in the hope that by united action of the lines in this territory, which are more fully developed than the lines in any other portion of the United States, we may succeed in obtaining certain modifications which are most desirable, if not absolutely necessary, to secure a classification which can be used and which will be of service to the Interstate Commission, the State railway commissions and the owners of the properties.

With reference to the claim of certain lines lying wholly within a single state, concerning the jurisdiction of the Interstate Commission, I quote as follows from a communication of James S. Harlan, commissioner of the Interstate Commission:

"Regardless of the physical location of either electric or steam railroads and whether their lines begin and end in the same state or not, if either is engaged in the transportation of property from a point in one state to a point in another, wholly by rail or in connection with a water carrier under some arrangement for a continuous movement, the act (interstate commerce act) applies in all its phases."

Therefore, whether or not this classification is adopted by the various state commissions, a large number of electric railways will be subject to the supervision of the Interstate Commission and we should endeavor to have this supervision exercised in such a manner as to produce the best results for the owners of our properties, as well as for the Interstate Commission.

The *Electric Railway Review* of April 11 contains a communication from the Michigan Railroad Commission, declining to adopt the proposed classification, and its issue of April 18 contains a communication from the New Hampshire Railroad Commission stating that the assistance of the Interstate Commission is not needed in handling the accounts of electric railways in New Hampshire. Both of these commissions previously intimated to the Interstate Commission, in reply to a communication on the subject dated Nov. 13, 1907, that they would cooperate with the Interstate Commission; the New Hampshire Commission then stated that it would adopt the system of accounts used by adjoining states and the Interstate Commission; but evidently after examining the proposed classification both of these commissions have realized that the classification is entirely unsuited to the needs of electric railways and are not willing to adopt it in its present form. It therefore appears that if

the proper objections are presented to the Interstate Commission it will be willing to modify the classification and it may be possible for us to obtain a classification which will be satisfactory to all electric railway lines.

In connection with the task undertaken by the Interstate Commission to supervise the accounts of railway properties, both steam and electric, Prof. Adams makes the following statement:

"The Interstate Commerce Law always had in it a phrase giving to the Interstate Commerce Commission the right, within its discretion, of prescribing a uniform system of accounts, but it was not until the act which went into force in August, 1906, that the commission was clothed with any effective power to exercise that right. It is upon this amended act that the new activity of the government, referred to, is based."

Prof. Adams, discussing certain principles in formulating the system of accounts and indicating the results which are to be obtained and which are expected to show in sufficient detail the actual financial standing of the properties and furnish a true statement of their value, says:

"Such a general statement will show the significance and importance of this part of the accounting scheme, and will, I am sure, emphasize * * * that control over accounting does in fact permit the government to exercise a certain degree of supervision over the management of railway property. Of course, the accounts themselves would be of little use were it not for the fact that the law also provides for examiners whose duty it shall be to examine the accounts of the carriers and determine whether or not the prescribed rules of accounting are followed."

From this you will understand that the accounts of electric railways will be examined from time to time by representatives of the Interstate Commission and every requirement of the commission will have to be carried out regardless of the expense involved.

No criticism can be made of the general principles laid down by the Interstate Commission regarding the desirability of a uniform system of accounts for electric railway lines. The fact that the electric lines of the country have no classification of operating expenses now in use by all lines shows the desirability of obtaining such a classification as will meet the requirements of lines both large and small. While the classification proposed by the American Street and Interurban Railway Accountants' Association has been adopted in part by a number of lines, my experience has proved that this classification is not adapted entirely to the needs of interurban lines, and certain modifications have been made in the past to enable interurban lines to use, so far as possible, the classification proposed by the association and to bring into the classification certain other items which were not contained in it originally. The revised classification adopted by the Atlantic City convention in October, 1907, is more satisfactory than the original classification which has been in use since 1903 and, while there are certain objections to the classification adopted at Atlantic City, it must be admitted that it is far better and more satisfactory to the majority of electric railway lines than the classification proposed by the Interstate Commission; in fact, there are certain features of the proposed classification covered by Circular No. 20 which, in my opinion, are impossible to carry out, and I feel satisfied that the commission will listen to any criticisms of the classification which may be presented and will be found willing to meet the views of electric railway lines whenever possible to do so.

It is hoped that all present realize the importance of this matter and that some action will be taken by the lines represented to present objections to the Interstate Commission which will result in a simpler and more satisfactory classification of accounts than that proposed by Circular No. 20.

After further discussion of the subject the roads in attendance decided to adopt for a reply to the Commission a letter prepared by its committee and already approved at a meeting of a number of the principal Indiana roads at a meeting held in Indianapolis April 14. The committee consisted of the following: W. H. Forse, jr., chairman; M. W. Glover, Jos. A. McGowan. This letter, which was sent to Professor Adams under date of May 1, follows:

May 1, 1908.

DEAR SIR:—

Referring to Accounting Series Circular No. 20 of the Inter-

state Commerce Commission, Division of Statistics and Accounts, issued at Washington, D. C., Jan. 10, 1908:

Complying with the clause of above mentioned circular which reads as follows:

"You are therefore requested to consider the tentative classifications herewith submitted, to put this office in possession of any criticisms upon its present form, and to submit any suggestions which in your opinion will bring the classifications into a more satisfactory form."

We beg to submit the following:

The five General Accounts (of Operating Expenses), with the exception of "III—Traffic Expenses," are practically the same as have been used by the electric railways of the country for the past fifteen or twenty years, and no criticisms can be made of these. It is in the subdivision of these five General Accounts into 116 primary accounts, which are proposed for the larger electric railway lines as stated in the Tentative Classification found on pages 11, 12 and 13 of Circular No. 20, that we desire to respectfully submit our most serious and earnest objections.

While the tentative classification submitted for small railways names but 22 primary accounts, the circular states that the small lines are to follow the text descriptive of the primary accounts provided for the larger lines. The small lines would, therefore, find little relief in the use of a restricted number of accounts, from the fact that the same departmental separation of charges and other objectionable features shown so clearly in the titles of the 116 accounts would be contained in the text of the 22 accounts.

In the first place, we doubt the wisdom or practicability of prescribing the same method of accounting for steam railways, electric railways, express companies, sleeping car companies, carriers by water and pipe lines. Outside the fact that all are transportation agencies, they differ in nearly every other respect. There can certainly be nothing in common between the fundamental accounts, for example, of electric railways and pipe lines or steamboat companies, and a general system of classification of accounts which attempts to include all of these classes of companies must necessarily be unsuitable and most unsatisfactory to all.

Those who are most directly concerned in securing accurate and comprehensive details of receipts and operating expenses have, for many years past, employed the best accountants procurable, whose experience embraces years of practical accounting both with steam and electric railways, to so classify the operating expenses of electric railways as to clearly show all the necessary and important divisions of expenditures, and thus enable the owners, operators and investors—who certainly are most vitally interested—to gain a minute and comprehensive knowledge of their properties and at the same time be in a position to supply such information to the public or federal and state authorities.

For over ten years past the electric railways of this country have been working with thirty-eight (38) accounts, which in the main have served all purposes and have stood the test of time and actual needs. This classification has been adopted by a number of States as the standard form of accounts to be used by electric railways. To provide, however, for some new features of operation, such as the Traffic Department and the operation of interurban lines, the electric railways have used some additional accounts. These accounts are all embraced in the Tentative Classification of Operating Expenses which was prepared by the American Street and Interurban Railway Accountants' Association at the solicitation of the Interstate Commerce Commission and adopted by the association at its convention held at Atlantic City, N. J., on Oct. 15, 16 and 17, 1907. This classification comprises fifty (50) accounts, which, in our opinion, ought to be the maximum number.

In all systems of scientific accounting there is recognized a final point of utility beyond which fine calculations, subtle distinctions and immaterial divisions are regarded as of no practical benefit, and as mere mathematical gymnastics. Such minutiae might be considered indifferently were it not that their compilation involves much extra time, labor and expense.

Applying this principle to many of the proposed accounts in Circular No. 20, we feel certain that our present force of clerks is wholly inadequate and would have to be greatly augmented in order to fulfill the requirements. To impose such a burden upon the electric railways would work a great hardship to which we feel they should not be subjected, unless the present system were inadequate or additional information could be secured

thereby, which is not true in the present case; and if the proposed classification as given in Circular No. 20 were adopted, many of the accounts would represent at best a compilation of guesses.

To enumerate some of the many objectionable features in the classification printed in Circular No. 20, we might cite the Joint Facilities Accounts, the Separation of the Cost of Electric Current used for various purposes; Maintenance of Electrical Equipment of Cars; the many sub-divisions of Damage to Property, and Injury to Persons; the sub-division of Insurance, Printing and Stationery, Clearing Accounts, etc., etc. As a specific example of how one of the accounts proposed would work out in practice, which would also be true of a great many of the accounts proposed in Accounting Series Circular No. 20—the salary of a man whose authority would extend over Maintenance of Way, Maintenance of Equipment, Power Plant and Car Operation, such as Division Superintendent or Division Manager, in many instances would not exceed \$75.00 per month. Under the proposed classification, the salary of this man would be divided between Accounts 14, 15, 24, 32, 63 and possibly 70 and 88, and perhaps some other accounts. The division of this would be merely guesswork, which is entirely unsatisfactory for statistical purposes. If a man were supposed actually to keep a record of how much time was to be charged each account, it would be necessary to furnish a timekeeper to go along with him and keep the record.

The objections referred to in this letter are more fully set out in Exhibits "A" and "B" hereto attached.

EXHIBIT "A"

Tentative Classification of Operating Expenses of Electric Railways

DAMAGES:

- 15—Other Maintenance of Way Expenses.
- 24—Miscellaneous Electric Line Expenses.
- 32—Miscellaneous Buildings and Structures Expenses.
- 42—Injuries to Persons (Availability Maintenance).
- 63—Other Equipment Expenditures.
- 101—Loss and Damage (to Merchandise in Transit).
- 102—Damages to Property (Transportation).
- 103—Injuries to Persons (Transportation).

There is no objection to having one account for loss and damage to freight and other merchandise intrusted for transportation (Account No. 101) and another account for injuries to persons and property. We do not think it practicable, however, to attempt a separation of Damage to Property and Injuries to Persons. For example, if a vehicle and driver were struck by a car, an arbitrary settlement might be made or one verdict be rendered covering the total amount to be paid for injuries to the driver and damages to the property. It would be impossible to state with accuracy the proportions of the total payment allotted for injuries to the person and damage to property, respectively.

Neither is it always possible to determine how the payments of claims should be classified. Two cases which occurred in Indiana will illustrate the point. A sectionman while engaged in track maintenance stood too close to a passing passenger car and was struck and injured. A sectionman while on a hand-car was overtaken by a passenger car, a collision occurred and the sectionman and the motorman were injured.

The expense in connection with the settlement of all damage claims should be included in one account. Even if it were possible to class the actual payment of every claim, the expense bears no proper relation to the amount of the claim. It sometimes costs less to settle a very large claim than one which is small and of doubtful legality. If an attempt were made to calculate the expense of every separate case, the result would be valueless and it could not possibly be accurate.

STATIONERY AND PRINTING:

- 15—Other Maintenance of Way Expenses.
- 24—Miscellaneous Electric Line Expenses.
- 32—Miscellaneous Buildings and Structures Expenses.
- 63—Other Equipment Expenditures.
- 72—Traffic Supplies and Expenses.
- 91—Stationery and Printing (Transportation).
- 113—Stationery and Printing (General).

A large percentage of the expense for printing and stationery is incurred in connection with car service, for tickets, transfers and station supplies, and the balance can rightly be put under General Expenses. We therefore recommend two accounts, as follows:

- Printing and Stationery—Transportation.
- Printing and Stationery—General.
- To attempt to sub-divide the expenses for printing and sta-

tionery outside transportation, other than placing it in General Expenses, would be wholly guess work and of no practical good whatever.

INSURANCE:

- 15—Other Maintenance of Way Expenses.
- 24—Miscellaneous Electric Line Expenses.
- 32—Miscellaneous Buildings and Structures Expenses.
- 63—Other Equipment Expenditures.
- 100—Insurance (Transportation).
- 110—Insurance (General).

This is another item of expense that should not be departmentalized. Insurance is one of the general expenses of administration and as such should be contained in one primary account under General Expenses. It is most essential, in the monthly reports to owners and operators of Electric Railways, that Insurance be shown as one amount instead of being lost under the title of "Miscellaneous."

MAINTENANCE OF ELECTRIC LINE:

- Transmission Lines—
 - 17—High Tension Transmission Lines.
- Distribution System—
 - 18—Overhead Feeders.
 - 19—Underground Feeders.
 - 20—Track Bonding.
- Conductors—
 - 21—Overhead Trolley Lines.
 - 22—Third-rail Conductors.
 - 23—Underground Conductor Rails.
 - 24—Miscellaneous Electric Line Expenses.

The separation of line maintenance expenses, if carried too far, would impair the value of the resulting statistics, and we therefore recommend that but four primary accounts be used instead of the eight that are named. The accounts recommended, which would suffice for the largest lines, are as follows:

- High-tension Transmission.
- Low-tension Transmission.
- Track Bonding.
- Miscellaneous Electric Line Expenses.

MAINTENANCE OF SERVICE EQUIPMENT—(Maintenance of Way and Structures):

- 34—Snow Equipment.
- 35—Work Cars.
- 36—Electric Locomotives (Utility).
- 37—Miscellaneous Service Equipment.

MAINTENANCE OF REVENUE EQUIPMENT—(Maintenance of Equipment):

- 47—Passenger Cars—Repairs.
- 48—Combination Cars—Repairs.
- 49—Express Cars—Repairs.
- 50—Mail Cars—Repairs.
- 51—Freight Cars—Repairs.
- 52—Locomotives—Repairs.

It is quite important to consider as one item of operation, the cost of maintaining all classes of equipment. The accounts covering maintenance of service equipment should by all means be grouped under Maintenance of Equipment rather than Maintenance of Way and Structures.

Work equipment is frequently converted into snow equipment by attaching a snow plow, and there is no need of separating these classes of (work and snow) equipment.

The classification provides separate accounts for the maintenance of passenger, combination, freight, mail and express cars. It is not stated, however, for electric railways, what distinction shall be made between Express and Freight Cars, these terms being used synonymously in actual operation. A combination car is described as a passenger and baggage car. Some electric railways carry baggage in separate compartments, while others carry it in the smoker or other passenger compartment. The various classes of equipment should be divided into not more than three accounts, under the primary account Maintenance of Equipment, viz.:

- Maintenance of Passenger and Combination Cars.
- Maintenance of Freight, Express and Mail Cars.
- Maintenance of Service Equipment.

MAINTENANCE OF ELECTRIC EQUIPMENT OF REVENUE EQUIPMENT:

- 53—Electric Equipment of Passenger Cars—Repairs.
- 54—Electric Equipment of Combination Cars—Repairs.
- 55—Electric Equipment of Express Cars—Repairs.
- 56—Electric Equipment of Mail Cars—Repairs.
- 57—Electric Equipment of Freight Cars—Repairs.
- 58—Electric Equipment of Locomotives—Repairs.

Five accounts are provided for the maintenance of electric equipment of revenue cars (in addition to electric equipment of locomotives).

It has been found impracticable, in past years, to separate the cost of maintaining the electric equipment of the various types of cars, owing to the fact that the same motors are used alternately under different bodies. Electric railways do not usually have enough motors to equip all of the car bodies. Motors that are used under closed bodies and snow equipment in winter are quite frequently used under work and open passenger cars in summer and under freight cars when traffic demands it. These changes are made with considerable frequency and the identity of the individual motor is entirely lost. Accurate statistics would not be secured if this separation were made, and it is recommended that but one account be used, entitled Maintenance of Electric Equipment of Cars.

AVAILABILITY MAINTENANCE EXPENSES:

(Group "E"—Maintenance of Way and Structures).

- 39—Care of Track
- 40—Removal of Snow, Sand and Ice.
- 41—Cleaning, Sprinkling and Oiling Roadbed.
- 42—Injuries to Persons.
- 43—Other Miscellaneous Maintenance Expenses.

A new group of accounts that has not been applied to the Steam Railways is group "E"—Availability Maintenance Expenses. It is probable that one idea which the commission had in mind in submitting this group of accounts, is to separate the amount expended for maintaining, and the amount expended for making the track available for operation. It would be quite a hardship to try to keep such expenses separately. The text contains many fine shadings. For example, if a sectionman inspects the track and tightens a bolt, which needs it, the cost of inspecting is to be charged to Account No. 39, and of tightening bolts to Account No. 8. In steam railway classification these are both contained in one primary account, namely, "Roadway and Track." Items that are so similar and so closely related should be included, for the purpose of securing accuracy, in one account. No good could possibly result in making a theoretical separation which can not naturally be made, and we recommend that these accounts be merged into the other accounts grouped under Maintenance of Way and Structures, and elsewhere.

JOINT FACILITIES:

- 45—Maintaining Joint Tracks, Yards and Other Facilities—Dr.
- 46—Maintaining Joint Tracks, Yards and Other Facilities—Cr.
- 66—Maintaining Joint Equipment—Dr.
- 67—Maintaining Joint Equipment—Cr.
- 104—Operating Joint Tracks, Yards and Other Facilities—Dr.
- 105—Operating Joint Tracks, Yards and Other Facilities—Cr.
- 115—General Administration Joint Tracks, Yards and Other Facilities—Dr.
- 116—General Administration Joint Tracks, Yards and Other Facilities—Cr.

The principle involved in the use of these accounts would cause much inaccuracy because of the conditions that are prevalent in actual operation. For example, we will say that a terminal-owning carrier charges each of the companies using its terminal tracks and station a rental of 2 cents per passenger carried. The cost of maintaining the joint facilities will vary somewhat with the volume of traffic, but not entirely so, for if a few more or less passengers are carried, the greater or less amount of wear and tear (or power required) will hardly be noticeable. It will, therefore, be necessary to estimate the amount of additional expense incurred by reason of the use of terminal facilities by other carriers and these estimates will result in anything but scientific accounting. If the terminal-owning carrier is not under the jurisdiction of the Interstate Commerce Commission (or a state commission using this system of accounting) the interstate carriers using its tracks cannot compel the terminal-owning carrier to give access to its books or aid in making estimates of the cost of maintaining, operating and administering the joint facilities in order to determine the amount that shall be charged in the lessee's operating expenses. These items will then be the result of guesses and thus be even less accurate than estimates.

As an example of the insurmountable obstacles that would be met with in compiling this class of statistics, we will cite the conditions as they actually exist in the city of Indianapolis, Ind.

There are twelve interurban electric railway lines entering the city of Indianapolis, all over the tracks of the Indianapolis Traction and Terminal Company—a local street railway. The cars of these various interurban lines come from all directions, but use only certain streets or portions of streets of the local company. In some instances the cars of two or more companies run over the same street, although the cars of the different

companies differ both as between companies and cars of the same company, in weight, types of motor, etc., and consume more or less power and cause a greater or less expense for cost of maintenance of track, electric line, etc. The city cars of the local company, which also differ as between themselves in the respects named, make use of the same tracks. At certain approaches to the Terminal Station in Indianapolis, the cars may enter the Station on different tracks from day to day. Each interurban line pays to the Traction and Terminal Company 3 cents per passenger for use of its tracks and 1 cent per passenger for use of Terminal Station. The question is, on what basis are the fixed charges and the different maintenance charges to be computed? No accurate figures could be obtained by taking the number of passengers hauled as they vary continually, and as the size and type of car differ, it could only be a mere guess to take the track miles or car miles as a basis. The giving of this information, even if estimated, by the Indianapolis Traction and Terminal Company to the interurban lines would be purely optional on its part and the interurban lines would have to accept its figures, if so given.

POWER TRANSFERRED—CR.—ACCOUNT No. 80:

An account new to Railway Operation is No. 80, "Power Transferred." This provides that the cost of electric current or steam when used for other purposes than the propulsion, lighting and heating of cars operated for revenue shall be charged to the accounts benefitted by the service and credited to this account. Thus, if stations are lighted by electric current, shops heated with steam, work and line cars heated by electric current, or machinery driven by power house steam, this power must all be measured and the cost determined. Even if it were practicable to have meters to measure this current there would be wide variations in methods used in compiling statistics, caused by the fact that transmission losses and the drop of voltage vary to such an extent as to require a great deal of estimating.

Suppose, as is frequently the case, that lathes, planers, drills and other shop machines are belted to a line shaft which is rotated by a steam engine driven with power-house steam. At various times during the day, different machines are turning axles and wheels, finishing trolley wheels and bushings, and doing general repair work on track and line material and power-house equipment. This is but one example of many that might be used to show the fallacy of using such an account as "Power Transferred." Statistics that were a compilation of guesses would be valueless, and these costs could not be secured except by using some theoretical bases from which to make guesses by the "rule of thumb."

COST OF ELECTRIC CURRENT USED FOR LIGHTING:

- 95—Car Supplies and Expenses.

The "Cost of Electric Current Used for Lighting Passenger and Other Cars" is provided for in account No. 95. Most of the text of this account, like others, is copied from the steam road classification which provides that the cost of lighting cars shall be included in account "Car Supplies and Expenses." In the operation of street railway and interurban lines the usual method followed is to have one central power station from which power is transmitted over considerable distance—in many cases from 100 to 150 miles. This current is usually transformed, at substations located several miles apart, into direct current and is used primarily for supplying power to the motors for propelling the cars; but it is also used for furnishing current for the lighting of cars and likewise for operating the motor of the air-compressor for furnishing air to the air brakes. The current is also used, in many instances, for heating the cars. It would be wholly impracticable to attempt to separate the power for lighting, for the propulsion of the cars, for operation of the air brakes, and for heating. To make such a division it would be necessary to have meters in the cars to measure the current consumed for lighting, heating, air brakes and the propelling motors. At the present time meters have not been so perfected as to stand in actual daily practice the jolts and jars which would be incident to the operation of the cars and the readings would thus be absolutely unreliable.

COST OF ELECTRIC CURRENT USED FOR POWER:

- 8—Roadway and Track.
- 10—Bridges, Trestles and Culverts.
- 14—Telegraph and Telephone Lines.
- 40—Removal of Snow, Sand and Ice.
- 92—Clearing Wrecks.

Accounts Nos. 8, 10, 14, 40 and 92 provide that the cost of power consumed by cars in maintaining track, roadway, trestles,

culverts, telephone and telegraph lines, in the removal of snow and ice and clearing wrecks, shall be pro-rated among the various accounts. This is no doubt suggested by the fact that the steam road text for these accounts is copied almost verbatim, and the addition "Cost of Power," inserted in each. Including such accounts in an electric railway classification is probably due to the fact that the fuel used in operating steam locomotives for the various kinds of work is thus pro-rated. Conditions, however, on electric railways are entirely different, as recited in our objections under (Cost of Electric Current Used for Lighting) Account No. 95. It is evident that very slight consideration has been given to actual electric railway operation, for no mention is made in this way of current consumed by cars used in line maintenance, sprinkling and oiling.

CLEARING ACCOUNTS:

- Shop Expenses.
- Store Expenses.
- Stable Expenses.
- Work Equipment—Operation.
- Insurance.
- Injuries to Persons.

These accounts illustrate quite forcibly the extent to which statistical tabulations may be carried, the very slight advantage to be gained by their use, and the vast amount of additional work required by any theoretical plan of accounting which departmentalizes and separates into minute portions, the statements of results expressed in figures. A concrete example will illustrate. The joint expenses of purchasing and of operating storerooms on an electric line will ordinarily not exceed one-half of 1 per cent of the operating expenses. If clearing accounts were used, this one-half of 1 per cent would be carried into the account Store Expenses. At the end of each month or year the accountant must apportion to each account charged with material issued, a percentage of the one-half of 1 per cent that is just and equitable in view of the services rendered by the storekeeper and his staff. But that is not all. The percentage of this one-half of 1 per centum that is represented by the purchasing agent's salary and expenses must be separated from the other portion of the expense, and each account that has received the benefit of the purchasing department's services must be allotted its portion of the expenses, with due regard, however, to the material that was not purchased by the purchasing department but ordered in an emergency by some other department.

Such a system of accounting would involve a great amount of estimating and would be very expensive in its operation. The clearing accounts should all be eliminated, in our estimation.

OUTSIDE OPERATIONS:

- 44—Other than Railway Operations—Cr. (Maint. Way and Structures).
- 65—Other than Railway Operations—Cr. (Maint. Equipment).
- 81—Other than Railway Operations—Cr. (Transportation).

This classification introduces a set of accounts new to railway operation, namely, Credits for "Outside Operations." We are not provided with a classification of Electric Railway Revenue and cannot predict what will be considered an "Outside Operation" for Electric Railways, by the commission. The principle of the Outside Operations accounts is, that Operating Expenses shall be credited with the exact cost of products sold and the difference between that cost and the amount received shall be credited to income account. This system of accounting has not heretofore been closely followed by railways, probably for the very good reason that it is so impracticable in operation, although theoretically a good arrangement. The scheme provides, for example, that if power is used for lighting a park, the Outside Operation (park) is to be charged with the cost of the current used. It is not stated whether cost is to include a portion of the expenses of railway administration as well as Power Plant expenses, but in a general way it is stated that the cost is "Cost of Production." This item will be quite important to those companies conducting a General Lighting business, especially if it is decided that the sale of power for various purposes is to be considered an Outside Operation.

It is generally understood that it is impracticable to attempt a separation of some features of railway operation, between the part used in transportation and the part used for other purposes. Thus, in steam railway practice, it has not been found practicable to endeavor to separate the expenses of the electric telegraph used by the carrier for transmitting its own messages from the expenses of the same lines used in trans-

mitting commercial messages for the public (see steam classification of Operating Revenue, first issue, page 15).

This principle applies with particular force to electric current as used in railway operation—when the difficulty of measuring and of accounting for the leaks and losses of current are considered it will readily be conceded that the separation cannot be made without guessing and estimating.

EXPRESS SERVICE—ACCOUNT No. 98.

This account includes the wages of motormen and messengers in express service. This seems to be a duplication, as accounts Nos. 85 and 87 include wages of motormen and other trainmen in express service. Another item that should not be included in this account is wages of warehousemen. In the majority of cases when express is handled by an electric railway, the stations where express matter is handled are the same as used for freight and passenger business, and it would hardly be possible to show separately the pay of "warehousemen," any more than other items of expense incurred in connection with the station as a whole.

EXHIBIT "B"

Tentative Classification of Expenditures for Road and Equipment of Electric Railways

The general criticism of the classification of Operating Expenses applies with equal force to the Tentative Classification of Expenditures for Road and Equipment of Electric Railways, namely, the superabundance of accounts and the too minute separation of charges.

Account No. 61 is followed by a note stating that "Discounts on securities issued for construction purposes or to raise funds for construction should not be charged to this account or considered as a proper charge against construction."

This is such a departure from the practice of past years that it deserves special consideration. It has heretofore been considered that discount on securities issued for construction purposes or to raise funds for construction are a part of the cost of financing and constructing the property. Discount is somewhat analogous to the interest accruing on the securities during the construction period, this being an item of construction cost.

The Classification of Construction and Equipment Accounts adopted by the Street Railway Accountants' Association of America has been found practicable in operation and its further use is recommended. It is composed of the following fifteen accounts:

- A—Organization.
- B—Engineering and Superintendence.
- C—Right of Way.
- D—Track and Roadway.
- E—Electric Line.
- F—Real Estate used in Operation of Road.
- G—Buildings and Fixtures used in Operation of Road.
- H—Investment Real Estate.
- I—Power Plant Equipment.
- J—Shop Tools and Machinery.
- K—Cars.
- L—Electric Equipment of Cars.
- M—Miscellaneous Equipment.
- N—Interest and Discount.
- O—Miscellaneous.

Some interesting facts are given in the *Chicago Tribune* by the representative of that paper, who recently made the trip from New York to Chicago by trolley. In all he traveled a distance of 1278 miles, 936 of which were covered on the trolley and 339 on the steam roads. The time spent on the trolley was 42 hours and that on the steam cars 10½ hours. The cost in fares was \$23.55, of which \$15.20 was paid to the electric railways and \$8.35 to the steam roads. The average rate on the electric lines was 1.6 cents per mile; that on the steam lines 2.4 cents per mile. The longest unbroken run by trolley was from Lafayette, Ind., to Westfield, N. Y., a distance of 595 miles. Strangely enough, the longest steam runs were made getting out of Chicago and into New York. The former was 74 miles and the latter about 89 miles. There are only two breaks in the line between Chicago and Buffalo, but there are four between Buffalo and New York.

MEETINGS OF THE FORT WAYNE & WABASH VALLEY TRACTION COMPANY'S MAINTENANCE OF WAY DEPARTMENT

In his article in the April 4 issue of this paper on "The Proper Construction and Maintenance of Tracks in Electric Railway Service," H. L. Weber, chief engineer of the Fort Wayne & Wabash Valley Traction Company, briefly referred to the weekly meetings of the trackmen on this system for the discussion of topics relating to their work. As these gatherings have proved very successful in maintaining harmonious relations and educating the men, the following particulars concerning them may prove to contain some useful hints for other companies.

The employees of the Maintenance of Way Department have been organized and divided into three sections, namely: The Fort Wayne division, comprising all the employees at Fort Wayne, on the Bluffton Line and as far west on the Fort Wayne-Logansport division as La Gro; Logansport division, comprising employees from Wabash west as far as Rockfield, and the Lafayette division, comprising employees from Rockfield on west to and including Lafayette. The Fort Wayne division meets every Tuesday evening at the chief engineer's office, Mr. Weber presiding and Mr. Johnston, his clerk, acting as secretary. The Logansport division meets every other week on Wednesday evening and the Lafayette division every other week on Thursday evening. By this arrangement the meetings do not conflict, and anyone from another division can attend the gatherings if he desires to do so. About every four to six weeks there is a general meeting at Fort Wayne which every section foreman on the entire system is expected to attend if possible.

At these meetings it is customary not only to discuss subjects of interest pertaining to the work, but also to consider the wants of any particular foreman and see that they are satisfied. For this year there has been outlined the following course of "Topic Talks," by the general manager, heads of departments, section foremen and other employees of the company.

TOPIC TALKS FOR MAINTENANCE OF WAY MEETINGS ON TUESDAY EVENINGS, 1908.

- Nov. 3 The Pulse of the Wabash, Robert Evans, section foreman.
10 How Best to Keep Our Switches from Freezing, Jerry Foley, section foreman.
17 Cleaning Up the Right of Way, Delbert Welch, section foreman.
24 How to Exterminate Weeds, Ed. Breeding, section foreman.
- Dec. 1 How to Handle a Snowstorm, John Betts, gang boss.
8 Little Scraps of Copper, Henry Flutter.
15 Our Hand Cars, Chas. Griffith, section foreman.
22 Our Track Tools, O. S. Heminger, section foreman.
29 Our Observations in Regard to Rail Bonds, Messrs. Haas and Keil, bonders.
- A talk by the general manager or head of department is always the occasion for a general meeting, which is held in the chief engineer's office. Each meeting is presided over by a chairman and a secretary, who keeps a typewritten record of all minutes, one copy of which is sent to the general manager, one copy placed on file and one copy sent to each of the chairmen of the other divisions. Thus the general manager, chief engineer and foremen are kept in close touch with all the track work being done throughout the system.
- The following paper presented by Wm. Dolan, roadmaster, before the meeting at Logansport on April 22 is typical of the practical character of these meetings:
- TIE RENEWALS AND BEST METHODS TO ADOPT
- The ties for interurban railroads with equipment of the character used by the Fort Wayne & Wabash Valley Traction Company should be 6 in. x 8 in. and 8 ft. long, with at least 16 ties to a 33-ft. rail. In the early fall a close estimate should be made of the number of ties required the following spring for renewals. This estimate will answer for placing orders. Endeavors should be made to secure local timber of white or burr oak, walnut, wild cherry or red elm, providing it can be cut in the months of December, January and February. If this is done local ties will last much longer than foreign timber. No timber to be made into ties should be cut after March 1.
- Each section foreman should make his final estimate of ties actually required by April 1. This estimate must cover the ties that will not last one year, but ties that will last six months or over should not be removed unless they are under joints. It is necessary to have every other tie a good tie, capable of firmly holding the spikes. Ties not put in should be piled neatly, the top row close together and inclined by placing a tie under one end to form a roof.
- The ties should be taken up and distributed as soon as the nature of the surroundings will permit, usually in the months of March and April, for local ties as well as for foreign timber. A very good way is to distribute them just previous to the time you desire to place them, say in April. However, should they be foreign timber the cars can be unloaded along the line by a work train crew from the original car assignments. This will save a great deal of handling, extra trucking and hard work, which means many dollars earned.
- Tie renewals should not begin until the frost is out of the ground and the latter settled and dry. In placing the renewals the section men should begin at the common end of their sections and work from each other. While making the first repairs to the surface of the track, all broken ties and those that may impair the safety of the track should be removed. The renewal should be made continuously over each section. Each morning the foreman will mark with a pick the ties he desires removed during the day. Jacks should not be used in taking out or putting in ties. Two consecutive ties should not be out of the track when trains pass over, or taken out unless renewals are absolutely necessary on account of their bad condition. A tie that will hold spikes firmly for six months should not be removed when a new tie is placed next to it. Ties should be placed square to track, sap side up and accurately spaced
- April 7 Construction and Maintenance, H. L. Weber, chief engineer.
14 Our Economics, C. D. Emmons, general manager.
21 Tie Renewal and Best Methods to Adopt, Wm. Dolan, roadmaster.
28 How to Keep and Report Your Time, A. Johnston, timekeeper.
- May 5 Railroad Curves, H. V. Norford, engineer maintenance of way.
12 Our Overhead System, J. J. Brennen, chief lineman.
19 How Best to Maintain Tracks on New Grades, Wm. Smith, section foreman.
26 The Rail Bond and Its Use, M. J. Kehoe, superintendent motive power.
- June 2 Roadbed Drainage, John Gower, section foreman.
9 Our Relations, R. T. Gunn, superintendent of transportation.
16 The Proper and Best Methods of Switch and Curve Greasing, the Oils, etc., Bert Arney, switch tender.
23 Our Equipments and Their Proper Use, L. W. Jacques, master mechanic.
30 Right of Way Fences and Their Maintenance, H. Bishop, carpenter.
- July 7 Our Ideas in Regard to Street Paving, Chas. Sanders, paver.
14 A Talk on Time and How to Keep It, H. E. Vordermark, auditor.
21 Work Car No. 20 for Interurban Use, Archie Marks, Motorman.
28 A Place for Everything and Everything in its Place, Larry Gill.
- Aug. 4 How to Line and Surface Up Track, Jacob Elliot, section foreman.
11 Our Scrap Collections, L. Kindlesparger, section foreman.
18 Who Has Right of Way, F. J. Hardy, superintendent Interurban Division.
25 How Best to Keep our Switch Lights Burning, John Carr, section foreman.
- Sept. 1 Our Work Car No. 10, Chas. Phillips, motorman.
8 How We Maintain Our Tracks in Logansport, Jas. Slagle, section foreman.
15 How to Clear Up a Wreck, John Akers, section foreman.
22 How to Put In a Short Curve, John O'Brien, section foreman.
29 How to Keep Our Interlocker in Working Order, Chas. Crowl, section foreman.
- Oct. 6 Rock Ballast, U. G. Russell, section foreman.
13 The Atlas One-Piece Joint, Chas. Edington, section foreman.
20 Our Switch Stands, J. S. Branstrator, section foreman.
27 Side Tracks, Tom Cassel, section foreman.

and joint ties placed accurately under slots in the angle bars. Hewed ties must be adzed if necessary to give a good and firm rail bearing. The line side should be on the north and east sides of single track and on the outside of double track and sidings. The lining of the ties is generally on the pole side and on the outside of all curves, as it gives a better appearance to the track because the ties are elevated on the outside and show to a greater extent than on the inside. The line end should be 17 in. from the web of the rail and must be carefully spiked to gage. The inside spikes must be on the north or east side and the outside on the south or west side of ties. Old spike holes should be plugged. New ties must be tamped without disturbing the surface of the track.

The old ties removed should be piled up on Saturday of each week. The last day of the week should be devoted to a general cleaning up, so the foreman as well as others can view with some degree of satisfaction the work accomplished during the week. The ties thus piled can be inspected if desired by the roadmaster, after which he may order them burned.

Old and new ties must not be piled so close to each other that there would be any danger of firing the new when burning the old. Dating nails should be furnished to put in the renewals so life records of ties can be kept. Foremen should report the number of ties put in each day on their time slip. If necessary to tamp the new and old ties to surface, the lining should not be neglected at the same time.

The idea has prevailed among some that an old tie, whose usefulness is over, can safely be left in the track. This plan is practised to quite an extent where a good tie is placed on either side of the old one by some railroad companies. The idea is wrong. If the tie does not require renewal after it has been put in and its life spent, it was not required in the first place. If it was a necessary appurtenance when first placed, then it should be renewed when it has decayed.

Full tied and what constitutes full tying depends upon the rolling stock and weight of rails for the same loading. An 80-lb. rail requires less ties than a 60-lb. rail. If a roadbed is properly tied in the first place, then all ties should be renewed when their usefulness is over, not only to keep the track in line and surface, but to make the track safe. A track maintained to good line and surface also causes the least wear and tear upon the equipment and the overhead system. Most railway managers begin economizing by reducing the track force, the poorest paid men on any road. This means a tearing down of the very foundation of the system. Neglected track produces a heavy maintenance charge on equipment and the overhead line, and it should be emphasized that this excess charge will more than balance the amount saved in wages, to say nothing about eliminating risks to life and property.

Mutual confidence is the one important thing that must not be lost sight of by those having the management and operation of railroads in charge. The motorman and the engineer must have confidence in the work of the track men. If this confidence is destroyed, they will not have the nerve to keep their trains on schedule, and should they get behind time they surely will not have the courage to try to make it up.

The Council of the Tramways & Light Railways Association will arrange for a tramway congress to be held at the Franco-British Exhibition in London the first week in July.

THE RELIABILITY OF STEAM AND GAS ENGINES

A table of the causes of steam, gas and oil engine failures in the past 25 years in the United Kingdom that has just come to hand throws some interesting light on a percentage basis upon the comparative reliability of these prime movers. On all kinds of engines, valve and valve gear troubles were the most numerous, but while the steam engine defects of this nature were 20.3 per cent in the 21 years previous to 1903 and had become 23.3 per cent in 1906, the gas and oil engine failures from these causes decreased from 32.9 in the long period to 28.7 in 1906. Possibly the use of superheated steam explains the increase in steam engine valve troubles, which, however, were fewer in proportion in 1906 than in either 1904 or 1905, but it is very encouraging to note the reduction in gas and oil engine valve troubles as time goes on. Cylinder troubles in the internal combustion engine have run from 16 to 17 per cent, roughly, over the time covered by the records, with a fair average of about 5 per cent in the case of steam.

Main shaft breakages have shown an unfortunate tendency to increase from 5.8 per cent to 15.7 per cent in the gas engine field during the last four years covered, whereas steam engines in the same period have increases from a minimum of 2.8 to a figure of 5.2 in 1906. This is clearly a problem for the designing engineer rather than the operating man. Connecting rods and bolts have increased from about 10 per cent in the last two years covered by the gas engine to 12 per cent in the last recorded year, and in the steam engine they have risen from about 3 to 5.6 per cent. Gas engine governors have furnished from about 4 to 7.5 per cent of the trouble in the entire period covered, while steam engine governors have improved from 2.9 to 1.7 per cent. The frames of steam engines have not withstood service nearly as well as those of the gas and oil prime movers, and it is no doubt a fact that in ruggedness of frame design the gas engine maker has always produced excellent results. Piston troubles have been cut down from about 12 to 6.5 per cent in the gas engines in the whole period and steam engine piston troubles have held fairly constant at about 3.5 per cent. All indications point to a steady increase of popularity as the gas engine becomes better known and as the designers appreciate the weak spots for definite conditions of service. The steam engine has the lead in reliability, but the internal combustion engines are making a hard fight to come abreast of their older competitor.

AIR BRAKES FOR CHICAGO RAILWAYS COMPANY

The Chicago Railways Company, which owns all of the north and west side street railways in Chicago, has just awarded a contract to the National Brake & Electric Company, of Milwaukee, Wis., for the air-brake apparatus for the 1200 new cars which in accordance with the traction ordinance the company will purchase and place in service within the next three years. The Chicago Railways Company expects to put about 550 new cars into service this summer, orders for 400 cars having already been placed. The contract is said to cover a larger number of air-brakes than has ever before been contracted for by any electric railway company and is largely significant of the merits of the product of the National Brake & Electric Company, which has already supplied a goodly number of air-brakes to both the Chicago City Railway Company, operating the south side lines, and also the Union Traction Company (now the Chicago Railways Company).

MAINTENANCE REGULATIONS PROPOSED BY THE AUSTRIAN STREET RAILWAY ASSOCIATION

The Austrian Street Railway Association recently has issued in pamphlet form a set of regulations covering the maintenance of track, line and rolling stock on railways operating up to 1000 volts on the trolley. These regulations are expected to receive the sanction of the government railway commissioners, and in this case will be enforceable as law.

TRACK

The track must be gone over at least twice a week on lines operating at a maximum speed of 20 km (12.4 miles) on open track and 30 km (18.6 miles) on paved streets. Railways operated at higher speeds must be inspected daily. All lines must try out their switches every day.

The object of these track inspections is to observe the condition of all bolts, spikes, rail joint fastenings and the like, to do whatever is necessary to make secure all such parts as are readily accessible; to test all switches, crossings and turntables and grease them when necessary; to clean all rail grooves and drains, and to sand the rails in places where this is specified by a local ordinance.

In addition there must be annually a thorough examination of the track with particular attention to the rail joints so far as this can be done without disturbing the pavement. Switches, crossings, curves and turntables should also be gaged in addition to the usual examination and the wear of the rail head at different points determined. The fastenings and conductivity of the rail bonds on open track should also be tested during this annual examination and similar bond tests should be made on city track when it is necessary to take up the pavement for other reasons.

When the heads of T-rails have worn down 20 per cent the rails must be removed from service. Similarly, girder rails on curves as well as tangents must be removed when the groove has increased by 35 mm (1.37 in.) and the width of the rail head has decreased 40 per cent. Such worn rails may afterward be used as guard rails, one on each side of tangents and on the outer side at least of curves.

LINE REGULATIONS

All underground feeders must undergo insulation measurements four times a year and the underground junction boxes two times a year. Cable connections at switches and crossings need be tested only once a year.

The insulation of the trolley wire from ground should be measured four times a year if bare telegraph, telephone or signal circuits cross or are near the trolley wire, but otherwise two tests a year are sufficient. These tests should include the insulation from ground and trolley of all span, carrier and guy wires. This insulation from the ground trolley must be at least one megohm. This insulation rule also applies to feeder circuits and signal circuits using over 250 volts.

Twice a year the overhead line must be examined in its entirety with reference to the position of the trolley wire over the track, all suspension points with soldered or mechanical connections, insulators, switches, section circuit breakers and protection to telephone circuits. Lightning arresters should be tested during these semi-annual inspections and also after lightning storms in their vicinity. The connections of bare overhead feeders and of signal wires carrying over 250 volts must be examined annually.

Wooden poles must be sounded for rot once a year dur-

ing the dry season. In doubtful cases the pole should be bored close to the earth and the sawdust examined.

The fastenings of span and carrier wires to poles and buildings and the span wire insulators should be examined every two years. Every three years iron poles must be repainted after examination for rust and breakage.

The wear of the trolley wire at sharp curves and at other points of unusual wear should not be permitted to exceed 15 per cent of the cross-section. Not more than 30 per cent wear should be allowed for short lengths anywhere unless additional protection against wire breakage is installed. In no event must the wire be continued in service on long sections after the cross-section has been reduced 60 per cent. Span and carrier wires must be renewed if their cross-section has worn down about 25 per cent, oxidation has begun or severe kinks formed.

ROLLING STOCK

Motor cars intended for service must be inspected daily with regard to the condition of the braking apparatus, sander, signal bells and gongs, drawbars and lights. Current collectors, fuses, controllers, switches, motors and other electrical apparatus must be thoroughly overhauled twice a year. Motor cars should be in for general repairs after a run of 30,000 km (18,600 miles) and in no case must they be in service over a year without undergoing general repairs. However, if the cars are thoroughly examined every six months, repairs may be postponed until the car has run 60,000 km (37,200 miles) or been operated for two years.

General repairs of a motor car are understood to mean the removal of the trucks from the car body, removal of motors from the trucks and the removal of springs, brake rods and movable braking parts. Other work covered by general repairs includes the electrical equipment, brakes, signals, couplers, grab handles, running board, hand straps and the condition of the car body in general. All electrical connections must also be tested for grounds. Brake shoes must not be used after wearing down to 10 mm (.39 in.) unless fitted with a special head.

The regulations with regard to trailers do not differ materially from those for motor cars except that trailers may operate for about 17 per cent additional mileage between overhauls and general repairs.

On lines operated up to 30 km (18.6 miles) an hour the tires of motor truck wheels bearing a maximum wheel pressure of 3 tons must be at least 16 mm (.62 in.) thick and 18 mm (.7 in.) thick if the wheel pressure is 4.5 tons. The tires of trailer wheels under corresponding pressures may be worn down 2 mm (.078 in.) less than motor wheels. If the tire thickness is reduced by keys at any point the allowable wear is 20 per cent less.

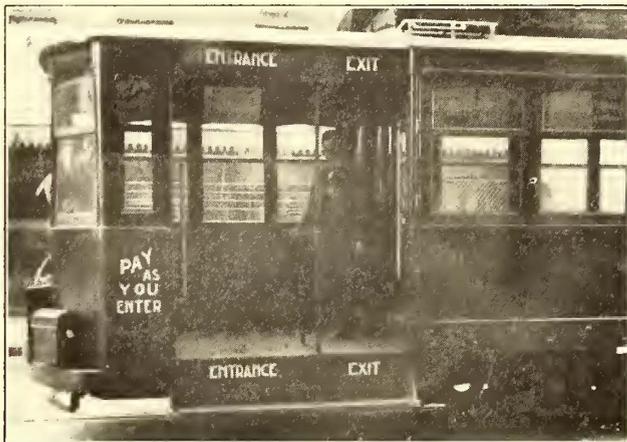
The heads of grooved rails may be worn down 12 mm (.47 in.) in height and 8 mm (.31 in.) in thickness. These regulations also apply to T-rails laid on sharp curves, but otherwise such rails may be worn down 15 mm (.58 in.) in height and 12 mm (.47 in.) in thickness.

The limiting wear of the axles of passenger cars and freight cars are factors of safety of five and four respectively, the breaking loads for such calculations being based on data furnished by the axle maker.

Traffic has been commenced on the single-phase system on a portion of the Lancashire lines of the Midland Railway. This is the first single-phase railway to be operated in England.

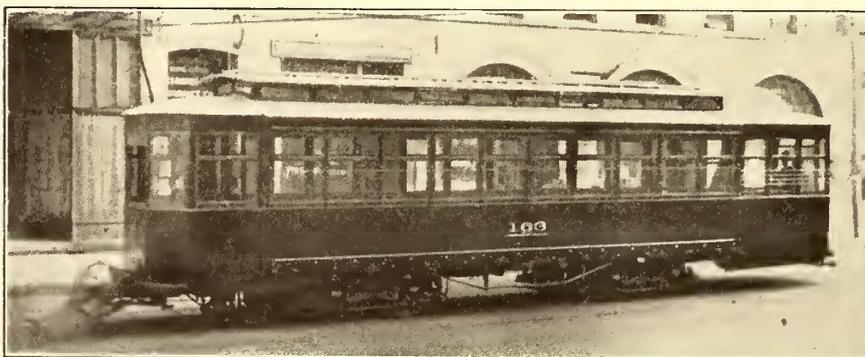
PAY-AS-YOU-ENTER CAR FOR DES MOINES, IA.

The Des Moines City Railway Company has rebuilt one of its standard double-truck steel underframe cars with a pay-as-you-enter platform on the rear end only. The car will be tried experimentally both with and without a three-arm turnstile in the entrance passage. The platform is 8 ft. long and has an exit passage 24 in. wide and an entrance passage 36 in. wide. The turnstile will be placed approximately in the center of the platform in the entrance pas-



BACK PLATFORM DES MOINES PAY-AS-YOU-ENTER CAR

sage which will be restricted by a pipe railing running inward from the rear end of the entrance step beyond the arm of the turnstile. Passengers boarding the car will pass through the turnstile before the conductor, who stands in the usual place, collects the fare. Those who go inside the car will pay as they pass the conductor in going through the entrance door on the left-hand side. The conductor will collect at his leisure from those who remain on the platform back to the turnstile passage railing. Passengers cannot leave the car without going inside and coming out



EXTERIOR VIEW OF DES MOINES PAY-AS-YOU-ENTER CAR

through the exit door or passing the conductor in the exit passage when he lifts the railing behind which he stands to permit them to do so. No passengers are allowed to stand in or leave the car through the front vestibule.

The entrance door to the car swings inward, but the exit door is arranged to slide toward the center of the end bulkhead. A lever pivoted at the bottom near the floor and engaging a bracket on the inner edge of the door by a pin and slot is provided for the conductor to open or close the door without leaving his position. Fares will be recorded on the turnstile register as well as on an ordinary

register inside of the car connected to a pedal operated by the conductor's foot. The inside and rear walls of the vestibule platform are glass enclosed with drop sash, but no door is provided for closing the opening over the step.

PRETORIA (S. A.) WANTS INFORMATION ABOUT ELECTRIC EQUIPMENT

The Town Council of Pretoria, in the Transvaal, reports Consul John H. Snodgrass, contemplates changing the equipment of the street car line to electric power. It requests that American manufacturers of street cars, overhead wires and iron and steel rails furnish information as to the probable cost of an equipment of from 9 to 15 miles. The Council also desires all the information obtainable as to cost per mile of track and overhead wire and cost per car for 10 or more. Letters and catalogues should be addressed to Dr. S. R. Savage, Mayor of Pretoria, or to the American Consul, John H. Snodgrass, post office box 952, Pretoria, Transvaal, S. A.

NEW CAR ORDERS

The Portland (Ore.) Railway & Light Company is to try the pay-as-you-enter plan and has secured the right for using the principle upon 25 new cars. The Cleveland Electric Railway Company has secured the right for five cars. The New York City Railway Company is considering bids for 100 pay-as-you-enter cars and 150 28-ft. double-truck cars.

TURBINE FOR THE FAR EAST

No less than ten machines, aggregating 25,000 horse-power, are included in a large shipment of Westinghouse turbo-electric power equipment from East Pittsburg to the Far East. Most of these machines will go to Japan for the equipment of railway, lighting and manufacturing plants. One of the first machines to be put in service will be a 1500-kw turbine unit for Manila, to be installed in a station with four other machines of like construction put into service several years ago. Past experience with these machines has resulted in the recent extension. It will be recalled that this railway system was engineered and constructed by J. G. White & Company, of New York. Hardly second in importance is the large turbine station of the Osaka Electric Company, Osaka, Japan, now building. This will be one of the largest power stations in Japanese territory and will contain for the present 15,000

kilowatts in five units. Three of these machines are now being shipped from East Pittsburg. The remainder will follow as fast as they can be built and tested. The Osaka installation is under direct charge of Messrs. Takata & Company, of New York and Tokio. In the strictly manufacturing field, there are two installations in process of erection for the Imperial Steel Works of the Japanese Government and the ship yards of the Hakkaido Tanko Steamship Company. Two 500-kw Westinghouse-Parsons turbo units will comprise an initial installation in each of these plants.

THE ANALYSIS AND GRADING OF CREOSOTES

The Forest Service of the U. S. Department of Agriculture has just published in Circular No. 112 a large amount of data on the analysis and grading of creosotes. The following abstract and accompanying curves cover the most

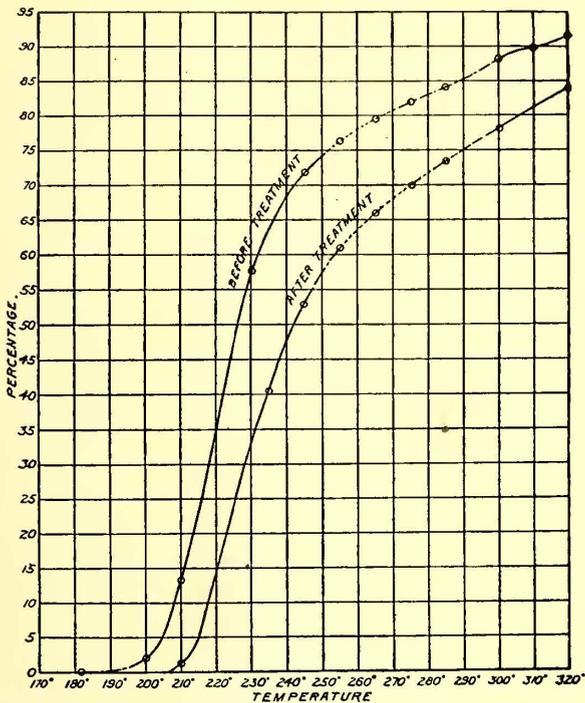


FIG. 1.—DISTILLATION OF CREOSOTE (NO. 46) BEFORE USE IN OPEN TANK TREATMENT, AND THE SAME CREOSOTE (NO. 47) AFTER USE

important points brought out with regard to the useful percentage and distribution of creosote under different conditions.

The losses of creosote from its volatility have received

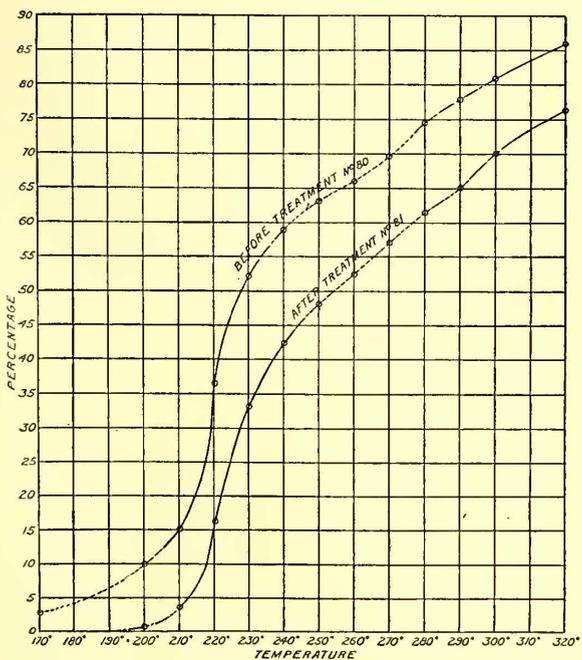


FIG. 2.—DISTILLATION OF CREOSOTE (NO. 80) BEFORE USE IN OPEN TANK TREATMENT, AND THE SAME (NO. 81) AFTER TREATMENT

scant attention. These losses may occur from the creosote itself before and during treatment or from the creosoted timbers. Some methods of treatment entail an excessive

loss when highly volatile oils are employed, although these oils would be well enough adapted for processes which entail only a small degree of exposure of the oil.

This point has been emphasized in some of the experimental treatments conducted by the Forest Service. A number of telephone poles, the seasoning of which had been the subject of investigation, were given butt treatments by an open-tank process. The butts of the poles were placed in tanks of hot creosote, which was kept for several hours at from 2 deg. to 10 deg. above the boiling point of water. The fires were then drawn and the oil allowed to

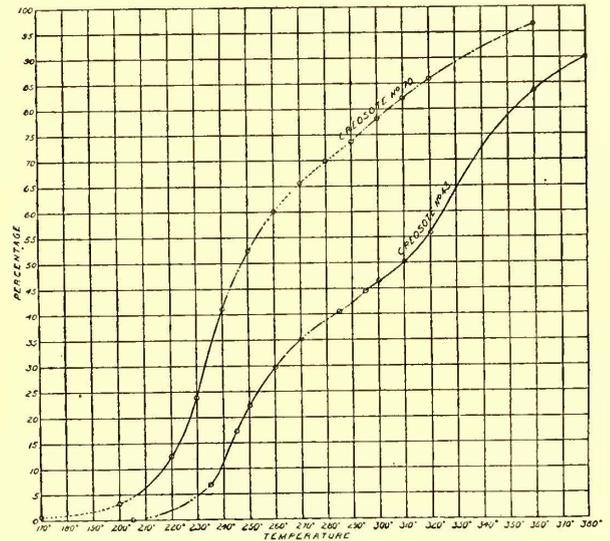


FIG. 3.—DISTILLATION OF CREOSOTE NOS. 43 AND 70

cool with the poles remaining in it. As the oil was taken up by the timber fresh oil was added. A sample of the creosote just as it came from the barrels and a sample of the oils remaining in the tank at the end of the treatments were sent to the laboratory for analysis. The curves shown in Fig. 1 give the results of the fractional distillations.

The different lines show the consistencies of the various

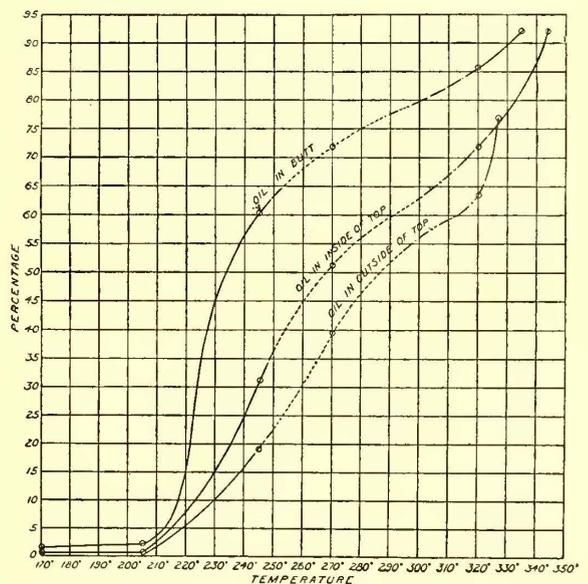


FIG. 4.—DISTILLATION OF CREOSOTE EXTRACTED FROM DIFFERENT PORTIONS OF A TREATED TELEPHONE POLE.

parts of the distillate. Solid lines represent fractions, dashed lines represent a pasty consistency and dashes interspersed with varying numbers of dots show varying conditions from

the semi-solid to liquids with a few floating crystals. The loss of certain portions of the oil during the treatment is obvious; for example, the original oil yielded 13 per cent of distillate below 210 deg., whereas the oil after treating operations gave but 1 per cent. Calculations show that, assuming that there was no loss of the portions of the oil which distill above 245 deg., it would require 1.7 gal. of the original oil to furnish the amount of distillate above 245 deg. which is obtained from 1 gal. of the residual oil. This indicates a loss of 41 per cent of the total creosote. A record kept of the amount of oil put into the tanks and of the amounts absorbed by the poles showed a discrepancy of over 38 per cent between the oil used and that finally got into the timbers.

It is interesting to compare the weights of the various fractions of the residual and original oils if, instead of equal amounts for each distillation, 59 per cent as much of the residual oil were used as of the original. The distillations would then represent like amounts of the original creosote:

TABLE 1.—LOCALIZATION OF LOSS BY EVAPORATION OF CREOSOTE DURING TREATMENT

Temperatures degrees	Original oil per cent	Residual oil per cent	Loss per cent
210	13.0	0.6	12.4
210-235	50.5	23.2	27.3
235-245	8.5	7.3	1.2
245-255	4.7	4.8	Duplicates
255-265	3.2	2.9	
265-275	2.2	2.3	
275-285	2.3	2.1	
285-300	3.9	3.8	
300-320	3.6	3.6	
Residue	8.1	9.1	

Table 1 shows that in the case of this oil the loss is almost entirely in the part distilling below 235 deg. In Fig. 2 distillation curves of another oil are given before and after open-tank treatments of chestnut telephone poles.

Laboratory tests of volatility were made on a number of creosotes. Five cubic centimeters of each melted oil were measured into tared glass crystallizing dishes 67 mm in diameter. After the oil had cooled each dish with its contents was weighed and then kept for four hours at a temperature of 98 deg. Then they were cooled and weighed again, and the percentage losses calculated. These are shown in Table 2.

TABLE 2.—COMPARATIVE VOLATILITIES OF CREOSOTES AT 98 DEG.

Creo- sote No.	Loss per cent	Temperature at which same loss will be secured during	Creo- sote No.	Loss per cent	Temperature at which same loss will be secured during
		distillation degrees			distillation degrees
13	42.2	260	41	80.6	245-250
14	51.1	235-240	42	53.6	230-235
15	56.4	235-240	43	24.6	255-260
40	63.7	240-250	46	71.7	240-245

A second series of tests was made in which the volatilization was determined for lower temperatures. The results are given in Table 3. The periods and temperatures were (1) for hours at 60 deg., followed by (2) ninety hours at 20 deg., followed by (3) five hours at 60 deg., followed by (4) forty-five hours at 20 deg., followed by (5) two weeks at 20 deg.

TABLE 3.—COMPARATIVE VOLATILITIES OF CREOSOTES AT LOW TEMPERATURES

Creo- sote	4 hours at 60 deg.	90 hours at 20 deg.	5 hours at 60 deg.	45 hours at 20 deg.	2 weeks at 20 deg.	Total per cent	Temperature at which same loss will be secured during
	per cent	per cent	per cent	per cent	per cent		dis- tillation degrees
51	37.2	4.1	18.3	0.6	3.2	62.8	246
41	41.9	4.2	24.9	.8	3.6	74.6	239
46	30.1	4.0	25.1	1.4	7.2	66.5	238
47	20.2	3.6	18.7	1.8	6.4	49.0	241
15	31.0	4.2	23.8	.8	4.6	63.7	237
43	14.1	2.3	8.7	.9	3.1	28.3	261
70	27.3	4.7	18.3	1.2	4.6	55.0	252

No. 51 is a rather low-boiling creosote from a coke-oven tar; No. 47 is the oil remaining after the open-tank treatment shown in Fig 1; No. 70 was prepared from a water-gas carburetor tar; its distillation curve is shown in Fig. 3.

From the results given in Table 3, it is evident that creosotes vary greatly in their volatility and that the differences are most marked at the higher temperatures around the boiling point of water. The relative volatility may be judged from the results of a fractional distillation, although the high-boiling oils lose rather more than expected.

Volatility tests and the analyses of creosote used in open-tank treatments thus prove that different oils have very different values for these treatments. The water in creosote and the oils which distill under 210 deg. are practically all waste. The difference in loss between two oils, one with 15 per cent of distillate under 210 deg. and the other with only 2 per cent, is so great that it would be economy in an open-tank method to use a smaller quantity of a high-boiling oil, despite the somewhat greater original price, than a larger quantity of a low-boiling oil. In the open-tank experiments (Fig. 1), where the loss was 40 per cent, if the price of the creosote, including all charges, had been 10 cents per gallon, the cost of the oil finally placed in the timber would have been 16 2/3 cents.

The creosotes also show marked differences after injection. In tests on creosoted blocks, creosote No. 15 evaporated from wood at nearly twice the rate of No. 43. (Compare Table No. 2). Exposure of treated timbers to an abundant air circulation, and to some heat, affects the loss by volatilization to a marked degree. This fact was brought out by analyses of the wood from different portions of a creosoted telephone pole in the Norfolk to Washington line of the American Telephone & Telegraph Company. This pole had been in service for about nine years. The creosote was extracted from samples obtained by making 1-in. borings in three different portions of the pole: first, centered 1 in. from the outside of the underground portion; second, centered 1 in. from the southern side of the pole near the cross-arm, and third, centered 3 1/2 in. from the outside of the pole in the cross-arm region. The creosotes extracted from these three localities were fractionated from a 200 c. c. distilling flask, with the results plotted in Fig. 4.

If the average distillation of the creosote used in treating the poles in this line, as given by the analyses made in the laboratory of the American Telephone & Telegraph Company, were plotted on the same sheet, it would almost coincide with the curve for the oil extracted from the butt.

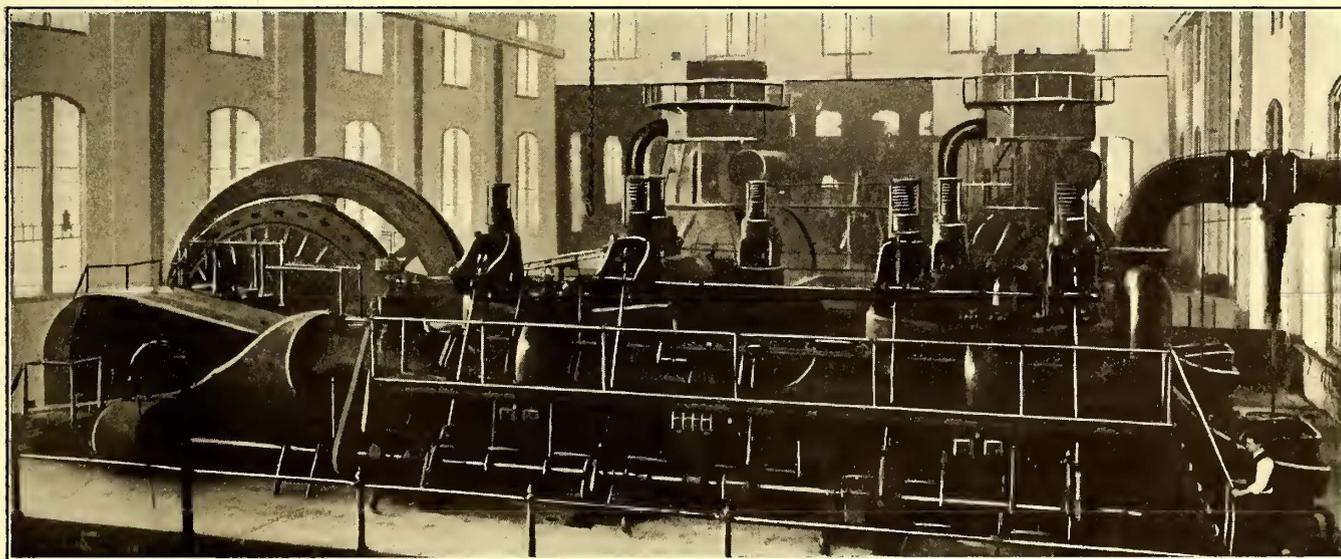
THE 2000-KW GAS-ELECTRIC SET FOR THE BESSEMER WORKS OF THE UNITED STATES STEEL CORPORATION

As a great deal of interest is being manifested by power users in the large gas engine units supplied to the United States Steel Corporation by the Westinghouse Machine Company, of East Pittsburg, Pa., a description of the characteristics of these prime movers should be opportune. At present the steel company has three 3000-hp units at the Bessemer works and eight more will soon be in operation at Gary, Ind. The 2900-3000-hp rating is based on the use of blast-furnace gases, but if natural gas were used the rating would be about 25 per cent greater. All of these prime movers are employed as blowing engines except one of the Bessemer units, which is direct-connected to a 2000-kw, 250-volt d. c. generator. The following paragraphs describe the principal features embodied in all of these gas engines:

The engine is of the horizontal twin tandem construction with four double-acting cylinders, four-stroke cycle with the cranks set 90 deg. apart, thus giving four impulses per revolution of the crank shaft. The cylinders are 40 in. x 54 in., and when running 84 r.p.m. the generator is rated at 2000 kw. Perhaps the most striking features of the design are in the inlet valve construction, a combination of the functions of inlet, mixing and governor valves in a single mechanism, one eccentric operating both inlet and exhaust valves, electromagnet igniters, relay governing and automatic starting. The arrangement of inlet valves per-

between the pairs of cylinders allowing access to the upper valve gear, while below free space is left between the pedestals supporting the cylinder ends to reach the exhaust valves from platforms in the basement under the cylinders. The main frame consists of a front housing which supports the main bearings and cylinder connections, and a cylindrical housing between the cylinders. The center and rear housings are of similar construction with the tops cut away to give access to the cylinder heads, the openings thus made in the tops of the housings being reinforced by removable steel struts. The cylinders are anchored to the foundation at the main housing only, and are arranged to slide in machined ways at the center and rear housings to permit free expansion and contraction longitudinally. The front housing is a one-piece box girder casting ribbed to withstand the transverse stresses from the side crank design. The box girder completely surrounds the crank pit, forming a rectangular bed anchored at the four corners. Access to the crosshead is obtained through open windows in the housing while the depression formed by the crank pit serves as an oil well, from which excess oil is drawn off and filtered for re-use. The main bearings are in four parts, two of which are adjustable by wedges. These bearings are self-centering, their brasses are removable without disturbing the shaft, and for tying the housings together tie rods through the uprights above the shaft are used instead of lips cast on the edges of the bearing caps.

The cylinders are cast in halves, each containing an inlet and an exhaust valve opening and a part of the water



BLAST FURNACE GAS ENGINE DIRECT-CONNECTED TO GENERATOR AT BESSEMER

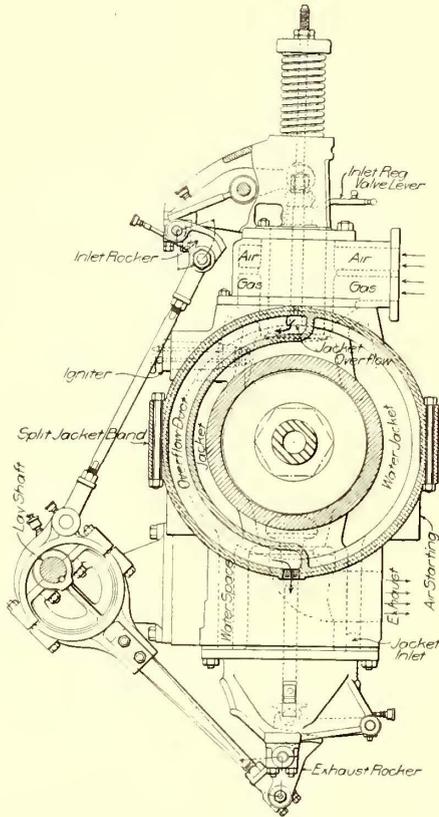
mits the compression clearance in any cylinder to be changed to suit various gases without altering the cylinder piston or valves. The pistons are "floated" on the rods, their weight being carried on the crossheads. All engine parts exposed to the heat of combustion are water cooled except the inlet valve. The side crank construction of the twin tandem arrangement permits the support of the shaft with but two points for alignment, while the main bearings are so constructed that shells may be removed without disturbing the crank shaft. The automatic compressed air starting system used is controlled by one valve, which continues in operation until all igniters are working. Automatic safety stops are provided against overspeed or loss of cooling water.

All parts on both levels may easily be reached, platforms

jacket. The two halves of the cylinder have a ground joint at the center and are held by arrowheads shrunk in rims projecting from the end of either half into the water jacket space. The jacket walls are purposely left open at the center to facilitate making the central joint and give access to the jacket space; the opening is closed by a split jacket band fitted in with a water-tight joint to permit free expansion and contraction of the cylinders. The removal of this jacket band gives ample access to all of the water spaces for cleaning. Similarly the jackets around the exhaust valves are reached by removing a retaining ring at the bottom without disturbing the valve bonnets. Access to the interior of the cylinders is facilitated through the valve openings.

The piston construction is of symmetrical design with no

internal webs and sharp corners to cause premature ignition. The permanent mounting on the piston rod is forced on by a pressed bit and secured by a retaining nut turned off flush with the piston. By the use of tail rod crossheads the piston is floated concentric with the cylinder bore, which leaves several spaces between the sectional packing rings into which the oil is injected and distributed. The piston rods are of steel 12 in. diameter outside, bored from



SECTION OF CYLINDER WITH VALVE GEAR

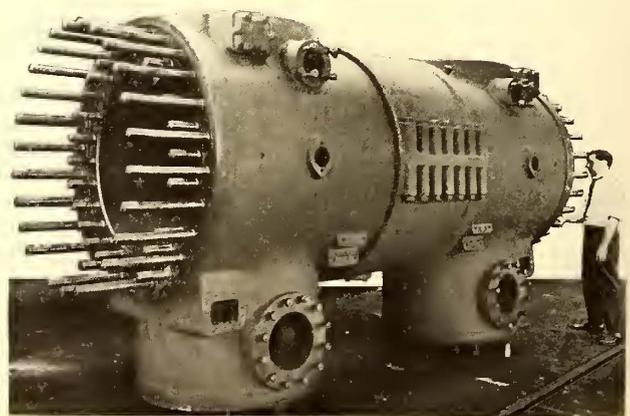
either end to the piston for water circulation, and are made in two parts joined at the center crosshead by a split threaded coupling, thus minimizing the building clearance necessary for removing pistons. The rod is supported by three crossheads, one the connecting-rod crosshead and the other guides at the center and rear ends, and in these crossheads are made the provisions for centering the rod, consisting of a wedge slipper in the main crosshead and shims in the center and rear crossheads. The rods have sectional metallic packing supported by springs to take the weight off the rods. They are lubricated from the positive feed cylinder oil pumps, the oil being injected at about the middle of the sections and working both ways.

The crank shafts of the engines are solid forged steel 30 in. diameter, carrying a 24-ft. flywheel at the middle and on either end of which are pressed solid cast-steel crank disks. A feature of the crank construction is that the pins are cast integral with them, eliminating the possibility of the metal between the crank pin and the crank shaft bore being strained in making the press fits. The cranks also were cast with the crank pin ends at the bottom of the mold to insure solid metal in that part. The connecting rods are steel forgings of the solid-end type and are designed for a crank ratio of 5.5:1. They have the usual wedge and bolt adjustments with babbitted boxes at both ends.

An important advantage of the cylinder construction is the diametrically opposite locations of the inlet and exhaust

valves at the ends of the cylinders. This results in a symmetrical cylinder structure, provides for the maximum distance between inlet and exhaust openings for minimum dilution of the incoming mixture with the spent gases, and also gives two large openings in the cylinder through which inspection is facilitated without removing the cylinder heads. This design permits the cylinder clearance to be readily altered for adjusting the compression to suit different gases by varying the bulk of the protruding cylinder head or packing cage, which thus involves no changes in the cylinder or piston construction. The valves are of the poppet pattern, of solid forged steel for the inlets and cast-iron for the exhaust, and the valve springs are located on the extended valve stems to be well removed from the heat of the cylinder. The exhaust valves are hollow and have a special arrangement for water cooling, the water entering through the annular space between an internal tube and the outside of the valve stem so that the coolest water is always in contact with the stem; the discharge is through the tube, which is extended within to the top of the valve so that air pockets are avoided and the valves always full of water.

The inlet valves combine the functions of inlet, mixing and governor valves in one mechanism, consisting of the spring-operated poppet valve, a stationary cage and bonnet in which it is housed, and a mixing or regulating valve sleeve that reciprocates within the cage and rotates on the inlet valve stem. The mechanism has, in fact, three distinct movements: the vertical movement of the valve transmitted from the eccentric, the vertical movement of the regulating sleeve which is carried with the valve stem, and the rotation of this sleeve on the valve stem, as actuated by the governor mechanism. The regulating sleeve is a cylinder with separate gas and air ports registering with corresponding openings within the valve cage that connect with the gas and air supplies; the action of the mechanism is such that when the valve is closed this sleeve is raised and closes both ports, but as the valve opens it drops and uncovers the ports, the amount of opening in either set of ports depending upon the angular position of the sleeve in



VIEW SHOWING CONSTRUCTION OF CYLINDER

its rotation about the valve stem as controlled by the governor. Hence the gas and air are mixed directly at the point of entrance to the cylinder and only as needed by the engine, which avoids large quantities of idle mixed gases in the intake connections and gives the governor absolute control over the engine. Incidentally a very small amount of mixed gas is involved in case of a back fire, and further, the resulting constant movement of the valve mechanism prevents the governor valve sticking when the engine is run on constant loads for long periods. As the mixture

at each end of each cylinder is also independently controlled by the governor, closer speed regulation has been found possible, the angular variation of the flywheel velocity being such that no difficulty has been experienced in operating a. c. generators of standard frequencies in parallel. Even with one cylinder out of commission, the angular variation of the flywheels will be within steam practice limits. Thus, with all four cylinders in operation, the angular variation is less than is customary with steam.

The valve gear is operated from the usual lay shaft arranged horizontally at the side of the cylinders, but a novelty has been introduced in operating both inlet and exhaust valves from a single eccentric at each end of each cylinder, and using rolling cams, by which large initial power is supplied to the valve rockers in opening the valves and very rapid opening and closing obtained. The valve cams are, as shown in the accompanying drawing, similar to the well-known roller cam gear of river-boat engine construction and act with variable leverages, the greatest occurring at the initial openings of the valves. This is a particular advantage for the exhaust valve which must be opened against the pressure, but is also favorable to both inlet and exhaust valves as the closure while very rapid is rendered easy through the elimination of hammering on seats. Precaution is taken to prevent interference with the timing of this engine by doweling the eccentric push rods in place, the slight adjustment necessary to secure easy seating of the valves being provided by shims in the rocker arm bearings which also compensate the slight wear on the cam faces. The lay shafts are driven from the main crank shaft by a combination of spur and bevel gearing, each with a "hunting" tooth, spiral gearing having been abandoned to obviate its back lash when worn and to avoid thrust bearings.

The governing system employs a centrifugal governor with rectilinear motion of weights, which operates the regulating sleeves of the valve mechanism through an oil cylinder with relay control. The governor merely actuates a small pilot valve which admits oil under pressure to either end of a small cylinder which works the mixing valves of the main cylinders through long reach rods. The reach rod on either side is connected with ball and socket joints serially to the regulating sleeves of each of the valves of the two cylinders and is thus in four sections subject to a certain amount of lateral motion as the valves and sleeves are depressed in opening, but the lateral motion is so slight compared with that necessary to change materially the regulating sleeve adjustment, that no effect upon the governing is traceable to this form of reach rod connection. The Jahns governor for operating the pilot is connected to the pilot valve with a bell crank and link connection with the dash pot to prevent hunting on fluctuating loads. The pilot valve is interlinked with the oil cylinder pistons and is designed for position control of the piston upon the principle of the pilot control steam steering gear used on ships. The governor is driven from the main crank shaft rather than the lay shaft so as to be unaffected by any side variations in the latter.

The automatic safety stops are made independent of the governor, that operating from over-speed consisting of a centrifugal attachment in the flywheel rim which under excessive speed opens a switch in the igniter circuit, while the one for failure of the jacket water supply operates through a diaphragm mechanism.

For ignition the make and break system has been adopted. Two sets of igniters are provided in duplicate for each end of each cylinder and a simple design of igniter plug is used

with cast-iron contacts which have been found to have remarkable wearing qualities with the low ignition current. The igniters are one-piece plugs inserted into openings in the compression spaces of the cylinders with one ground joint, which carry the fixed and moving parts. The former is protected by an insulated sleeve which passes through the hollow space of the igniter plug with heavy mica washer insulation at either end. As both sides of each igniter circuit are therefore thoroughly insulated, troubles from grounds are minimized. A feature of the mechanically driven igniter mechanism is the magnetic indicator to show the conditions of the various circuits. The igniters may be removed while the engine is in operation, by shutting off the gas supply to the corresponding cylinder and blocking open the exhaust valves by cams provided to permit the removal of the igniters.

The electrical ignition gear, which is often installed, consists of a timer or contactor for making and breaking the ignition circuits, and in place of the igniter knock-off cams used on the mechanical gear, an electrical knock-off device is employed. This consists of two magnets wound in series with an S-shaped armature carrying a hammer to strike the igniter and trip it when the magnets are energized. The ignition is easily advanced and retarded, as in the mechanical gear, and, besides, all the igniters at each end of each cylinder operate simultaneously.

The series cooling system now used requires for each cylinder but two independent water circuits, one through the exhaust valves to the cylinder jacket and the other serially through the exhaust valve cages, thence to the two cylinder heads and finally through the piston rod and piston, an arrangement somewhat on the counter-current principle, as the coldest water surrounds the hottest rod. The piston rod connections are of the telescopic tube type, arranged on a bracket carried by the center crosshead, the tubes reciprocating with the piston-rod movement into packed cylinders that have large air chambers to neutralize the effect of the surging water.

General lubrication for the engine is supplied by a continuous gravity system with filters insuring ample lubrication of all bearings, crank pins, crossheads, etc., while that for the cylinders is supplied by a timed forced lubrication system supplying the oil at four points in the upper quadrant of each cylinder during the suction stroke only, thereby giving two working strokes at low temperature during which the cylinder oil is evenly distributed over the entire cylinder surface. The even distribution of the oil to the cylinder surfaces is ensured because the pistons do not touch the cylinders at any point, and the oil is forced in only when the piston is directly under the oil ports so that the recesses between piston rings distribute the oil evenly. The lubrication is controlled by one valve without disturbing the individual adjustment of the lubricators, and all important parts are lubricated by sight-feed oilers.

The automatic air starting system consists of an air supply pipe, fitted with an unbalanced poppet valve connected to each end of each cylinder, the valve being located directly under the air knock-off cam mounted on the main lay shaft. To start the engine, it is only necessary to turn on the main air valve, which causes the poppet valves to move upward toward their seats. One or more of these poppet valves will be held down and open by the air cam, thus admitting air to one end of the cylinder, causing the engine to turn over. As the air is admitted to the cylinder only during the power stroke, the exhaust valves open on the succeeding stroke and permit the escape of the air from the cylinder.

ECONOMICAL LUBRICATION IN LARGE PLANTS

One of the most interesting duties of the modern industrial chemist is the supervision of the lubrication problem which confronts his client or employer. Expert knowledge is essential to the proper preparation of oil or grease specifications, and both physical and chemical tests are necessary to the best solution of the problem. There are a number of ways, however, in which the power plant operator and owner can avoid waste and secure better economy in the purchase and use of oil. These were discussed at a recent meeting of the Boston Society of Civil Engineers by W. M. Davis. An abstract of his remarks follows:

Too little attention is paid in many plants to oil leaks. As far as possible every piece of machinery should be provided with drip pans. On slow running engines where the pressure is low, a good grade of grease will often be satisfactory. With large engines it is sometimes the case that the hub of the flywheel or a large gear wheel is fitted so close to the bearing that there is not sufficient space to fasten oil pans under the bearing, and all excess of oil will be lost. Such bearings can often be lubricated economically by packing a lump of medium hard grease on the journal at each end of the bearing and feeding a little oil in the middle. The grease prevents the oil from running out too fast, and at the same time adds to the lubrication. Modern practice tends away from the use of cylinder oil in vertical cylinders, but for horizontal service there seems to be no alternative but a moderate use of oil. There is little doubt that the higher steam pressures now coming into general service tend to reduce the quantity of cylinder oil required. Dry steam and an absence of too strongly alkaline boiler compounds, and care not to set the piston rings out too tight, make for economy in oil consumption. Chamfering the edges of piston rings slightly tends to save oil often wasted by being scraped off the surface.

By reducing the oil feed gradually in an engine, and noting the action of the valves, the proper quantity of oil can be determined. As soon as the valves begin to groan and work roughly a slight increase of the feed solves the problem. If a stain is left on a piece of soft paper used to wipe the cylinder, after the head is taken off, it is certain that enough oil is being used. In large plants the provision of tanks of car capacity reduces the price per gallon, and the saving of empty barrels and their return with hoops driven up tight in carload lots is a source of economy often overlooked. Even in small plants it pays to arrange for feeding the oil from barrel to tank by gravity. The best station log sheets now provide a lubricant space.

The relations between lubrication and cylinder condensation are as yet but little understood, and the study of this subject by some of the engineering laboratories would undoubtedly be productive of valuable results. In the case of a manufacturer who recently agreed to build some vertical engines to run on a limited steam consumption, it was found on trial that without oil in the cylinders the steam used was 20 per cent more than was required with oil in the cylinders. The cause of this great difference is as yet in doubt. Whether it is due to the oil acting as a non-conductor and preventing initial condensation, to a reduction in leakage losses, to the prevention of air leakage into the exhaust by oil on the stuffing box, or purely to a reduction in friction, remains to be determined.

For use with superheated steam an oil with a high flash test is desirable, but in order to get this the manufacturer is obliged to reduce the oils to drive down the more vola-

tile products, so that as the flash test increases the density increases also. To reach the proper medium between high flashing and viscosity, a flash test of about 550 to 570 deg. seems to be satisfactory. With perfectly dry steam it may be possible to use a straight petroleum oil, but in lubricating the low-pressure cylinder of a compound engine it is necessary to use an oil compounded with animal fat in order to have the oil stick on the surface. The large drop in temperature leads to heavy condensation, and petroleum oil used alone does not stay on the surface. There are few matters of greater consequence to operating engineers at the present time than the selection and purchase of lubricants best adapted to high steam pressures and moderate degrees of superheat.

INSTRUCTION ON ACCIDENTS

During the last two years the Connecticut Company has been giving a great deal of attention to the subject of instructing motormen and conductors in the careful operation of their cars to reduce accidents. The plan followed has been to detail the claim agents of the company to give lectures at intervals to motormen and conductors and explain the most common causes of accidents and the best way of avoiding them. The motormen are told to be especially careful to have the car under perfect control when approaching children at play in the street or near the track, as no one can tell in what way a child is going to run, and also in approaching teams on which children may be hanging, as they may jump off in front of the car. The danger of accidents to children increases, of course, in warm weather, because the families in many districts spend more time out of doors. Mothers often cause an accident instead of avoiding it by getting excited when they see a car coming and calling to a child on the opposite side of the street instead of crossing the street to them. The danger is also increased because the average child will pay little attention to the foot gong.

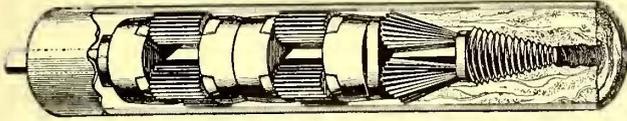
Motormen are also cautioned to keep at least five car lengths behind a car ahead of them, as there is no way of telling when the front car may have to be braked suddenly. They are instructed to stop their cars four lengths from a railroad crossing and not to run close to it before stopping, as it is impossible to tell when the rail may be slippery or the brake may not work. They are told that care must also be taken in approaching teams and automobiles going in the same direction as the car, for the latter are liable to turn suddenly across the track. Under these circumstances the foot gong must be continuously sounded and the car must be under control. In the case of an accident the main office is to be notified promptly from the nearest telephone box. If witnesses decline to give their names, diplomacy should be used to secure them. A conductor can tell such persons that it will show the company that he is doing his duty. The names of witnesses should be secured even if the injured person claims that he is not hurt.

If intoxicated men must be ejected they should not be left near the track or in the outskirts of the city, and if a motorman should see an intoxicated man on the highway in the suburbs he should notify the motorman of the car going in the opposite direction to be on the lookout.

The results of this policy of having the claim agents make addresses to the train crews on the importance of exercising care and in pointing out prevalent causes of accidents have been very satisfactory in reducing the number of casualties.

A STEAM OR AIR BOILER-TUBE CLEANER

A new Weinland steam or air boiler-tube cleaner has been brought out by the Lagonda Manufacturing Company, of Springfield, Ohio. It has a jointed steel shaft with a powerful cleaning head on one end and rotary engine on the other and is supported by a trolley consisting of a rope-operated differential pulley block and an overhead pipe on which it rolls across the boiler front to align to each vertical row of tubes. The self-locking rope differential be-



CLEANER WITH SCREW POINT HEAD AND SERRATED CUTTERS

tween the motor and the overhead pipe offers adjustment of the motor to proper height for any row of tubes or to keep the shaft concentric with the tube axis as the head proceeds down the tube. None of the weight of the motor is supported by the operator. The two handles are merely for guiding the machine and pushing it against the scale.

Steam or air enters through a hose connected to the rear of the case and operates against three radial paddles or pistons, thus revolving the motor at a speed determined by the pressure of the steam and the forward thrust against the scale. The pistons are forced outward to a steam-tight fit with the case by the admission of pressure at the back end of the cages in which they slide. The admission ports near the handles admit steam to the space between the rotor and case. Each piston is under full steam pressure until the rotor has made a quarter turn and, as there are three pistons, the rotative effort is practically continuous.

Five to nine horse-power may be brought to bear upon the scale and by throttling the steam the torque of the shaft and the speed of the cutting head may be adapted to any hardness or thickness of scale without danger of becoming stalled. When used with compressed air, the motor can exhaust direct to atmosphere, but with steam a short length of hose is attached to conduct the exhaust out of the operator's way.

The cleaning head used on this machine is of the type which has been so successfully used in the past on other Weinland mechanical cleaners. The screw point bores into the thickest scale, three serrated cone cutters crush the intermediate scale and the eight cylindrical cutters which follow remove the small bits and polish the tube surface.

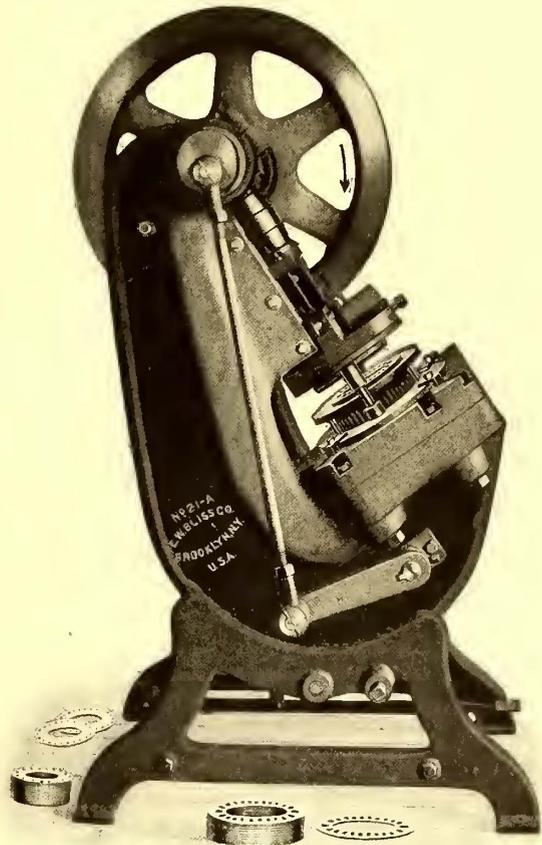
CANADIAN CROCKER-WHEELER COMPANY

The Canadian Crocker-Wheeler Company, Ltd., has been organized for the manufacture and sale in Canada of the well-known Crocker-Wheeler apparatus. The Crocker-Wheeler Company, of Ampere, N. J., manufactures all types of direct-current and alternating-current motors and generators, transformers, motor-generator sets, frequency changers, etc., some of the best known lines being direct-current motors for special purposes, such as machine-tool and printing-press drive and steel mill work. Crocker-Wheeler alternating-current generators up to 200-kw capacity have been in successful operation in Canada for some years. F. E. Lovell, president of the new company, is a member of the old established lumbering firm of H. Lovell & Sons, of Coaticooke, Que., who have extensive interests in mills and timber limits throughout the Province of Quebec. Russell A. Stinson and F. Jno. Bell, vice-

president and secretary-treasurer, respectively, have been identified with the manufacturing, construction and sales ends of the electrical trade in Canada for the past 15 years and are particularly well known in Montreal, where the head office of the company has recently been opened in the Street Railway Chambers, Place d'Armes Hill.

ARMATURE DISK-CUTTING PRESS

The requirements of electric work have led to the construction by the E. W. Bliss Company, of Brooklyn, of presses for the manufacture of armature disks differing essentially from those used for other kinds of sheet-metal work. The Bliss machine, though it may be adapted for other accurate blanking operations, is especially designed for operating dies for punching armature disks for small motors and generators, such a die being shown in position



PRESS OPERATING DIE FOR PUNCHING SMALL DISKS

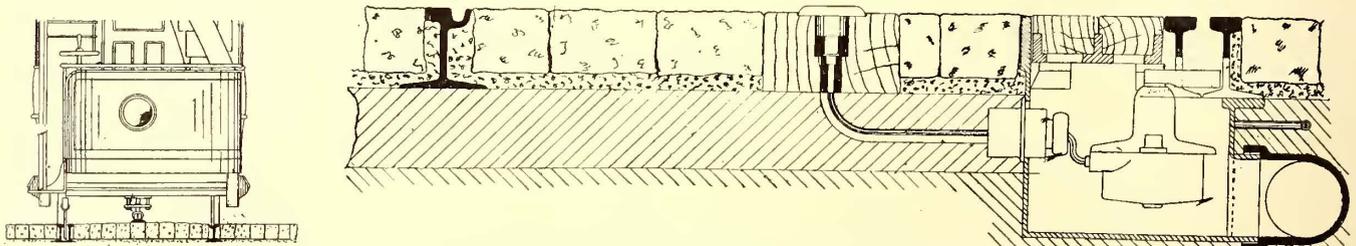
in press. The inclined position of the press allows the blank punched and lifted out of the die by its positive knockouts to slide off by gravity, greatly facilitating the operation of the press and increasing the daily production. The press will punch disks up to 14 in. diameter where the disks are plain, afterward being notched by means of an automatic press built for this purpose by the company. When the inside and outside notches and the keyway are cut simultaneously at one stroke 6 in. or 7 in. is the capacity, this varying according to the size and number of holes and notches to be punched. From 6000 to 10,000 complete disks per day may be punched on this machine in its inclined position. The positive knockout for both punch and die are easy of access and readily adjustable for different heights of dies. The slides are guided in ways of exceptional length so as to carry the tools with accuracy. The weight of the machine arranged as illustrated is approximately 4000 lb.

SHALLOW CONDUIT RAILWAY FOR BENARES, INDIA

Benares, India, has recently given an order for the construction of $9\frac{1}{2}$ miles of street railway to be operated on the "Robrov" surface-contact system, which is exploited by the Traction Corporation, Ltd., of London, England. The principal features of this latest contact system are shown in the accompanying cross-section taken through the place where a collector stud and switch are located. The power conductor is laid in a 7-in. conduit formed by two abutting T-rails. One of these rails serves also as a running rail, and the space between the heads accommodates the flanges of the car wheels. The power conductor is tapped into the street boxes at each current-carrying switch. The street box shown in the cut contains the operating switch and also drains the stretch of conduit between boxes. This switch is easily accessible from the street surface and may be replaced in two or three minutes. The street box has two terminal boxes, one forming the inlet from the power wire, to which one of the switch terminals is connected, and the other the outlet to the stud, making a connection for the other switch terminal. The studs on the Benares system will probably be spaced 15 ft.

The making and breaking of contact is effected as follows: A bar suspended from the car and running in the T-rail conduit throws a lever round about 90 deg. and causes the spindle to which it is attached to revolve. At the other end of the spindle, inside the box, a double-armed brush is mounted, which revolves also with the spindle. This engages the brushes with the terminal jaws on each side of the box, the stud being connected to one jaw and the power wire to the other, so that, on the operation of the lever, the circuit from the wire to the stud is closed by the double-armed brush bridging these box terminals, thereby enabling the car to get current. Provision is made for the immediate return of the lever and the brushes to their normal positions.

The special car equipment consists of a skate and operating bar. The skate, or collector, is made of a single bar of T-steel hung either from the axles or a special bracket attached to the body. The skate is hung on slides which limit its downward movement, but permit it to rise enough to



CROSS-SECTION AND LONGITUDINAL SECTIONS OF SURFACE CONTACT SYSTEM FOR BENARES, INDIA

clear ordinary obstructions. The operating bar is hung either from the side frames or from the axle boxes and travels in the shallow conduit to operate the switches. This bar is slightly longer than the collecting skate, while the latter is also slightly longer than the distance between the studs on the track. The skate is always on one stud, which is made alive before the skate gets over it, and is not cut out of circuit until after the skate has left it. This bar is jointed and accommodates itself to the track curvature.

Felix Martinez, of Juarez, Mexico, has authorized the announcement of his plan for the construction of an electric railway in El Valle.

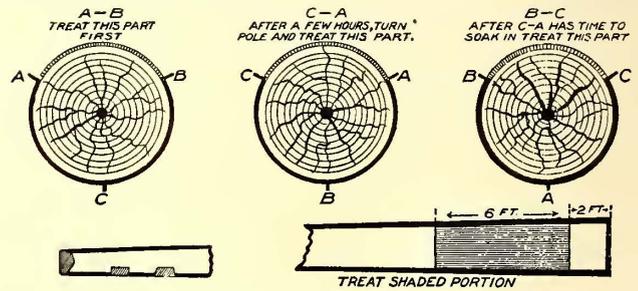
PRESERVING POLES AND CROSS-ARMS

For the better information of new users of Avenarius carbolineum, the Carbolineum Wood Preserving Company, of New York, has prepared a set of directions based on the data furnished by many large railway, telephone and telegraph companies which have had wide experience with this preservative. An abstract of the specifications follows:

To obtain the best results, only seasoned timber should be used. All trimming should be done before treatment.

BUTTS.

Partial Butt Treatment.—Paint 3 ft. of the butt so that the treatment will extend 2 ft. below the ground line and 1 ft. above. Apply two hot coats of the preservative and run the



SECTIONS SHOWING COURSE OF TREATMENT

carbolineum well into all seasoned checks. Allow about one day between coats for drying.

Entire Butt Treatment.—Extending from 1 ft. above the ground line to the bottom of the pole, apply two hot coats of Avenarius carbolineum, running all seasoning checks full of the oil. Second coat not to be applied until the first coat is dry.

Special Butt Treatment.—Treat the poles with at least two and preferably three coats, applied about a day apart, in the manner illustrated in the drawing below, care being exercised to run all the seasoning checks full of oil; the pole to be left for several hours in the same position as when treated, in order to facilitate the impregnation. Apply at a temperature of 150-200 deg. Fahr. Treat one-third of the pole at a time, as shown in the drawing.

NOTE.—Use wire-bound brushes 4 to 6 in. wide, and preferably roofing brushes with 2-ft. handles. For country lines, where poles are set in grass, it is recommended to treat 2-ft. above the ground line to minimize the danger from grass fires. The method of butt-end treatment should be the one best adapted to soil and climatic conditions. The knotty surfaces, being especially susceptible to decay, should receive extra

heavy treatment. Partially seasoned timber should be treated at a temperature above the boiling point of water. Avenarius carbolineum boils at 557 deg. Fahr. It is suggested that treated poles be marked for identification, with a dating nail or other marks showing the time when they were set.

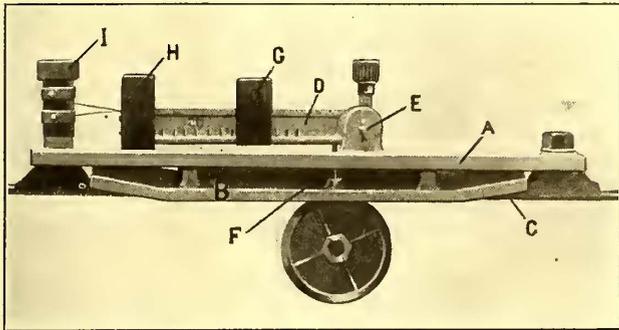
CROSS-ARMS.

Tank Treatment.—Heat the preservative in an open tank to a temperature of 150-200 deg. Fahr. Dip the arms in the oil for from 5 to 15 minutes, according to size of arm and quality and character of lumber. Partially seasoned arms should be treated at a temperature above the boiling point of water.

Brush Treatment.—Paint the arms with two coats of the hot oil, applying liberally to the cut ends and running it well into the pinholes and seasoning checks. Use wire-bound brushes. Allow ample time between coats for drying.

TROLLEY TENSION INDICATOR

The effects on the overhead work of arcing and undue strains and of hammer blows of trolley wheels at ears, frogs, section insulators and other fittings make the subject of trolley tension one of great import. This is especially true of roads which operate at high speeds and where the tendency is to employ a higher tension on the pole than is absolutely necessary. Several methods of determining the tension exerted by the wheel against the wire have been proposed, but none has been adopted to any extent except perhaps that of using a spring balance, which is cumbersome



TROLLEY TENSION INDICATOR

and more or less inaccurate. For this reason, and especially to enable motormen on returning to the depot to note and record the tension with facility, the Consolidated Accessories Company, of London, England, introduced in that country some time ago the trolley tension indicator illustrated herewith.

This device consists essentially of two half-ears arranged so as to communicate the thrust of the trolley wheel to a weighted arm suitably fulcrumed to record the pressure exerted. The two half-ears support between them a cast plate, *A*, to the side of which is hinged an inclined cast plate, *B*, which has a groove, *C*, running parallel with the trolley wire throughout its length for the purpose of engaging with one of the flanges of the trolley wheel. On the top of the plate *A* is a lever *D* working on the fulcrum *E*, consisting of a hardened knife-edge. A small lubricator above the knife-edge keeps the knife-edge and its bearing thoroughly oiled, to the exclusion of damp and rust. The lever is connected with plate *B* by means of the pin *F*, so that any motion of the plate *B* is freely transmitted to the lever, causing it to lift about 1 in. as a maximum. The weight *G* is free to be moved over that half of the scale in its neighborhood, and, according to the position it is fixed relative to the scale, exerts a downward pressure on the hinged plate, through the medium of the pin *F*, varying from 15 to 25 lb.

The second weight *H* is not fixed to the lever, but is slotted out so that the lever can be moved from its slightly inclined position, shown in the sketch, to a horizontal one, before it begins to engage with this weight and lift it. According to the relative position of this weight on the scale, some 2 to 5 lb. pressure can be exerted on the plate *B*. The two scales are marked directly in pounds, for convenience in setting the weights to whatever the requirements may be. Assuming that the first weight is set at 20 lb., if the trolley tension is less than this the lever will not move, and, if equal, it will be moved to a horizontal position and there retained, as the second weight has now engaged with the lever and is ready to exert its weight on it. If this second weight is set to give 24 lb., then, if the trolley tension exceeds 24 lb., the lever will be further moved upward,

lifting the second weight with it. It will be seen, therefore, that the minimum tension can be varied between 15 and 25 lb., and the maximum tension between 17 lb. and 30 lb. Experiments made in regular service show 3 lb. to be the variation between minimum and maximum tension that can be worked in practice, the closeness with which the minimum and maximum tension can be worked depending, of course, upon the design of the trolley and its sensitiveness. *I* is an insulator with two contact pieces arranged to make contact with two springs fixed to the end of the lever. The first movement of the lever causes contact to be made, lighting up a green lamp, and the second movement a red lamp. No lamps alight indicate that the tension is insufficient; a green lamp only, that the tension is correct, and a red and green lamp, that there is too much tension. The indicator is simple in construction, requires no cutting of the trolley wire and can be quickly installed in the overhead system.

GENERAL ELECTRIC RAILWAY MOTOR CONTROLLERS

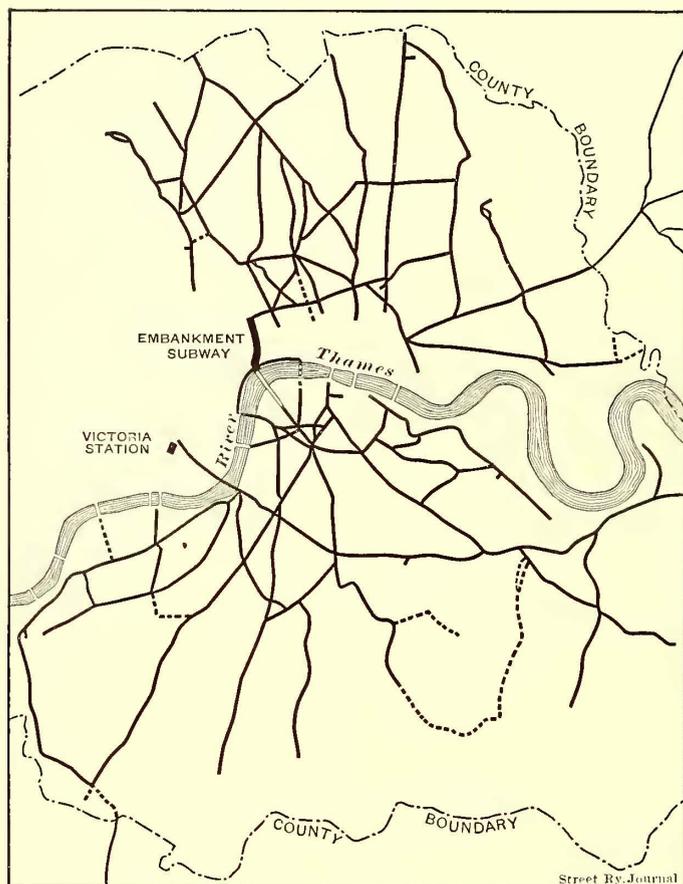
The object of Bulletin No. 4578 recently issued by the General Electric Company is to describe in a comprehensive manner the essentials of the various standard controllers that are manufactured for railway service with special reference to the operating conditions for which each type is suited. Among the controllers described are Type B, which include the necessary contacts and connections for electric braking; Type K, for series parallel operation; Type L, also in the series parallel class, but which completely open the power circuit when changing from series to parallel; Type R, which are designed to control the motor speeds by means of resistance only, and a brief outline of the Sprague-General Electric Type M control system. Details of some of the advantages of General Electric controllers are given in paragraphs describing the magnetic blowout, cutout switches that facilitate removing any motor from circuit without affecting the operation of the remaining motor or motors, interlocks which, to a great extent, prevent the misuse of the controller by the motorman, and interchangeability of parts which insures ready renewals or repairs and economy of operation. Tabulated data and dimension diagrams of the many standard forms of controllers together with illustrations of the apparatus provide ready means of reference.

NEW TYPE OF ALTERNATOR

The Electric Construction Company, of London, has recently placed on the market a 1000-kw alternator for turbo operation. The first machine, connected to a Willans-Parsons turbine, has been installed in the electricity works of the Wolverhampton Corporation. The rotor is of the cylindrical, smooth-core type with four poles and distributed windings in open slots cut in a solid block of steel. All of the slots are parallel or at right angles to each other. In this way former-wound coils can be placed in the parallel slots without disturbing the form of the coil. The winding in each slot is subdivided into two or three sections, according to the depth of the slot, and each section is held in position by phosphor bronze wedges. The end connections are formed by steel plates. The stator windings do not differ materially from those of other similar machines. The alternator is provided with air suction, the cold air being drawn in at the base and discharged from funnel-shaped openings at the top.

LONDON LETTER

The most important event connected with the tramway situation in London this month has been the opening of the new link connecting the southern and northern tramways, the two systems having hitherto been divided by the river Thames. Some time ago rights were procured for crossing the Thames by way of Westminster Bridge and the construction of the tramways on the embankment followed, thus extending the southern system across the river but providing no link with the northern system. From Holborn also some time ago a subway, under Aldwych, was built and completed as far as the Strand. Now the connecting link from the Strand under Wellington Street, which forms the approach to Waterloo Bridge and comes out at one side of Waterloo Bridge on the embankment, has been completed, and regular service has been commenced. The work of constructing this continuation of the subway and the tramway was begun about a year ago. The cost has been about £96,000, the other portion of the subway having



MAP OF LONDON COUNTY COUNCIL TRAMWAYS JOINED BY OPENING OF ALDWYCH EXTENSION

cost approximately £145,000. The work has been carried out under the supervision of the Council's chief engineer, Maurice Fitzmaurice. It naturally divides itself into three different parts: first, the alteration of Waterloo Bridge abutment so as to admit of an entrance to the subway from the embankment; second, the underpinning of the viaduct supporting Wellington Street; and, third, the construction of two tubes under the Strand. It will be remembered that at Waterloo Bridge there existed a staircase at either side leading from Wellington Street to the embankment. One of these staircases has been removed and a new semi-circular arch formed to admit the cars, the whole work harmonizing with the architecture of the bridge, which is generally conceded to be one of the finest structures of its kind. The work of underpinning the viaduct supporting Wellington Street presented many difficulties, as the viaduct was built at the same time as the bridge and consisted of 16 arches carried on brick piers. The work had all to be done without interfering with the surface of the street above. The cars which use the subway are single-deck, as it was considered that the expense of making the subway deep enough to allow of the usual double-deck car would be too

great. The cars are all semi-steel, and wood and other material entering into their construction have been specially treated to render them non-inflammable. It is now possible, therefore, to travel from any part of the southern system to most any part of the northern system by means of this link, though changes of cars necessarily have to be made at certain points. The first services of cars will be between Highbury Station and the Tower Bridge and between Highbury Station and Kennington Gate, and changes can therefore be effected in the north at Highbury Station, at the Angel, at Gray's Inn Road and other places where cars are passing for all the northern points. Similarly, in the south connections can be made at Westminster Bridge, Kennington Gate, St. George's Circus, Elephant & Castle and Tower Bridge with practically every line in south London. The chairman of the London County Council officiated at the formal opening ceremony.

Just as interesting from another point of view is the audit of the London County Council tramways accounts made by Messrs. Peat and Pixley. Already it has given rise to many questions about the financial condition of the tramways. The report of the auditors was certainly not flattering, and though the experts approve the excellent manner in which the accounts were kept they take exception to the fact that the Council included in its capital account the outlay on both the horse traction and the electric tramways, the latter including the expenditure on street improvements. All the tramways in London previously were, of course, horse tramways, and the sum outstanding for outlay on the horse traction amounted to £2,380,736 and for electric traction £4,356,000, making a total capital account of £6,736,737. This principle the auditors do not consider sound, as there are practically no existing assets to represent the horse system of traction so far as it has been displaced. They consider there is a loss on the tramways of more than £1,000,000 and that no profits can possibly be derived from the tramways for the repayment of rates until this amount is wiped out. This is, of course, a debatable point and has given rise to many discussions, especially among the Progressives, who are out of power and who maintain that it is ridiculous to consider this £1,000,000 which had to be paid for the old horse tramways as a loss. They point to the fact that as far as profit is concerned as the income tax officers had assessed their profits at £400,000 and that they had to pay income tax on that amount it would look as if there were a considerable profit; goodwill must surely count for something and that is represented by the money which was paid for the old systems. Notwithstanding all this, recently, when sanction had been granted for the issue of new London County Council stock to the amount of £2,750,000 carrying interest at the rate of 3½ per cent, the writer understands that the issue was subscribed 30 or 40 times over.

In addition to what we have already written regarding the London tramways, it is interesting to note that during the past month two new lines of electric tramways have been opened, one being from Brixton to Victoria Station by way of Vauxhall Bridge and the other between Greenwich and the Obelisk at Lewisham. It is also interesting to note that as a result of the negotiations between the London County Council, the Highgate Hill Tramways, Ltd., and the Hornsey Corporation, the County Council will purchase the system. The line is about three-quarters of a mile long, double track, and is of narrow-gauge and worked by cable. It has been a source of anxiety to the company for some time to get sufficient revenue to maintain the system. The plan is to join it with the existing Council tramways at the Archway Tavern. The cost of conversion to electricity will be about £53,000.

It is interesting to note that Fulham Borough Council has decided to sanction the use of the overhead trolley on the tramway from Hammersmith Broadway across Putney Bridge to a point in Lower Richmond Road. This tramway was sanctioned under a 1902 act, but the use of the overhead trolley was forbidden. With sanction of the authorities through which the tramway will run, however, the County Council will ask Parliament for permission to adopt the trolley. The line when completed will enable passengers to travel in through cars from Putney to Harlesden. It is comforting to note that certain boroughs of London are overcoming their prejudice to the overhead system, as the underground conduit system is undoubtedly too expensive, except in the densely populated districts of London.

Though the G. B. surface contact system in the East End of London has been completed for about a month, service has

not yet been opened. At a recent meeting of the London County Council questions were asked of the chairman of the highways committee as to when this particular section would be opened. The reply was that the chairman was still thinking and that his thoughts at the present moment were not fit for publication. Undoubtedly there has been trouble, and it would appear that the calculations have been upset by the heavy traffic. While this system has been a success in Lincoln, it is, of course, a much more difficult thing to make a success of it in streets where the traffic is probably a hundredfold greater than that which obtains in that comparatively quiet town.

While on the subject of surface contact systems, it may be interesting to note that the Rawmarsh, Swinton and Mexbro' Urban District Councils have been holding conferences to consider the situation of the tramways operating in their territories constructed on the Dolter surface contact system and which, so far as we can gather, have never been a complete success. It would appear almost certain that the overhead system will be substituted before long, and resolutions have been passed at the various Council meetings recommending the company to install the overhead system and making various proposals as to the financing of the change. Little sympathy will be forthcoming for this particular misfortune, as there appears to have been no reason why tramways in that district should not have been constructed on the overhead system. There are, of course, places where some compromise has to be arrived at and where the overhead system meets with reasonable opposition and would be detrimental to the general surroundings, but in this particular district no such reasons existed.

A tramcar parcels express has been inaugurated by the South Metropolitan Company, which operates in the suburbs of London, in connection with the services of cars between Croydon and Wallington, Carsbalton, Sutton, Mitcham, Tooting and Penge. The conductors receive packages at any of the recognized stopping places, or they may be left with certain agents, and they are dealt with by special messengers. The rates for collection and delivery within half a mile of any part of the lines vary from 7 lb. for 3d to 56 lb. for 7d.

The acquisition by Morecambe Corporation of the tramways which run along the sea front appears now to be a foregone conclusion. The matter was raised at the Town Council recently, when the Mayor, replying to a question as to what steps were being taken toward securing the money for purchasing the tramways, said the question was premature. The corporation did not know what to apply for until it knew the price the company would ask.

The tramways committee of the York City Council reports that the Light Railway Commissioners have held their local inquiry into the application of the corporation for a light railways order, the application being opposed by the North Eastern Railway Company. At the conclusion of the inquiry the commissioners intimated that they would grant the order subject to a clause being agreed upon between the corporation and the railway company for the protection of public access to the railway station. The commissioners also decided that no lines should be laid in front of the railway company's new offices.

It is planned to form a company to construct and work a new system of electric tramways, to be known as the Oldham & Saddleworth District Tramways. There are four tramways contemplated in the scheme. The first, about 4½ miles long, is to commence at a junction with the Stalybridge, Hyde, Mossley and Dukinfield tramways at the Mossley boundary, along the public roads, through Friezland, Waterside, Greenfield, Upper Mill and Dob Cross, and terminating in the main street of Delph. Another, more than 2½ miles long, is to commence at a junction with this line and proceed thence along the Oldham Road, through the main streets of Springhead, terminating at a junction with the Oldham Corporation tramways. The third, about 5 furlongs 2 chains long, runs from the last-named tramway to the boundary of the borough of Mossley, and the fourth, a little more than 6 furlongs long, connects the third with the terminus of the Stalybridge, Hyde, Mossley and Dukinfield tramways in Stamford Street, Mossley. The idea is that these new lines, in connection with the tramways of the Manchester and Oldham corporations and of the Stalybridge, Hyde, Mossley and Dukinfield Tramways Joint Board, shall form a continuous route between Oldham, Saddleworth, Springhead, Mossley and Manchester, through a densely populated district, the more distant parts of which are at present inadequately provided with tramway facilities.

Before the Select Committee of the House of Commons

details were recently given of a plan for establishing in Ireland a new electric supply generated by peat gas. The Dublin & Central Ireland Electric Power Company is seeking powers to supply electricity and has arranged to purchase 500 acres of peat bog in the district. Hitherto one of the chief objections to the use of peat for generating power is that it contains 90 per cent of moisture. The promoters propose to use a process, common in Germany, by which it is advantageous to retain 50 per cent of moisture in peat, thereby obtaining by-products which alone would pay the cost of the fuel. The committee has, however, refused to grant the powers, and the bill has been thrown out for this session.

Two important additions to the Edinburgh cable tramway system will be opened to the public soon. The larger of the two, that known as the Gilmore Place tramway route, displaces the last remnant of horse haulage in Edinburgh, while the other, the Gorgie extension, has for its immediate purpose the provision of additional facilities for reaching the Scottish National Exhibition. The Gilmore Place line is about 2 miles long, and for two-thirds of its length it is double. In connection with its construction four pits have had to be built, three of these being at the Gilmore Place end and the other at the Craiglockhart terminus. Of the three at Gilmore Place, two are in connection with the auxiliary cable for hauling the cars to and from the cables in Home Street. The machinery in these pits is in all respects similar to that in use at the other tramway junctions and termini in the city, but the construction of the Home Street pit has entailed on the engineers, Messrs. Dick, Kerr & Company, a somewhat heavy task, in that the pit has had to be built while the South Side cars were running overhead.

The terms of the agreement between the National Electric Construction Company and the Oxford Tramways Company have been arrived at without the necessity of incurring the costs of arbitration. The sum of £34,000 is to be paid, and of this sum £24,000 and costs is to be satisfied by mortgage debentures in the future company allotted to the shareholders of the present company, the remaining £10,000 to be paid in cash to the debenture holders.

A. C. S.

NEW PLAN FOR REORGANIZING WESTINGHOUSE COMPANY

A new plan of reorganization for the Westinghouse Company has been submitted by the merchandise creditors' committee and a committee of the stockholders for an issue of \$10,000,000 of new stock without a bond issue. The plan has been submitted to the readjustment committee and approved by it. The merchandise creditors' committee propose to accept for their claims \$4,000,000 of this stock. The remaining \$6,000,000 is to be taken by the creditors of the Security Investment Company and individual stockholders.

IMPORTANT OREGON PROJECT

The Oregon Electric Railway Company, which recently placed in operation the local lines in Portland on which it has been working for some time, has announced plans for improvements, which include as their most important feature an extensive system of interurban lines aggregating about 250 miles. As a first step the capitalization of the company has been increased \$7,500,000, or from \$2,500,000. The plan of the company is the most important railroad announcement to Portland since the North Bank road was projected from Pasco, Wash., to Portland. The following new lines were authorized by the directors of the company: Salem to Albany, 18 miles; Garden Home to Hillsboro, 12 miles; Hillsboro to Tillamook, 57 miles; Tigardville to Eugene, 125 miles; Salem to Mill City, 54 miles, and Albany to Cascadia, 35 miles. Total mileage, 301. With the 50 miles already constructed by the company between Portland and Salem, the construction of the new lines just authorized will give the Oregon Electric 351 miles of standard gage railroad in the State. Moffatt & White, of New York, are managers of the syndicate that is supplying the capital for the company's operations in Oregon. The executive committee is made up of the following New York capitalists: A. C. Bedford, George Barclay Moffatt and William A. White. W. S. Barstow & Company have assembled construction materials and will begin work at once on the Garden Home-Hillsboro line. Upon its completion, attention will be turned to building

from Salem to Albany. The Oregon Electric Railway Company's principal officers are: George Barclay Moffatt, New York, president; Guy W. Talbot, Portland, vice-president; George F. Nevins, Portland, secretary; H. W. Brower, New York, treasurer.

REPORT ON CHICAGO UNION ELEVATED LOOP

In accordance with a request from the transportation committee of the Chicago City Council, George Weston, consulting engineer, has submitted to that body an elaborate report in which he states that the capacity of the loop will be increased 43 per cent by making the following changes: Through routing of trains; extension of station platforms and their rearrangement; development of stub terminals, and universal transfers.

It is believed that these changes will make it possible for the loop to handle comfortably 65,880 passengers an hour, where now it can only take care of 40,800 in the same time. This is based on sixty passengers per car, or only eight more than the average seating capacity. The changes would make it possible to run 1068 cars an hour, where there are now but 680, or furnish 55,536 seats in place of the present 35,360. This would mean the Metropolitan could put on eleven more trains, the South Side road sixteen trains, the Northwestern fourteen more trains, and the Oak Park line four more trains, and they would be six-car trains instead of five.

Mr. Weston points out that, while this increased capacity will relieve existing conditions and meet present needs, it is but a temporary arrangement, and the constantly increasing traffic will soon reach and pass it. He quotes Bion J. Arnold's curve "L" (published on page 117 of the STREET RAILWAY JOURNAL for Jan. 17, 1903), showing probable growth in the population with its accompanying growth of street car traffic whereby under the lowest computation the present figures of 57,700 passengers an hour now actually crowded into loop cars can be expected to grow to 128,097 an hour by 1927.

Mr. Weston would through route only the Northwestern and South Side cars. The Metropolitan and Oak Park he would allow to run around the loop as they do now. He would have the trains starting at Jackson Park run straight through to Wilson Avenue, and those starting at Wilson Avenue go directly to Jackson Park. So the Englewood branch of the South Side road and the Ravenswood one of the Northwestern would make another through route, and Belmont Avenue on the north and Fifty-eighth Street on the south might make the terminals of another.

His reason for joining the lines in this manner is that the Wilson Avenue line of the Northwestern runs fifteen locals and twelve express trains an hour, and the Jackson Park branch of the South Side road fifteen locals and eleven express trains, thus about balancing each other, while the Ravenswood branch of the Northwestern has twelve trains an hour from Ravenswood, and the South Side road eleven from Englewood.

On the loop Mr. Weston wants what he calls the "alternating system." He would have one northbound train go on the loop and take the inner track north in Wabash Avenue to Lake Street, and west in Lake Street to Fifth Avenue, thence north on the Northwestern. The next northbound train would go west in Van Buren Street on the outer track and north in Fifth Avenue. So one southbound train would come down Fifth Avenue and east in Van Buren Street to Wabash Avenue on the inner track and the next one east in Lake Street and south in Wabash Avenue on the outer track. In this manner the passenger who wanted to land at any particular station on the loop could make it by at least waiting over one train, while, if all northbound trains ran on one-half of the loop and all southbound ones on another, unless his station was on the right side, he would have to walk or delay for a transfer.

As for the Metropolitan and Oak Park trains, the engineer cannot see any particular benefit in through routing them. They would have to use only one-quarter of the loop, the Fifth Avenue side, where they would serve simply to unbalance the traffic, or else the other three-quarters, and they might as well go entirely around as run that far. He suggests to the Metropolitan that it could save mileage by using Lake Street to bring its Humboldt Park and Logan Square trains down to the loop and taking them back on its Douglas Park line, but it would not help the loop situation materially.

Universal transfers, Mr. Weston says, could be issued without any trouble. All that would have to be done would be to establish transfer stations on the loop and connect those on opposite sides of the tracks by elevated passage ways over them. It would not be necessary to make all stations transfer points; in his opinion five, one at Clark and Lake Streets, one at Adams and Wabash Avenue, one at State and Van Buren Streets, and one at Randolph Street and Fifth Avenue would be enough.

Mr. Weston also advocates cutting down the stations in Van Buren Street to two, owing to the time lost at present on account of the interlocking switches at Van Buren Street and Fifth Avenue, and Van Buren Street and Wabash Avenue. To get the stations out of the way he would move the La Salle Street one farther east and the State Street one west, and abolish the Dearborn Street one as unnecessary.

Lengthening the station platforms so that two six-car trains could load and unload at the same time would increase their capacity 30 per cent. Twenty per cent of this would be gained by the added cars and 10 by eliminating the present wait of trains until the one ahead can get out of the way. The existing eighteen-minute schedule for circling the loop would be cut down to fifteen if these waits were taken out. As to improving the construction of the loop stations, Mr. Weston says:

"The lengthening of the station platforms brings up the question of obstructing the light and darkening the first story of business places adjacent to the platforms. Inasmuch as I am firmly of the belief that the platforms should be lengthened, if permanent or temporary relief to the loop is to be secured, the subject of light in connection with the station platforms has been given careful study, with the result that by the use of prismatic glass the station platforms can be made a source of increased light through first story windows, and instead of the platforms being an obstruction to the light, they would be of assistance in lighting the stores or street beneath.

"A different construction would be required to carry the extended platform from that now in place upon the elevated structure. The rays of light reflected from the prismatic glass must have an unobstructed path to the windows. This can be accomplished either by the use of lattice girders on the building side of the platform, or the use of bracket construction and a method of supporting the platform that will give an unobstructed path for the rays of light from the station platform to the store windows."

In summing up the gains the plans would effect, the report states that the added trains an hour would be forty-five, divided according to this table:

Road.	Present number.	Added number.	Total number.	No. passengers.
Metropolitan	42	11	53	18,000
South Side "L"	43	16	59	19,800
Northwestern	43	14	57	19,080
Oak Park	23	4	27	9,000
Totals	150	45	195	65,880

This allotment of 65,880 passengers is based on the presumption that they will be distributed at the rate of sixty to a car.

At present the passengers taken on at loop stations by a total of 680 cars are divided in this manner:

Metropolitan	13,000
South Side "L"	13,000
Northwestern	14,000
Oak Park	6,000
Total	46,000

In addition the Metropolitan takes on an average of 8000 passengers at its Franklin Street station and Fifth Avenue stub terminal, the South Side "L" an average of 2,800 at Congress Street, and the Oak Park road 700 at Market Street.

PILFERER OF FARES IN BOSTON GOES TO JAIL

A conductor of the Boston Elevated Railway Company was tried in the Brighton District Court, April 18, on a charge of larceny of fares from that company March 12 and April 15. He was found guilty and was sentenced by Judge Barnard to six months in the House of Correction.

RECOVERING FROM THE EFFECTS OF THE CHELSEA FIRE

The \$8,000,000 fire that on Sunday, April 12, literally wiped out 340 acres of the city of Chelsea, Mass., practically cancelled the territory of the Boston Elevated Railway lines in that city, at least until rebuilding of the burned district brings back its population, and destroyed about two miles of the Boston & Northern Street Railway's trunk lines in and out of Boston. Few fires have wrought such havoc. Nothing was left but the cellars of buildings, and the paved way and car rails in the streets. All overhead work was broken, and the rails of the Boston & Northern for about 500 feet in the hottest part of Broadway, the main thoroughfare, were so twisted by the heat as to necessitate reconstruction.

Fortunately for the Boston & Northern Company, its two car-houses in Chelsea were both about a mile to the north of the district affected by the fire, while its Chelsea power house was a quarter mile to the south. Of double track on Broadway the fire destroyed 2753 feet, or a total equivalent single track of 5506; on Washington Avenue, 2146 double track, a total of 4292; on Everett Avenue, 2230; thus including a total destruction of 12,028 feet of trackage of 90-lb., 9-in. girder rail, and practically all the overhead work for the entire distance. Hard pine poles had been used and only one was left standing.

Owing to the phenomenal spread of the fire, through blazing brands driven far ahead by the gale that blew from morning until night, the flames were close to the railway thoroughfares before their proximity was realized. Power was cut off with about 16 cars still on the lines eventually traversed by the fire. One of these, a large double-truck Malden-Melrose car on Everett Street, had to be abandoned, and was destroyed. The others were reached with teams of four horses each and drawn north, some distance beyond the Boston & Maine Railroad bridges on Broadway and Washington Avenue. The abandoned car was the only property of the Boston & Northern destroyed that was insured. The company's loss was about \$30,000.

The company stopped running cars when power was shut off Sunday afternoon at 1.30 p. m. The fire was out about 2 o'clock Monday morning, and a few men were at once put at work clearing out the wire and debris. Teams with gangs of men from all over the system were allowed in the burned district between 3 and 4 p. m. Monday, and the company was ready to run cars through Broadway at 6 a. m. Tuesday. The first car was run through at 7.15 a. m. The fire district was not without service, however, during the conflagration, for cars were run regularly from the fire lines to the different termini. In less than 42 hours from the time the power was shut off the Broadway line was restored and traffic resumed. This was less than 16 hours from the time gangs were allowed inside the lines to go to work. The Washington Avenue line opened at 4.30 p. m. Tuesday and the Everett Avenue at 10 p. m.

The southern boundary of the fire was directly through the company's car station in Chelsea Square, the headquarters of the Chelsea Division. Many transfer checks and other paraphernalia of the accounting department were destroyed, but the waiting room was not rendered entirely useless. About 26 married employees and 16 single men lost their homes in the fire, most of them conductors, motormen and shop hands.

Naturally the company did a tremendous business carrying people to the edge of the fire district. After the service was restored through the district, however, the travel of mere sightseers was enormous, on both the Boston & Northern and Boston Elevated lines, as passengers on either line could see to the outskirts of the city, across the ruins, without leaving the cars. For the first day or two after resumption the car doors were closed by militia orders on reaching the district and the cars required to run without stop straight through to the opposite border before taking or leaving passengers. Both lines advertised the sight-seeing possibilities and attracted patronage from far and near. April 19 and 20, a Sunday and a holiday, the travel was enormous.

Strangely enough, it was in relief work for those burned out by the fire that trolley express cars were operated for the first time in the cities and towns between Boston and the Merrimac River to the north, as well as in Boston itself. The Boston & Northern offered the use of one or two new cars, which it is preparing to operate in the northern district, as well as other cars of the same type from those now used in express service on the Old Colony Street Railway, south of Boston. These cars brought in clothing and supplies from

Lowell, Lawrence, Haverhill and other places north; and from Brockton, Taunton, Fall River and Quincy south. This free transportation actually developed gifts of supplies from these more distant communities, and contributed to their effectiveness by landing them without delay where they could be quickly distributed. The Revere town hall, the Chelsea police station, and the relief headquarters at Keany Square, Boston, were used as places of unloading, the unloading being done by militiamen. Co-operation of the Boston Elevated was necessary for the operation of these cars through Boston, but General Manager C. S. Sergeant was no sooner advised of the need than he took the matter up with President Bancroft, and the Boston & Northern was given free hand in the matter, the Elevated providing crews to handle the cars while on its lines.

The Boston Elevated's loss in the fire reached probably \$30,000 to \$35,000, although no official figures are obtainable. Curiously enough, the southerly edge of the burned district is at or within a few hundred feet of the river across which the company enters Chelsea from East Boston, and the northerly edge just beyond the site of the Chelsea car house, which was entirely destroyed together with seven snow plows stored without motors, and several wagons. There is understood to be a fair amount of insurance on all, whereas the Boston & Northern was insured only for the abandoned car. But in place of a population of 20,000 to serve, the Boston Elevated lines have nothing but the ruins; whereas the Boston & Northern lines still reach a heavy local traffic and all the through patronage. The Elevated company's property destroyed aggregated about 14,000 feet of line, but the company had gangs at work clearing up by Monday morning, and the first car through the burned district ran at about 9:30 a. m. Tuesday.

INDIANA REPRESENTATIVES BEFORE TAX BOARD

Representatives of a number of Indiana interurban companies appeared before the Indiana Tax Board the past week, and argued against an increase of the rate of assessment per mile of their roads for taxation. In some cases a reduction was asked, and in some a desire was expressed that the assessment of 1907 be the rate for 1908. The traction men showed by their reports that the business of the Indiana traction lines was not so good in 1907 as in the previous years. While they hauled more passengers and a greater amount of freight, the cost of maintenance was greater because of the high price of material and supplies. It was pointed out that some of the lines had been constructed a sufficient length of time to begin to show depreciation to a greater extent than in previous years. There was no attempt on the part of some of the roads to conceal the fact that there would be a deficit this year.

Ex-Governor Durban, who at one time was chairman of the tax board, appeared in behalf of several lines in which he is interested. He presented figures to show that the interurban lines were assessed higher in proportion to the earnings than the steam roads and said the gross earnings of the steam roads for 1906 in the State amounted to \$11,867 per mile, while the gross earnings of the traction lines were only \$6,769 a mile. The net earnings for the steam lines for the same time were \$477 a mile, while the net earnings of the traction lines were only \$23 a mile. The valuation of the steam and traction lines was compared and the statement made that the amount of taxes paid by the interurban lines was nearly five times that by the steam roads, basing the comparison on the gross earnings of steam and interurban roads.

EARNINGS IN SAN FRANCISCO

The first official statement of the loss in gross earnings sustained by the United Railroads of San Francisco during last year is contained in a brief annual report of President Calhoun, which has just been made public. His report of gross earnings for 1907 shows \$4,745,116, as compared with \$5,955,786 in 1906, a decrease of \$1,210,670. This latter sum is therefore the loss in gross receipts, caused largely by the strike which began May 5, 1907, and continued until late in the fall. The company's business so far this year is shown by reports for January and March last. In January last the gross receipts were \$499,770, as compared with \$537,994 for the same month of last year, or a decrease of \$38,224. The March gross earnings were \$558,524, as compared with \$537,700 for March, 1907, or an increase of \$20,824, or 3.87 per cent.

THE CLEVELAND SITUATION

The latter part of last week was spent by Mayor Johnson and F. H. Goff and members of the City Council in holding meetings in the various wards to ascertain the feeling of the people on the proposition to fix a price of \$55 a share for the Cleveland Electric stock on the leasing proposition, as suggested by Mr. Goff at the meeting on Tuesday. In nearly every instance the vote was almost unanimously in favor of accepting this figure and in a general way the public seemed pleased at the prospects of peace. From the manner in which they expressed themselves on this question, it is believed they would have been just as eager to arrive at a settlement at \$60. According to the expressions of councilmen at the public meetings, the proposition to put a rate of six tickets for a quarter in the security franchise was a stumbling block for a large number of the people in their wards, but if anything can be judged from what was done, the people had very little interest in this matter. The indications are that the people were willing to settle with the old company at a rate of seven tickets for a quarter, if they had been left to decide it themselves without advice from any one.

Details of the traction settlement were made public last week in the belief that an agreement would be reached within a few days. The exact mode of transfer was prescribed and manner in which all the papers shall be handled agreed upon. It was understood that when the security grant should be passed the Forest City Railway Company would acquire the property and franchises of the Low Fare Company and then the contract between the Cleveland Electric and the Forest City, providing for the purchase of all the assets of the latter by the former, will be closed. The purchase price will be paid in capital stock of the Cleveland Electric issued at par. The authorized capital stock of the Cleveland Electric will be reduced to \$12,870,000, and the present outstanding certificates, amounting to \$23,400,000, will be called in. Action will then be taken to increase the capital stock to \$35,000,000, after which shares will be issued in the name of the Forest City Railway Company to pay for the property purchased and this will be distributed as the company may elect.

The name of the Cleveland Electric is to be changed to the Cleveland Railway Company and the directors are to pass appropriate resolutions authorizing the purchase of the assets of the Forest City Company and the execution of the lease to the Municipal Traction Company by which it will surrender all franchises, including those acquired from the Forest City Railway Company. The other companies are to take like action legalizing the transfer of assets to the Cleveland Electric and accepting the lease of its properties. At the same time all suits in court are to be dismissed and all the papers placed in the hands of Mayor Johnson and Mr. Goff, to be held by them jointly at the Cleveland Trust Company, so as to insure the performance, according to the plans outlined, of all the things to be done by the parties to the agreement.

As a result of the prospects of a settlement, the stock of the Cleveland Electric made several rapid advances on the Cleveland Stock Exchange. From 42 it gradually crept up, until Thursday of last week 600 shares changed hands at 53½. On Monday it advanced to 54¼ and about 500 shares changed hands.

At a meeting of the stockholders of the Cleveland Electric, Monday, the terms of the agreement were sanctioned by a vote of 169,728 shares out of a total of 234,000 shares. No votes were cast in the negative. However, at the meeting of the directors later, Vice-President J. J. Stanley went on record as being opposed to the settlement. He has always maintained that the terms were not fair to the stockholders.

A. B. Du Pont stated that the Municipal Traction Company would maintain an exchange for the stock of the Cleveland Railway Company if a settlement is reached, but that the security would not be listed on the Cleveland Stock Exchange unless the Cleveland Railway people request that this be done.

On the same day the formal transfer took place and the security franchise was delivered. Previous to this meeting the City Council had enacted the security franchise and it had been signed by Vice-Mayor Charles Lapp. It provides for the rights of the Cleveland Electric in the streets now occupied by its lines for 25 years at a fare of 5 cents or six tickets for a quarter. A roll call of the Council showed 28 votes in favor of the franchise to 4 against it. Mayor Johnson and Mr. Goff went to the residence of Mr. Goff after the vote had been

taken in order to allow Vice-Mayor Lapp to sign the ordinance and prevent any trouble from the claim that Mayor Johnson is financially interested in the operating company. He preferred that his name should not appear on the ordinance.

When the meeting was finally called to order in the Chamber of Commerce after the Council meeting, the lease, agreement and the ordinance just signed, which had been in the hands of Mayor Johnson and Mr. Goff, were presented to the companies. In each instance the Mayor announced their presentation, saying: "The lease has been exchanged and the ordinance has been delivered." President Horace E. Andrews, of the Cleveland Electric, then arose and handing A. B. Du Pont, of the Municipal Traction Company, a small key, said: "I formally deliver to you, Mr. Du Pont, the property of the Cleveland Electric Railway Company. I deliver to you the key of the Cleveland Electric offices, and I turn over to you the organization. I present the heads of our departments." The superintendents were all present, having come in with Mr. Andrews, and Mr. Du Pont addressed Mr. Andrews.

Mayor Johnson and Mr. Goff were appointed members of the board of directors of the Municipal Traction Company. Mr. Goff had at one time refused to have his name considered as a member of this board.

President Andrews stated that he would hereafter make his home in New York and give his attention to the electrical interests of the Vanderbilt system. Vice-President John J. Stanley stated that he would not leave Cleveland at once and that his plans had not been fully matured. It is probable that he will be connected with the Andrews-New York Central syndicate also. George Stanley, purchasing agent of the Cleveland Electric, is interested in Eastern tractions and will probably make his headquarters in New York. It is said that Henry J. Davies, secretary of the Cleveland Electric, will remain in charge of that corporation and be the representative on the ground of the owners.

The new companies took such action as placed them in position to accept the lease and begin the operation of the entire system. The Municipal Traction Company took hold of matters at midnight and Tuesday was designated as Municipal Day, in celebration of which everybody in the city rode free all day.

Under the lease and the action taken by the City Council the Municipal Traction Company will have a right to charge any fare up to 5 cents for a single fare or six tickets for a quarter, which is the maximum limit in the security franchise of the Cleveland Electric, no fare having been fixed for the Municipal Traction Company. It is asserted that the fare will be reduced to 3 cents on Wednesday with 1 cent additional for a transfer, but that the transfer charge will be eliminated within 10 days. This will make it possible to make the fare in the suburban towns anything up to six tickets for a quarter where contracts require the same rate as in the city, and any fare the company may see fit in municipalities where such contracts do not exist.

On Wednesday a straight 3-cent fare went into operation on all lines. All outstanding tickets were accepted as fares and in all cases 2 cents were refunded by conductors. The plan stimulated business to such an extent that all cars were packed.

According to a report telegraphed to the East at the time of going to press there are prospects of a strike by the employees, as the local union demands that the new company keep the pledge of the former Cleveland Electric Railway Company to raise all wages 2 cents an hour, immediately following settlement of the traction war. President Du Pont agreed to a 1-cent raise, at the same time cutting off all free transportation to employees.

Several conferences have been held between a committee of the employees of the Pittsburg Railway Company, representing the men and the officers of the company, at which a proposition was made for a reduction of 1 cent per hour, but no conclusion was reached. On March 28 it was suggested that the matter be referred to a board of arbitration on April 6, and an agreement was drawn up to this effect. Each side has appointed an arbitrator, but the third has not been chosen. Having exhausted every honorable means in its power to have this matter passed upon by a board of arbitration, the company has announced that it will, commencing May 1, 1908, pay the following rate of wages: First year, 24 cents per hour. Second year, 25 cents per hour. Third year and thereafter, 26 cents an hour. This rate will remain in effect until May 1, 1909, unless the arbitrators should determine upon a different rate, in which case the rates named by them will be paid as from May 1.

AFFAIRS IN NEW YORK

The Public Service Commission has formally approved the application of the Interborough Rapid Transit Company to issue \$30,000,000 5 per cent first mortgage bonds dated Nov. 1, 1907, and maturing Nov. 1, 1952, out of a total authorized issue of \$55,000,000. The \$30,000,000 bonds will be used as collateral for the \$25,000,000 3-year 6 per cent note issue of the Interborough Rapid Transit Company, underwritten by J. P. Morgan & Company. Further details have also been announced in regard to the note issue. It is stated that the \$25,000,000 notes are to be underwritten by a syndicate headed by J. P. Morgan & Company at 97, plus accrued interest from Nov. 1 last, the date of the bonds which will secure them. At the end of two and one-half years holders of the notes will be allowed to exchange them for bonds at 99. Some changes were made by the Public Service Commission in the specifications of the mortgage to secure the \$55,000,000 bond issue. The commission insisted that the lease of the Manhattan Elevated lines and the sale of the street railway tunnel, should such a sale be made, be incorporated in the mortgage, making these bonds a first lien on all the assets of the Interborough Rapid Transit Company. The redemption price of the bonds is placed at 105 instead of 110, as at first proposed. Chairman Willcox, of the commission, in announcing its decision, said: "I understand that this is the first time that Mr. Morgan's firm has undertaken such an operation for any railroad in this city. It is a source of great gratification."

The New York City Railway Company has received bids and has them under consideration for 150 double-truck cars of standard type, with 28-ft. body, and also 100 pay-as-you-enter cars for use on its Eighth Avenue line. According to General Manager Root, the cars are giving satisfaction on the Madison Avenue line.

The Public Service Commission hearing on the 10-cent fare to Coney Island is under way. Officials of the Brooklyn Rapid Transit Company believe it possible to show that the subsidiary lines not only have the legal right to charge the 10-cent fare to the Island, but that this fare is due them as a matter of justice, because of the character and length of haul. The connections of the South Brooklyn Railway Company and of the Sea Beach Railway Company with the rest of the Brooklyn Rapid Transit system have been considered. Cars are operated over the lines by the Brooklyn Union Company, charges being apportioned on a car mileage basis. The fares collected are apportioned between the several companies, depending upon the places of collection, being separated at the time of collection. This is a point on which counsel for the Brooklyn Rapid Transit hangs much importance. The matter of the so-called "free-fare zone" was taken up. It was explained that the arrangement was made to accommodate everyday traffic and to permit residents of South Brooklyn to ride to any point in Brooklyn for one fare.

The passage of the Coney Island fare bill does not affect materially the present situation in regard to this matter. The bill gives the Public Service Commission power to order a 5-cent fare to the island over the lines of the Brooklyn Rapid Transit Company and the Coney Island & Brooklyn Railroad Company. The commission has had the matter before it for some time and, as noted elsewhere in this column, a hearing is in progress.

STATEMENT FROM THE LONDON UNDERGROUND

The directors of the Underground Electric Railways Company, of London, Ltd., have made public the following statement in regard to the financial operation of the company:

"In 1903, when the £7,000,000 profit-sharing secured notes were issued, it was anticipated that the whole of the works undertaken by the company would be completed in the first half of the year 1906, thus allowing a period of two years of full operation of the whole system before maturity of the notes. It was also expected, on the basis of expert advice, that before the date of the maturity of the notes the Tube Railways and the District Railway would be earning sufficient revenue to pay dividends on the stocks and shares held by this company, and that the company in consequence would be able to sell at satisfactory prices sufficient of these stocks and shares to enable it to provide for its capital requirements and to pay the notes at maturity.

"The development of the District Company's traffic has been less rapid than was anticipated. Moreover, the tube construc-

tion work has taken longer than was expected, so that the Piccadilly tube was not opened until Dec. 15, 1906, and Charing Cross, Euston and Hcmstead not till June 30, 1907. There has therefore not yet been time for traffic on the tubes to develop, and though on the Baker Street & Piccadilly lines, which alone have been opened sufficiently long to afford a basis of comparison, the signs of increase are satisfactory, the receipts have not yet come up to expectation."

Comparative figures showing the results of operations of various divisions are then published. Those for the six months ended Dec. 31, 1907, include:

	Gross.	Gross, less	Surplus (b).	Gross in-
	op. exp.	op. exp.	6 months.	crease for
Baker St. & Waterloo...	£69,240	£25,324	£8,485	£5,788
Gt. North. F. & B.....	119,271	48,518	7,114	12,701
C. Cross, Eu. & Hem....	74,328	12,975	(d) 5,627	not in op.
London Un. Tram.....(a)	345,570	130,898	9,411	17,674
Met. Dist.....	224,463	68,394	(d) 45,328	3,835

(a) For year, not for 6 months. (b) After deducting interest. (d) Deficit.

ANNUAL REPORT FROM BERLIN

The report for 1907 of the Grosse Berliner Strassenbahn shows that despite snow troubles with the conduit system and unfavorable spring weather, the company was able to pay the usual 8 per cent dividend on about \$25,000,000 stock. After a hard struggle, the municipal authorities permitted the company to abandon all conduit installations except the square before the Brandenburg Gate. Even there provision has been made for temporary overhead operation whenever snow and ice cause trouble in the conduits. The company is allowed to increase the percentage of standing passengers during rush hours.

There are now in operation 2494 cars on 521.7 km (323.4 miles) of track, and all of the cars added recently are of the double-truck semi-convertible type; 378,200,000 passengers were carried in 1907, an increase of 3.87 per cent. The income from fares was 35,976,381 marks, an increase of 3.88 per cent, while the mileage rose from 82,873,635 car-km (51,381,653 car-miles) to 85,718,727 car-km (53,145,610 car-miles) or 3.43 per cent. The gross earnings per car-km were 42 pfennigs, equivalent to 16.8 cents per car-mile.

The total gross earnings in 1907 were 36,592,440 marks, against 35,174,338 marks in 1906, and the respective operating expenses 20,255,066 marks and 18,968,847 marks. The percentage of operating expense to gross earnings consequently rose from 53.9 per cent in 1906 to 55.3 per cent in 1907. The salary and wages account was 9,233,345 marks, an increase of 327,246 marks, due to granting the 10-hour day to all conductors. This has also brought a corresponding increase in the different employees' benefit funds, to which the company contributed a total of 739,344 marks. The damage and insurance expenditures for 1907 were 442,534 marks. The renewal fund was increased 2,335,000 marks, and the amortization fund 200,000 marks, the usual amount.

The report also contains some interesting data showing the success and growth of the employees' benefit societies. The society founded for old age pensions in July, 1900, and broadened in January, 1907, to include widows, has 6272 members and a total fund of 5,993,937 marks. During 1907 the employees contributed 384,624 marks and the company 435,445 marks; the interest on the money invested was 225,897 marks. This old age provision went into effect July, 1905, and there are now 123 pensioners, including 14 widows. One member who left Germany was given three years' payment in full settlement.

The sick benefit society has 10,306 male and 41 female members, and a force of 80 male, 3 female and 52 special doctors. There were 8176 cases of illness, totaling 118,155 days, an average of 14.45 days per case. It is customary to give free treatment and medicines to employees and their families to a maximum of 26 weeks. The total income of this fund for 1907 was 522,632 marks, and the outlay 522,129 marks. The reserve fund consists of high-grade securities valued at 364,700 marks.

The company has also rendered assistance to the building and loan society formed by its employees. Five buildings containing room for 300 families are now in use. The particulars of this scheme were given in the STREET RAILWAY JOURNAL of May 4, 1907, in an article entitled "The Construction of Employees' Homes by German Electric Railways."

LOEB'S RELATION TO THE WASHINGTON COMPANY

The frequent mention of late of the possibility of the election of Mr. Loeb, secretary to the President, to the presidency of the Washington Railway & Electric Company, and his election not long ago as a director of the company, have given rise to no end of rumors regarding his connection with the company that eventually have proved wide of the mark. The facts in regard to Mr. Loeb's connection with the company are explained in a letter recently sent by him to Representative Sims, of Tennessee, and read in the House in connection with district matters. Mr. Loeb said, in part:

"Forty-seven hundred shares of the common stock of the Washington Railway & Electric Company stand in my name on the books of the company. One hundred of these shares, enough to enable me to qualify as director, are mine; 4600 are holdings of friends of mine for whom I simply acted as representative at the last annual meeting of the stockholders of the company, at which I was elected a director, with the view of my possible election as president of the company, if I decided to take up that line of work after leaving official life."

TEXAS TRACTION COMPANY'S LINE

The Texas Traction Company, which is building the electric railway between Dallas and Sherman, Texas, about 65 miles, is finishing up its tracks in Dallas, where its headquarters will be situated, and has nearly completed the entire line. President J. F. Strickland informs the stockholders of the company that it is contemplated to open the road and begin operations with a sufficient car equipment some time in June, and to have all cars running on schedule by July 1. He also says that the company is encouraged by prospects for a good business. Grading has been completed to Sherman and Dallas, and the back fillings have been completed on all of the bridges. There have been built 58 miles of track, and the remainder is practically done. A large force of men are now surfacing the track. Forty miles of poles have been set and 20 miles of transmission line erected, while 25 miles of feeder are also in place. The remainder of the overhead work will be pushed rapidly.

At the main power station in McKinney all the steam machinery has been operated, and the electrical equipment is practically ready for use. The substations at Sherman, Van Alstyne and Plano are practically ready for operation. At Dallas the building is completed and the electrical machinery 50 per cent erected and will be done within about two weeks.

When the line is completed there will be about 110 miles of electric railway, which could be made one continuous line from Denison to Sherman, Dallas and Fort Worth, Texas. The line from Denison as far as Dallas is from north to south, and that between Dallas and Fort Worth from east to west.

PLAN FOR LEASING WEST JERSEY & SEASHORE

A committee from the Ocean City Board of Trade is said to be authority for the statement that the West Jersey & Seashore is considering the leasing of its third-rail electric system between Camden and Atlantic City and Ocean City. The committee declares it has President McCrea's word for the statement to this effect: "To tell you the truth, I cannot at this time state just what plans we will pursue for the coming summer. We are holding under advisement the leasing of the West Jersey electric road to Stern & Silverman, in which case you would need to apply to them. Just what we shall do has not been decided upon, but we shall look after your interests."

The Pennsylvania Railroad has denied the report, and Stern & Silverman, owners of the Atlantic City & Seashore Railroad Company, the probable lessors of the system in the event of any contract being entered into, are said to have disclaimed all knowledge of the subject.

NORTH AMERICAN TO ISSUE \$5,000,000 IN BONDS

The North American Company is preparing to place on the market about \$5,000,000 bonds of certain of its subsidiary companies, and it is probable that the issue will appear within a month. "The North American Company has been negotiating with several well-known banking firms for some time," said Secretary Burt, "with a view to putting out a bond issue of probably not more than \$5,000,000. The question as to the rate of interest has delayed matters somewhat, but the proper steps in the matter of

arranging for mortgages have been taken, and as soon as the rate of interest has been decided the negotiations will be speedily concluded. But we are in no haste, as the bond market is improving each day. Just which of the companies will appear on the bonds is still undecided, and an effort is being made to discover which of the twelve companies in whose names the bonds might be issued would appeal the most to bankers and investors. Spencer Trask & Company have found a good market in the West for the \$2,000,000 bond issue of the Milwaukee Light & Traction Company, which was put out about two weeks ago, and it is expected that the coming bond issue, under the improved conditions, will have an even better sale." Announcement was made later by N. W. Harris & Company that they had completed arrangements with the North American Company for the purchase of \$5,500,000 refunding mortgage 5 per cent bonds of the Union Electric & Power Company, of St. Louis, which is controlled by the North American Company, and has practically a monopoly of the lighting and industrial business in St. Louis. On Dec. 2, 1907, this company increased its authorized bond issue from \$10,000,000 to \$18,000,000, which was done to help finance in part the purchase by it of the Edison Electric Illuminating Company and the LaClede Power Company. At the same time its authorized stock was increased from \$10,000,000 to \$18,000,000. The North American Company itself has done no financing since last May, when it issued \$5,000,000 5 per cent notes to a syndicate headed by Redmond & Company, and Lee, Higginson & Company. Recently notice was given that all of these notes had been sold.

LIVERPOOL REPORT

The report for the year ended Dec. 31, 1907, of the traffic manager of the Liverpool Corporation Tramways has just been published. It shows:

	1907.
Traffic revenue	£572,822
Sundry revenue.....	10,235
Total	£583,057
Traffic expenses.....	£151,895
General expenses.....	55,574
General repairs and maintenance expenses.....	83,772
Power expenses.....	107,491
Total expenses.....	£398,733
Net revenue account.....	184,323
Other income.....	15,307
Gross revenue.....	£199,631
Interest on loans.....	£53,059
Rentals	5,891
Sinking funds.....	54,275
Repayment of loans.....	3,026
Contribution in aid of general rate.....	27,793
Reserve, renewal and depreciation acc't.....	55,586
	£199,631

The number of passengers carried during the year was 124,043,239; car miles run, 12,231,799; earnings per car mile, 11.17d.

TO ELECTRIFY CANADIAN FERRY LINE

The Legislature of the Province of Ontario, Canada, has just passed an act empowering the Fort Erie Ferry Railway Company to build extensions to its present lines which will give it an electric railway extending along the Canadian frontier from Chippewa to Port Colborne. Frederick J. Weber, president of the Fort Erie Railway Company, has announced that work will be started on the extensions this year, and that electric cars will be in operation from the Fort Erie Ferry to Ridgeway and Point Abino as soon as the construction can possibly be carried out.

In the bill passed by the Legislature the company must extend its present line from the westerly terminus at Fort Erie Beach to Ridgeway and Point Abino within 3 years. Thence onward to Port Colborne it must be completed within 5 years. Fifteen per cent of the road from Fort Erie to Bridgeburg and Chippewa must be built within 2 years. The line from Fort Erie Beach, which will be built first, extends for 3½ miles from the beach in an air line to the Windmill Point Crossroad, according to the plans which have been prepared. Thence it will proceed northward along the Windmill Point Crossroad for half a mile, thence in an air line almost to Ridgeway, and thence northward by road to Point Abino.

THE CAMBRIDGE SUBWAY BRINGS UP QUESTION OF THROUGH TRANSIT

Now that the hearings on the Cambridge subway plans have been resumed under a decision of the State courts by the Massachusetts Railroad Commission, it is coming to be generally recognized that in deciding the question as to whether the new subway shall have two stations or five, the commission will be doing little less than to establish an important precedent in urban and suburban transportation. No previous instance has brought the issue as to how far local convenience shall be sacrificed to "through" rapid transit so squarely before the board; for in this case it is not merely a transportation company on one side and the general public on the other. The company, in a sense, is a neutral; the public, or a strong faction of it, may be regarded as on either side of the proposition.

Apparently the majority of Cambridge residents, within whose municipality the new subway, or trunk line, is to be included, want four stations in addition to the subway terminal, or transfer station, at Harvard Square. Outlying towns, which will get the advantage of the new subway route by means of surface lines radiating fan-like from the Harvard Square station, are practically a unit in urging the commission to allow only one other station besides the one at Harvard Square, that other station being at Central Square, Cambridge, half way between Harvard Square and the Charles River, and affording another transfer point for surface lines radiating to Brighton, Allston, Newton, North Cambridge and Somerville.

The lines of surface cars from the Harvard Square terminal will reach North Cambridge, Arlington, Lexington, Concord, Belmont, Waverley, Watertown and Newton. What the outsiders seek is the fewest number of stations possible on the trunk line, in order that they may whisk through Cambridge at high speed and make the subway run to Boston in eight or ten minutes instead of twenty. But the Cambridge residents, aside from those in the immediate neighborhood of the proposed Harvard Square and Central Square stops, want additional stations in order that they may board the subway trains direct and get the advantage of rapid transit without transferring to and from surface cars.

Two hearings held since the resumption before the commissioners have resulted in practically nothing but to get this divergence of public interest well defined. The company's plans at present show two stations. Arguments of the Cambridge people are that as Cambridge is to bear what disfigurement is occasioned by the new route its residents should have facilities for profiting by it to the utmost; also that since the law makes Cambridge the municipality to buy out the subway on behalf of the public at the end of a term of years, if a purchase is required, this responsibility entitles Cambridge to the fullest use of the line, and if anything a preference over towns farther out. The only argument of the outlying towns is that they are compelled to ride through Cambridge in accepting railway transportation into Boston, and that they certainly want real rapid transit.

The commission had comparatively little to do with the location of stations in the original Boston subway, or the Washington Street Tunnel, as the locations were determined by the Boston Transit Commission and natural conditions. But so far as it has had occasion to deal with stations on the "L," now used in connection with the Boston subway, it has in one instance ordered a station which the Boston Elevated Railway Company believed to be unnecessary (Thompson Square, Charlestown); and in one instance declined to order one (Green Street, Jamaica Plain).

Both of these locations have been urged by public petition. The reason given by the board for declining the Green Street station was to the effect that some local convenience must be sacrificed in order that the public as a whole might have real rapid transit. In the Green Street case the principle involved was the same as that involved at Cambridge, but the proportion of public benefit from the proposed station was a small matter compared with that involved in the Cambridge problem.

No decision can be expected for some time, as additional hearings have been fixed for May 8, 11 and 12. The board took a view of the route and its proposed station sites several days ago.

PERSONAL MENTION

MR. J. F. LARDNER, vice-president and general manager of the Tri-City Railway Company, of Davenport, Ia., has resigned to engage in other business in Davenport.

MR. W. B. ATWOOD has been appointed assistant superintendent of the Ashtabula Rapid Transit Company, of Ashtabula, Ohio, with entire charge of the construction work contemplated by the company. Mr. Atwood formerly was with the Keystone Construction Company and more recently with the construction department of the Ohio Electric Railway at Lima, Ohio.

MR. JOHN B. PARSONS, president of the Philadelphia Rapid Transit Company, has returned to Philadelphia after a 10 weeks' stay abroad. Most of this time was spent in Egypt, where he went with Mr. P. A. B. Widener. From New York the party went to Naples, thence to Alexandria, thence to Cairo, thence to Luxow. Mr. Widener is now in Paris.

MISS R. BOYDLAND, for the past year general accountant of the Grand Rapids, Grand Haven & Muskegon Railway, of Grand Rapids, Mich., has been appointed auditor of the company. Miss Boydland entered the service of the company as stenographer about four years ago and succeeded Mr. S. L. Vaughan as general accountant last April when he was appointed traffic manager.

MR. WARREN L. BOYER has resigned as superintendent of the New York Car & Truck Company, which is now in the hands of a receiver. Mr. Boyer has been associated with the company and its predecessor, the Peckham Manufacturing Company, for the past eight years. He was previously associated with the Lehigh Valley Traction Company at Allentown, Pa., and later with the Union Traction Company, of Philadelphia.

MR. L. M. GOLLIDAY has been appointed train dispatcher for the Southern division of the Public Service Railway Company at Camden, N. J. Mr. Golliday has a thorough knowledge of single-track operation, gained from the 12 years' experience on the Pennsylvania Railroad and the interurban lines of Ohio and the Middle West. He carries to the Public Service Company the best wishes of the employees of the Columbus, Delaware & Marion Railway, from which he resigned to accept his present position.

MR. BERNARD C. COBB has been elected vice-president of the Saginaw-Bay City Railway & Light Company, of Saginaw, Mich., succeeding Mr. S. E. Wolff, whose resignation as vice-president and general manager was announced in the STREET RAILWAY JOURNAL of April 18. Mr. H. T. Wicks has been elected second vice-president. Mr. E. C. Folsom, heretofore superintendent of the company, has resigned and Mr. J. F. Collins, who was recently appointed general manager to succeed Mr. Wolff, will combine the duties of superintendent and general manager.

MR. SAMUEL ANDERSON has been appointed superintendent of the New London lines of the Connecticut Company, which include those in Norwich and New London and the lines to Central Village. He succeeds Superintendent Horatio Bigelow, resigned. Mr. Anderson is at present superintendent of the Connecticut Company's lines between Central Village and the Massachusetts line, and at one time was superintendent of the line through to Worcester and of the Worcester & Southbridge line. He started in the railroad business in 1883 with the New England Car Service Association.

MR. JAMES R. LEAGUE has been made general manager of the Augusta Railway & Electric Company, of Augusta, Ga., to take effect May 1, Mr. Turner C. Vason being made auditor to fill the place formerly occupied by Mr. League. The directors have been changed, Mr. Stewart F. Knott taking the place of Mr. W. T. Van Brunt, Mr. Gordon M. Buek succeeding Mr. D. S. Herdy, Mr. W. S. S. Johnson succeeding Mr. H. B. Parson and Mr. J. H. Hellen taking the place of Mr. W. P. Gardiner. Mr. James U. Jackson continues as vice-president of the concern and will be in active charge of the business here.

MR. T. GARRETT, superintendent of the Washington, Arlington & Falls Church Railway, of Ballston, Va., will, in addition to his present duties, take over those of manager and purchasing agent, which were formerly discharged by Mr. Fred

B. Hubbell, vice-president of the company, until the appointment of Mr. Charles Hine as receiver last October. Mr. Jacob Gerke, chief electrician and master mechanic, and Mr. C. A. S. Sinclair, civil engineer, have had their titles changed to assistant superintendent, with offices at Ballston, Va., where the general offices of the company are now located, the Washington office having been discontinued.

MR. L. D. MATHES, secretary and treasurer of the Iowa Street & Interurban Railway Association, received a well-deserved honor in his re-election to that position last week. Mr. Mathes, who is general manager of the Union Electric Company at Dubuque, has been actively interested in the Iowa association for the last four years, or since he has been in Dubuque, and has put into it that energy which has brought such successful results in the Dubuque property and in other work in which he has been identified. Mr. Mathes has been engaged in electric railway work for the past 15 years with the General Electric and Westinghouse companies as well as with operating properties at Buffalo, Norfolk and elsewhere.

MR. L. H. McCRAY, whose connection with the Atlantic Shore Line Railway was announced in the last issue of the STREET RAILWAY JOURNAL, has been appointed trainmaster and acts as assistant to General Manager E. B. Kirk. Mr. McCray was with the Winnebago Traction Company, at Oshkosh, Wis., in several capacities from September, 1904, until July, 1907, and was assistant foreman of the transportation department of the company when he resigned to accept the superintendency of the Sterling, Dixon & Eastern Electric Railway, Dixon, Ill. He resigned with the latter company March 15 of this year, to accept a position with the Atlantic Shore Line Railway in the capacity mentioned, and entered upon his new duties April 1.

MR. H. R. FOTHERGILL has resigned as general superintendent of the Greenville Traction Company, superintendent of the Greenville Gas & Electric Light & Power Company, and superintendent of the Paris Mountain Water Company, all plants of the American Pipe Manufacturing Company's syndicate, owned principally in Philadelphia, to engage again in the contracting business. He was presented with a handsome gold watch by the employees as a token of their appreciation of his treatment of them, and their desire to have him carry their good will wherever he might be. Mr. Fothergill has been identified with electric railway and lighting properties for 15 years, having engaged particularly in power plant construction. He enters his new field with two central station plants already turned over to him for construction.

MR. BRET HARTER, who has been associated as assistant engineer and chief railway engineer with the Roberts & Abbott Company for a long time, has severed his connection with that firm. Mr. Harter is a graduate of Purdue University and commenced railway work with the Syracuse Rapid Transit Company, as assistant to the general superintendent, in the early summer of 1896. He remained with this company until 1898, when he served for a period of about two years as assistant engineer in construction of the Syracuse, Lakeside & Baldwinsville Railway. In 1900 he accepted the position of general superintendent of the Detroit, Rochester, Romeo & Lake Orion Railway, now the Flint Division of the Detroit United Railways Company. For the last seven years he has represented the Roberts & Abbott Company in the supervision of construction of the lines of the Northern Traction Company; Muncie, Hartford & Fort Wayne Railway Company; Dayton & Muncie Traction Company; Cleveland, Ashland & Mansfield Railroad Company, and the Washington, Baltimore & Annapolis Electric Railway Company, his work being mainly electrical and mechanical engineering. He has also made a number of financial reports upon railway, lighting and gas properties.

MR. C. E. A. CARR, manager of the Helena Light & Railway Company, of Helena, Mont., has been appointed managing director of the Quebec Gas Company, of Quebec, Que., which position, it is understood, will eventually carry with it the duties of president of the concern. Mr. Carr is a Canadian by birth, having been born at Thornton, Ont., in 1870. He was graduated from the high school at Barrie, Ont., in 1883, and then studied at the British-American Commercial School, Toronto, until 1886. He was in the office of the Toronto city engineer from 1888 to 1891, and from 1892 to 1894 was secretary to the general manager of the Toronto Railway Company, the Montreal Street Railway and the Cleveland Electric Railway. From 1895 to 1905 he was general manager, secretary and treasurer of

the London Street Railway Company, of London, Ont. During his connection with the London Company Mr. Carr also was general manager and secretary of the Montreal Park & Island Railway Company, a 40-mile suburban property, spending alternate weeks in London and Montreal, until the property at Montreal was sold to the City Railway. He has been with J. G. White & Company as manager of the Helena Light & Railway Company since 1905, being directly in charge of construction and reconstruction of the property. He is a member of the Helena Business Men's Association, Commercial Club of Helena, Montana Club of Helena and Lambs' Club of Helena.

MR. P. P. CRAFTS, the new president of the Iowa Street & Interurban Railway Association, is general manager of the Iowa & Illinois Railway Company, which connects Clinton and Davenport. He began electric railway work 11 years ago with Stone & Webster in their Boston office. His first four years with this company were devoted to engineering and construction work, but in 1901 he went to Minneapolis as their manager of an electric light property, which was afterward absorbed by the Minneapolis General Electric Company. In 1902 he became manager of the Saginaw Valley Traction Com-



P. P. CRAFTS



L. D. MATHES

pany, connecting Saginaw and Bay City, Mich. After the consolidation of this road by the Saginaw-Bay City Railway & Light Company in 1904, he came to the Iowa & Illinois Railway as general manager just before the line was completed. During the past year he has been acting also as general manager of the Joplin & Pittsburg Railway, an interurban road in Southeastern Kansas, which is partly under construction. This position he resigned on April 1, in order to devote his whole time to the Iowa & Illinois Railway. Mr. Crafts has always taken an active interest in the affairs of the Iowa State Association, serving last year as its vice-president.

MR. A. T. POTTER, by order of President Mellen, of the New York, New Haven & Hartford Railroad, will have direct supervision of the operation and management of the electric railways of the Rhode Island Company. Mr. Potter, since the street railways of Providence and vicinity were acquired by the New York, New Haven & Hartford Railroad, has had the office of vice-president, but has acted only in an advisory capacity. Under President Mellen's new order he becomes active vice-president. Mr. Potter's new duties, it is explained, will in no way affect Mr. Buckland, the vice-president, except in relieving him of many of the details of operation. Mr. Buckland at present is in Washington as the representative of the New York, New Haven & Hartford Railroad, and will not return to Providence after the adjournment of Congress. No other change is to be made. Mr. A. T. Potter will continue as general manager, and the other officials will do their regular work under the general direction of Vice-President Potter. Mr. Potter's office will be removed from the Union Trust Building to the New York, New Haven & Hartford office building, in which the general manager, the chief engineer and other officials of the electric railway are located. Mr. Potter has been connected with the street railways in Rhode Island for about 40 years, and his return to active service is gratifying alike to his former associates and to the many local merchants with whom his duties with the company formerly brought him into contact.

TABLE OF OPERATING STATISTICS

Notice.—These statistics will be carefully revised from month to month, upon information received from the companies direct, or from official sources. The table should be used in connection with our Financial Supplement, "American Street Railway Investments," which contains the annual operating reports to the ends of the various financial years. Similar statistics in regard to roads not reporting are solicited by the editors. * Including taxes. † Deficit. ‡ Including Rapid Railway system, Sandwich, Windsor & Amherstburg Railway, and Detroit, Monroe & Toledo Short Line Railway.

COMPANY.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Avail-able for Dividends.	COMPANY.	Period.	Total Gross Earnings.	Operating Expenses.	Net Earnings.	Deductions From Income.	Net Income, Amount Avail-able for Dividends.
AKRON, O. Northern Ohio Tr. & Light Co.	1m., Mar. '08	129,659	81,273	48,386	43,953	4,433	KANSAS CITY, MO. Kansas City Ry. & Lt. Co.	1m., Feb. '08	464,118	251,389	212,729	151,050	61,679
	1 " " '07	133,834	83,215	50,619	41,290	9,329		1 " " '07	423,509	230,313	193,196	146,876	46,320
	3 " " '08	375,086	241,631	133,454	128,860	4,595		9 " " '08	4,639,177	2,391,634	2,247,543	1,379,072	868,471
	3 " " '07	375,883	235,507	140,376	124,029	16,346		9 " " '07	4,275,151	2,127,053	2,148,098	1,312,011	836,087
BELLINGHAM, WASH. Whatcom Co. Ry. & Lt. Co.	1m., Feb. '08	27,569	*17,251	10,318	6,373	3,945	LEXINGTON, KY. Lexington & Inter-urban Rys. Co.	1m., Feb. '08	38,931	27,672	11,259	.....	.....
	1 " " '07	25,707	*15,673	10,033	6,198	3,836		1 " " '07	35,267	25,357	9,910	.....	.....
	12 " " '08	359,803	*214,406	145,400	78,275	67,124		2 " " '08	81,975	56,595	25,380	.....	.....
	12 " " '07	289,864	*184,672	105,192	52,840	52,352		2 " " '07	74,981	53,438	21,543	.....	.....
CHAMPAIGN, ILL. Illinois Traction Co.	1m., Mar. '08	318,339	*184,432	133,907	.....	.....	MILWAUKEE, WIS. Milwaukee Elec. Ry & Lt. Co.	1m., Mar. '08	308,864	164,713	144,151	96,374	47,777
	1 " " '07	286,159	*157,982	128,177	.....	.....		1 " " '07	309,154	155,998	153,156	95,751	57,405
	3 " " '08	950,787	*561,454	389,333	.....	.....		3 " " '08	924,006	518,531	405,475	290,461	115,014
	3 " " '07	827,599	*469,919	357,680	.....	.....		3 " " '07	902,589	469,311	433,278	280,267	103,012
CHARLESTON, S. C. Charleston Con. Ry., Gas & Elec. Co.	1m., Mar. '08	61,497	40,664	20,833	13,817	7,016	Milwaukee Lt., Ht. & Tr. Co.	1m., Mar. '08	189,554	28,191	161,363	103,533	57,830
	1 " " '07	56,135	37,129	19,006	13,517	5,489		1 " " '07	54,273	25,395	28,878	30,509	11,631
.....	.....	.....	.....	.....	.....	.....		3 " " '08	293,691	88,445	205,246	169,180	36,066
.....	.....	.....	.....	.....	.....	.....		3 " " '07	156,484	78,455	78,029	90,147	12,118
CHICAGO, ILL. Aurora, Elgin & Chi- cago Ry. Co.	1m., Feb. '08	85,552	54,825	30,727	28,605	2,122	MINNEAPOLIS, MINN. Twin City R. T. Co.	1m., Feb. '08	453,944	253,644	200,301	122,789	77,512
	1 " " '07	86,940	53,809	33,131	27,131	6,000		1 " " '07	419,802	217,468	202,334	115,258	87,076
	8 " " '08	962,760	520,479	435,281	221,201	214,079		2 " " '08	923,836	511,844	411,991	244,744	167,247
	8 " " '07	876,639	473,808	402,832	210,318	192,514		2 " " '07	876,640	460,566	416,074	230,517	185,557
CLEVELAND, O. Cleveland, Paines- ville & Eastern R.R. Co.	1m., Mar. '08	19,966	*11,137	8,829	7,213	1,617	MONTREAL, CAN. Montreal St. Ry.	1m., Mar. '08	288,674	202,390	86,284	52,257	34,027
	1 " " '07	18,585	*9,948	8,638	7,213	1,425		1 " " '07	271,588	185,461	86,127	43,212	42,915
	3 " " '08	54,146	*31,950	22,196	21,638	558		6 " " '08	1,747,137	1,145,866	601,271	272,282	328,899
	3 " " '07	52,073	*30,140	21,932	21,638	294		6 " " '07	1,599,048	1,073,657	525,391	238,878	286,513
COLUMBUS, GA. Columbus Elec. Co.	1m., Feb. '08	28,844	*14,063	14,782	10,727	4,054	NORFOLK, VA. Norfolk & Ports- mouth Tr. Co.	1m., Feb. '08	131,799	88,279	43,520	.....	.....
	1 " " '07	25,620	*12,794	12,826	10,457	2,369		1 " " '07	128,558	91,154	37,404	.....	.....
12 " " '08	347,577	*187,200	160,377	123,888	36,489	2 " " '08		276,660	186,900	89,760	.....	.....
.....	.....	.....	.....	.....	.....	.....		2 " " '07	280,578	187,941	92,636	.....	.....
DALLAS, TEX. Dallas Elec. Corp'n.	1m., Feb. '08	84,186	*62,994	21,192	20,115	1,076	PEEKSKILL, N. V. Peekskill Lt. & R. R. Co.	1m., Feb. '08	11,151	*7,297	3,854	.....	.....
	1 " " '07	78,073	*64,151	13,922	16,647	†2,725		1 " " '07	10,957	*6,784	4,173	.....	.....
	12 " " '08	1,134,078	*814,322	319,756	230,348	89,408		2 " " '08	24,407	*15,893	8,514	.....	.....
	12 " " '07	1,041,010	*731,857	309,153	189,029	120,124		2 " " '07	23,596	*13,882	9,714	.....	.....
DETROIT, MICH. Detroit United Ry. Co.	1m., Feb. '08	469,839	*332,046	137,793	135,122	2,671	PENSACOLA, FLA. Pensacola Elec. Co.	1m., Feb. '08	15,378	*14,477	901	3,587	†2,686
	1 " " '07	470,925	*329,832	141,093	123,348	17,745		1 " " '07	17,369	*11,879	5,490	3,125	2,363
	2 " " '08	984,519	*671,519	313,000	271,168	41,832		12 " " '08	227,006	*155,659	71,347	41,846	29,501
	2 " " '07	985,924	*669,034	316,890	246,463	70,427		.....	.....	.....	.....	.....	.....
DULUTH, MINN. Duluth St. Ry. Co.	1m., Feb. '08	62,115	42,331	19,784	18,417	1,368	PHILADELPHIA, American Rys. Co.	1m., Mar. '08	207,774	.....	.....	.....	.....
	1 " " '07	52,857	32,903	19,954	17,529	2,425		1 " " '07	227,150	.....	.....	.....	.....
	2 " " '08	126,845	86,057	40,789	36,833	3,955		9 " " '08	2,181,200	.....	.....	.....	.....
	2 " " '07	112,341	66,506	45,835	35,104	10,731		9 " " '07	2,121,666	.....	.....	.....	.....
E. ST. LOUIS, ILL. East St. Louis & Suburban Co.	1m., Mar. '08	171,803	86,816	84,987	.....	.....	PLYMOUTH, MASS. Brockton & Plym- outh St. Ry. Co.	1m., Feb. '08	6,341	*6,890	†549	1,849	†2,399
	1 " " '07	166,582	89,453	77,129	.....	.....		1 " " '07	5,485	*5,471	14	1,796	†1,782
	3 " " '08	502,591	248,718	253,873	.....	.....		12 " " '08	120,612	*91,092	29,521	21,574	7,947
	3 " " '07	478,152	262,473	215,679	.....	.....		12 " " '07	112,318	*71,240	41,078	21,773	19,304
EL PASO, TEX. El Paso Cos.	1m., Feb. '08	43,863	*30,988	12,875	5,842	7,033	ST. LOUIS, MO. United Railways Co. of St. Louis.	1m., Mar. '08	858,908	*559,135	299,773	233,290	66,483
	1 " " '07	36,559	*29,967	6,592	4,564	2,027		1 " " '07	903,145	*596,247	306,898	230,868	76,030
	12 " " '08	523,757	*384,122	139,634	63,060	76,574		3 " " '08	2,461,761	*1,633,034	828,727	700,163	128,564
	12 " " '07	410,114	*296,782	113,332	48,741	64,591		3 " " '07	2,494,162	*1,722,595	771,567	693,734	77,833
FT. WAVNE, IND. Ft. Wayne & Wa- bash Valley Tr. Co.	1m., Feb. '08	97,446	56,680	40,775	.....	.....	SAVANNAH, GA. Savannah Electric Co.	1m., Feb. '08	43,718	*39,388	4,330	12,515	†8,184
	1 " " '07	83,340	52,270	31,070	.....	.....		1 " " '07	43,947	*28,223	15,724	11,335	4,389
	2 " " '08	200,475	114,177	86,298	.....	.....		12 " " '08	603,050	*435,428	167,622	146,095	21,527
	2 " " '07	174,518	107,065	67,453	.....	.....		12 " " '07	605,165	*376,772	228,393	135,675	92,719
FT. WORTH, TEX. Northern Texas Tr. Co.	1m., Feb. '08	71,311	*46,727	24,583	11,935	12,648	SEATTLE, WASH. Seattle Elec. Co.	1m., Feb. '08	346,127	*240,386	105,741	55,890	49,851
	1 " " '07	67,292	*45,558	21,735	10,300	11,435		1 " " '07	288,165	*177,283	110,883	43,140	67,742
	12 " " '08	1,064,221	*624,502	439,720	131,573	308,147		12 " " '08	4,234,143	*2,771,707	1,462,435	621,226	841,209
	12 " " '07	893,280	*567,295	325,985	120,137	205,848		12 " " '07	3,345,275	*1,995,105	1,350,170	495,363	854,807
GALVESTON, TEX. Galveston-Houston Elec. Co.	1m., Feb. '08	74,715	*52,253	22,462	13,805	8,657	TACOMA, WASH. Puget Sound Elec. Ry. Co.	1m., Feb. '08	117,502	*86,001	31,500	31,043	457
	1 " " '07	68,715	*46,449	22,266	12,188	10,079		1 " " '07	105,775	*75,123	30,653	26,362	4,291
	12 " " '08	1,061,866	*667,315	394,551	157,570	236,981		12 " " '08	1,691,470	*1,109,828	581,642	357,930	223,712
	12 " " '07	930,848	*581,822	349,026	143,233	205,794		12 " " '07	1,396,838	*935,982	460,856	282,289	178,567
HOUGHTON, MICH. Houghton County St. Ry. Co.	1m., Feb. '08	17,336	*13,886	3,450	3,917	†467	TAMPA, FLA. Tampa Elec. Co.	1m., Feb. '08	48,568	*31,784	16,784	964	15,819
	1 " " '07	15,205	*13,243	1,962	3,877	†1,915		1 " " '07	38,693	*29,375	9,318	994	8,323
	12 " " '08	254,783	*154,401	100,382	47,511	52,871		12 " " '08	532,355	*390,360	141,995	6,516	135,479
	12 " " '07	231,886	*149,113	82,773	47,089	35,683		12 " " '07	478,196	*300,754	177,442	3,378	174,064
JACKSONVILLE, FLA. Jacksonville Elec. Co.	1m., Feb. '08	31,378	*23,282	8,096	5,598	2,498	TOLEDO, O. Toledo Rys. & Lt. Co.	1m., Mar. '08	202,187	114,879	87,308	68,898	18,410
	1 " " '07	30,006	*20,189	9,817	3,475	6,342		1 " " '07	214,837	118,714	96,123	63,457	32,666
	12 " " '08	394,898	*261,377	133,521	54,240	79,281		3 " " '08	628,623	356,269	272,354	205,952	66,402
	12 " " '07	340,917	*214,207	126,709	41,004	85,706		3 " " '07	637,425	369,256	268,169	188,920	79,249

NEWS OF THE WEEK

CONSTRUCTION NOTES

Items in this department are classified geographically by States, with an alphabetical arrangement of cities under each State heading.

For the convenience of readers seeking information on particular subjects, the character of the individual item is indicated as follows:

- * Proposed roads not previously reported.
- o Additional information regarding new roads.
- † Extensions and new equipment for operating roads.

Numerals preceding these signs indicate items referring to:

1. Track and roadway.
2. Cars, trucks and rolling stock equipment.
3. Power stations and substations.
4. Car houses and repair shops.
5. Parks and amusement attractions.

*DOUGLAS, ARIZ.—The Cochise County Electric Railroad Company has been incorporated for the purpose of constructing an electric railway from Douglas to Bisbee. The incorporators are James S. Douglas, W. H. Brophy, M. J. Cunningham, M. J. Brophy and George H. Neale. The company is capitalized at \$500,000 with \$100 the par value of each share. Most of the incorporators are connected with the Douglas Street Railway Company, which now operates an electric railway from Calumet to Douglas, a distance of 10 miles.

*BERKELEY, CAL.—There is considerable talk of organizing a company to continue the Spruce Street car line of the Oakland Traction Company out through the Cragmont tracts over a zig-zag route and up the Berkeley hills to the top of Grizzly Peak on a 6 per cent grade. It is estimated that the proposed road will be about seven miles in length.

oLOS ANGELES, CAL.—The right of way over which the old cycleway was built between Los Angeles and Pasadena is being put into shape preparatory to work on the new electric railway between these two cities. Horace M. Dobbins, of Pasadena, promoter of both the cycleway and railway project, and principal stockholder in the cycleway corporation, hopes to have matters in shape to begin the actual building of the line before the end of the summer. The route over this right of way will reduce the rail distance between Los Angeles and Pasadena to nine miles, and the running time between the two cities will be approximately 14 minutes. It will also have a great advantage in Pasadena in that it will not have to operate over the public streets. The right of way of the new concern is along an alley midway between Raymond and Fair Oaks Avenues. It is planned to use the third-rail. This will be made possible by the fact that the tracks will be depressed, running through cuts a great part of the way. The engineer's plans have reduced the curves almost to a minimum and the greatest grade is but 2 per cent. The average grade will run less than 1 per cent. The route is but three-quarters of a mile longer than the air line between the two cities. The promoters have not made public where their Los Angeles terminal will be, but they say it will be near the business center, and quite accessible to all car lines. The estimated cost of building the railroad is \$2,500,000. Nearly all the capital required will come from Pasadena and the company will be composed largely of Pasadena people.

†OAKLAND, CAL.—It is announced that the San Francisco, Oakland & San José Railway Company expects to apply to the City Council for an extension franchise to Twelfth and Union Streets, where a station will be erected. It is believed that the intention of the San Francisco, Oakland & San José Company is to extend the Key Route line along Twelfth Street, into the heart of the business section of Oakland, right through East Oakland to Hayward.

†REDLANDS, CAL.—The Redlands Central Electric Railway Company recently filed an application with the Board of Supervisors asking for a franchise for an extension of its line from the foot of Brookside Avenue, at the Redlands city limits, to Redlands Junction, a distance of about two miles. John H. Fisher is the general manager of the company.

oWOODLAND, CAL.—A stockholders' meeting is to be held in Washington, D. C., on May 12 to reorganize the Jeanette, Montclair & Woodland Traction Company. This company plans to build an electric railway from Woodland to Brawley, Cal., and construction work will be started this summer. The contract for grading and excavating has been awarded to John Hahwood, of Brawley. The general contractors will be Henry Savage & Ferrish, of Yarmouth. The officers are as follows: Albert Molizal, president; Ladd Veitt, Tulsa, Okla., vice-president; Bruce Clark, El Reno, care El Reno Mill & Elevator Company, Oklahoma, treasurer; A. E. Culley, 407 Hudson Street, New York, secretary and manager. The committee on construction work is composed of the above officials and R. D. McCue, Home Life Bldg., Washington, D. C.; Walter E.

Wright, Tulsa, and J. Wesley Snapper. The STREET RAILWAY JOURNAL is advised that this company will soon be in the market for equipment.

oBOULDER, COLO.—The Denver & Interurban Railway Company expects to reach Boulder with its first cars about May 15. It will enter Denver via the Twenty-third Street viaduct. It is estimated that it will take an hour and twenty minutes to make the trip.

†DENVER, COLO.—The Intermountain Railroad, formerly the Denver, Lakewood & Golden, which is engaged in electrifying its line from Denver to Golden, expects to have the new service in operation within 30 days. The city terminal for the road will be at Fifteenth and Arapahoe Streets, and the company is figuring on making a 40-minute schedule between Denver and Golden.

†DENVER, COL.—The Town Council of Littleton has granted a permit, pending the passing of a franchise ordinance, allowing the Denver & South Platte Railway Company to construct its line through that city, and that company will at once begin work extending the line up the South Platte River. The road will be extended next summer on to Roxbury Park and Colorado Springs. William J. Coursin, of Pittsburg, is the engineer in charge of the reconstruction work. He states that the work to be done immediately will be the building of the line through Littleton, the constructing of a loop in that city and the laying of track for a few miles beyond. W. E. Hughes, of Denver, is president of the company.

*HARTFORD, CONN.—It is announced that the Hartford citizens' committee has taken steps to procure a charter to build the electric railway from Hartford to Middletown which the Connecticut Company originally planned to construct.

oKANKAKEE, ILL.—F. B. Vennum, of the Chicago, Kankakee & Champaign Electric Railway Company, states that this line has been surveyed from Kankakee to Champaign, Ill., and that grading will begin as soon as the bonds are placed. The officers are I. F. Palmer, Onarga, Ill., president; Upton Schaub, vice-president; Robert W. Renton, Kankakee, Ill., chief engineer.

oPINCKNEYVILLE, ILL.—The Belleville & Pinckneyville Traction Company, which proposes to construct an electric railway from Belleville to Pinckneyville, has practically completed all surveys and estimates and it is hoped to commence work at an early date. It is estimated that the total length of the road will be about 46.5 miles. The company is capitalized at \$100,000 and expects to issue \$1,250,000 bonds. The officers are: L. D. Turner, Belleville, Ill., president; C. R. Hincke, vice-president; Geo. F. Mead, secretary; J. A. Hamilton, Marissa, Ill., treasurer; Harper Bros., East St. Louis, Ill., chief engineers.

*SPRINGFIELD, ILL.—The Terre Haute, Robinson, Olney & Southwestern Railway Company has been incorporated in Illinois to construct an electric railway from a point on the Wabash River, on the boundary between Illinois and Indiana, through the counties of Crawford, Richland, Wayne and Jefferson, to Mount Vernon. The capital stock is \$10,000. The incorporators are Horace C. Pugh, H. P. Taussig, Norman H. Moss, W. H. Cisne, S. C. Wilson, George E. Parker and F. W. Lewis.

*SPRINGFIELD, ILL.—The Secretary of State on April 18 issued a license to incorporate to the Alton, St. Louis & Cairo Railroad Company. The principal office is in East St. Louis, and the capital stock is \$100,000. It is proposed to construct an electric railway from Alton to East St. Louis, from East St. Louis to Cairo, and a branch to Columbia, Waterloo and Mammoth Cave. The incorporators and first board of directors are B. L. Renfrow, Dr. C. H. Walters, William L. Ensol, George M. Switzer, and C. B. Meredith of Springfield. The promoter and financier is Thomas N. Chase, of St. Louis.

1-5†DECATUR, IND.—We are advised that the Fort Wayne & Springfield Railway Company has acquired a number of acres of land for park purposes, and is in the market for amusement devices to be installed at this proposed resort. The company also expects to place contracts during the next 60 days for the following material: 650 40-ft. 7-in. top poles and 2600, 6x8x8 oak ties. In addition, it is planned to drive 600 ft. of piling and construct four railroad crossings. W. H. Fledderjohann is president and general manager.

oFRANFORT, IND.—The Indianapolis, Frankfort, Delphi & Chicago Traction Company has filed articles of incorporation with the Secretary of State. The capital stock is \$100,000. The object of the company is to construct an electric railway from Frankfort to Hammond by way of Delphi, Monticello and other intermediate towns, and through Clinton, Carroll, White, Jasper and Lake counties. The principal place of business will be in Frankfort. This company will succeed the Frankfort, Delphi & Northern Traction Company, incorporated last year to construct this line and improve water power at Monticello, furnish electric light, power, etc.

oMARION, IND.—We are officially informed that the Marion & Logansport Traction Company has secured all the necessary franchises and rights of way, but the road has not been financed. The following cities will be connected by this line: Marion, Sweetser, Mier, Converse, Amboy, North Grove, McGrawsville, Bunker Hill, Onward, Avoka and