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### Brush-Holder Tension and Commutator Troubles

Failure to ascertain and keep up the correct brush-holder tension is one of the more insidious reasons for the difference in the stand and service trials of electric railway motors. When the machines are tested in the laboratory there is so little vibration that the commutators run sparklessly on full loads with only 2 lb. or 3 lb. tension on the brush-holder springs. Under a car in actual service the motors behave differently, however, because the unavoidable pounding over the roadbed causes the brushes, which are held against the commutators with only light spring

pressure, to pull away and produce excessive sparking. In consequence, the commutators are roughened and find their way to the repair shop much too soon. If the track is unusually good, the brush arcing may not be severe enough to attract much notice. Loose brush-holders are also responsible for undue heating and losses in conductivity and copper. The necessity for raising the brush-holder tension 3 lb. to 4 lb. above that used in the manufacturer's shop tests is becoming better understood by electrical engineers. It has been found that 7 lb. to 8 lb. is sufficient to get good brush contact under ordinary city track conditions, but trouble cannot be completely avoided unless a uniform standard is maintained, depending upon the condition of the track. On the motors on one large railway system, variations in tension of from 1 lb. to 15 lb. were found. Such wide differences emphasize the necessity of a definite standard for each class of service. Not all will agree that the brush-holder tension should be as high as 7 lb., but it must be admitted that it is cheaper to shorten the life of the brushes somewhat than needlessly to damage the delicate and costly commutators.

### Preventing Air-Brake Leakage

The prevention of leakage in the air-brake system is one of the most important details to be looked after in the routine maintenance of rolling stock equipped with power brakes. The necessity of avoiding any failure of the brakes through insufficient pressure and the expense of almost continuous operation of compressors are the chief reasons why it is so essential not to neglect this part of the auxiliary apparatus on cars. The trainmen may easily overlook serious leaks in the brake system while the car is running, as the compressor will operate perhaps 80 per cent of the time without attracting any special attention, and unless a time test is made of the drop in pressure after the reservoir is fully charged, faulty conditions may exist unnoticed for a long time. A standing car in good condition and fully charged should ordinarily remain without cutting in the compressor for at least 10 minutes. This would represent a drop in pressure due to leakage of a pound a minute, which amount ought not to be exceeded. If the frequency of a compressor operation can be reduced the tendency will be to increase the life of the armature and commutator of the compressor motor a proportionate time, and will be accompanied by a reduction in maintenance expenses as well as in power consumption. There are many places in an air-brake equipment where leaks can take place when the system is under pressure. There is no excuse for leaks which are bad enough to hiss audibly. After all the audible leaks are stopped, by moving the brake-valve handle to the lap position and noting the pressure conditions in the train line and main reservoir

gages, it is possible to determine approximately where the worst leaks are. Several small leaks may cause trouble through their cumulative effects. The use of soapsuds, applied with a brush around the joints, will show up small leaks by the resulting bubbling. When compressor valves leak, the trouble is frequently due either to carbonized oil on the valves and guides or to the failure of the valves to seat properly. In the latter event, a slight blowing will be caused at the suction strainer at each stroke of the compressor when operating. Cleaning the valves will remove the trouble caused by burned oil, and if the valves are resealed by grinding with pulverized quartz, good results may be secured when the fitting is imperfect.

### Timber Handling and Preservation

Few years have passed since electric railways began to take a serious interest in the conservation of timber, so that it is not unusual to find that track engineers are not fully informed as to the most effective methods of installing ties or of preserving them in the best manner. Experience has shown moisture to be such a powerful help to decay that the use of a slow-drying ballast like sand will materially shorten the life of almost any kind of tie. Of course, rock ballast is often unavailable, but the factor of earlier tie replacement ought to be more seriously considered in the calculation of roadway cost. If it were generally understood that rotten wood disseminates the decay spores or fungi which can and do inoculate sound timber near by, the track engineer would insist on the burning of all replaced ties, instead of permitting them to be abandoned within a few feet of the ones just installed. Another cause of premature impairment arises from the injuries inflicted on the ties by installing them with pickaxes or sharp-edged shovels, instead of placing them with carrying hooks. To attain the maximum life of railroad timber, even under the most favorable roadway conditions, preservation is absolutely necessary. It should be pointed out, however, that some engineers who have experimented with preservatives have failed to attain the results anticipated, because they assumed that the chemical treatment was in itself a complete preventive of decay. This is erroneous. It is equally essential to use the best tie plates, spikes and other fastenings, coating them with a preservative to prevent both the rusting of the metal and the decay of the adjacent wood.

### Pull-In Records

The pull-in record is the best gage that the general manager has to measure the efficiency of the car maintenance department. It follows, then, that such a chronicle should be absolutely correct. Unfortunately, this accuracy is not obtained in many cases because the pull-in record is made up by the transportation foremen from crew reports, and often is sent to headquarters without verification by the maintenance forces. Even soiled seats and broken windows have been responsible for the swelling of the pull-in record. Division superintendents are not ignorant of the fact that when two grades of equipment are on the line the motormen are liable to find a great deal of fault with the poorer kind if there is a chance of getting the better apparatus. It is so much easier to handle a car

with air than without it that one can hardly blame the motorman for turning in a hand-brake car with the laconic "Brakes out of order." This may be easier for the motorman, but is apt to prove quite serious business for the shop foreman, who is wasting time and getting an undeserved black mark in the bargain.

A successful cure for this trouble is to have the pull-in record made up to show in parallel columns the cause assigned by the crew and that actually found by the shopman upon examination. The objection may be raised that this method would hold up the daily report to the general manager. However, there is nothing to prevent the number of pull-ins being transmitted in gross at the end of the day, leaving the detailed comparative statement to follow later.

When once the trainmen understand that their reports are being checked by the maintenance department for the scrutiny of the general manager, they will abstain from illegitimate causes for reporting their cars unfit for service. On the other hand, the shop foremen will breathe easier in the knowledge that they are being judged according to their merits.

### Standardizing Overhead Material

In preparing the excellent specifications published elsewhere in this number, the Connecticut Company has made a most valuable contribution toward the attainment of standards in overhead material. Brake shoes, journal boxes, axles and other car parts have been brought into the fold by the American Street & Interurban Railway Association, but as yet no like official action has been taken to codify line material for d.c. railways. The work of the Connecticut Company would form a very suitable basis for such regulations, because its 600 miles of track embrace almost every variety of urban, suburban and interurban construction. Hence the standards chosen necessarily are elastic, and can be more readily followed by other railways than if they represented the practice for but one set of conditions. "Whoever brings much must bring something for everybody." The common sense which guided the engineers of this company is apparent from the fact that these specifications call for few items of unusual character. Too often the ambitious originator of a specification feels that his labors are incomplete without some radical departures from current practice. In this case it was realized that unique or uncommercial designs would prove equally embarrassing to maker and user. A careful study of the field showed that the ends of the railway company would be best served by a judicious selection from the offerings of all the manufacturers and then making the most liberal variations practicable to secure free competition and prompt deliveries. The efforts of the Connecticut Company were heartily encouraged by the manufacturers, who gave the company's engineers every opportunity to study the practical limitations affecting the production of line material. Thus the specifications eventually were drawn up with a full knowledge of what the factories could do to obey them. These overhead line standards also embrace a very extensive set of rules regarding the pole line, the transposition of high-tension wires, the setting of insulators, and many

other construction details. This code covers the same wide field as the line material standards, and so will be found equally serviceable to other railways. By thus adopting uniform materials and methods for the guidance of the overhead department, the Connecticut Company has given a powerful impetus toward the thorough overhauling of this branch of electric railway equipment.

### The Size of Technical Papers

Many of the technical papers have now grown to be so large that the inquiry is occasionally heard: "Is it possible for the busy man to read and digest the 50 or 60, or more, pages a week published in the paper devoted to his industry, and if all be not read what rule can be followed in reading some and skipping others?" This is a very practical question, and one which calls for an answer. Is there a call for so much information as that contained in each issue of the average leading technical journal of the day? So far as the electric railway field is concerned, we answer, unhesitatingly, yes, and we believe the same conditions hold in any other field of endeavor and knowledge which is developing as rapidly as that of electric railway transportation. Confusion on this point disappears when the extent and number of the problems to be solved are considered. Progress is being made in electrical and mechanical engineering, in accounting, operation, legal and transportation, and the conclusions reached by one road in each of these lines are certain to be of great assistance to others engaged in the industry. Every article in every issue of a progressive technical paper may not be of interest to every reader, but it is safe to say that every number contains some articles which are of interest to every one, and the captions and sub-captions usually give the cue to what should be followed up. A very successful street railway operator said recently that his plan upon receiving his paper was to glance over it quickly to obtain a general idea of its contents, then to turn back and read those articles which appealed particularly to him. If the habit is acquired of reading the paper immediately on its arrival, or, at least, of going over it carefully to determine just what articles to read, and then of taking those up later in the day, but little actual time will be required, and one will be sure of not having missed anything of importance.

### Generalized vs. Specialized Knowledge

The technical journal not only covers each field of the industry which it represents, but it covers, or should cover, all departments, and there is no easier and quicker way of keeping in touch with the developments in other branches besides one's own than through its pages. This is a point frequently overlooked in connection with the technical journal, that through it one can keep in touch with the entire field. The statement is often made that this is the age of specialization, and that success awaits those who can do a certain kind of work as well or better than any one else. This is to a certain extent true. But there is even a greater demand, in most industrial undertakings, for the man with capacity to direct specialists and co-ordinate their work so as to secure the most fruitful results. The shop foreman is not selected for his position because he has a better knowledge of any one kind of work than some of the other

shop men. He probably would not be able to wind an armature better or turn a wheel more true than the men who are engaged upon this work continuously. His usefulness lies in the fact that he is able to do those things and the 20 other things required in the shop equally as well as any one, or else he knows how they should be done and sees that they are done properly. We can apply the same reasoning to the master mechanic, the accountant and the superintendent of transportation; in fact, to the head of each department of an electric railway company. As a rule, these officials are valuable to the company not because they are specialists in any one branch of their department, but because they have a broad knowledge of all of the work which has to be conducted under their direction; and also because they are sufficiently acquainted with the conditions in the other departments of the company so that they can work in harmony with them. Finally, the manager, from the nature of his duties, has to be conversant with the needs of all departments, and his success as a rule will depend very largely upon his ability to give to each its proper weight in the work of the entire organization. It is safe to say that the man who knows how to do only one thing and makes no effort to know about anything else, is inferior even in that kind of work to the man of broader attainments.

### Verbal Transfers

The question "When is a transfer not a transfer?" was answered by the Michigan Supreme Court in a recent decision by saying, when it is a verbal one. The case came before the court as the result of a "car-ahead" ordinance passed by the Detroit City Council some time previously. No person but an unreasonable one should have any objection to transferring from one car to another when the needs of others require the car to be turned back before it has completed its run and another car is immediately at hand to take him to his destination. But many otherwise estimable persons seem to be unreasonable when public corporations are concerned and prefer to stay obstinately in a car which has been turned back and travel to the car house rather than suffer the slight inconvenience of stepping from one car to another.

In the case of *People vs. Detroit United Railway* (118 *Northwestern Reporter*, page 9) the complainant alleged that on a certain day the company violated the car-ahead ordinance which required the cars to be run through to the end of their route, except in cases of delay due to causes beyond control, when cars having passengers aboard may be turned to restore service in the opposite direction, provided there is a car following in the same block and going through to the end of the route and provided transfers shall be given to all passengers thereon entitling them to free transportation to their destination. The testimony showed that the car in question had been sent out to take the place of one which was crippled, and so was late; that when the car was ordered back by the inspector another car was immediately behind it, and that to save time the conductor of the first car told the conductor of the second car that all of the passengers to be transferred had paid their fares and that they should be allowed to continue their journey. Counsel for the com-

pany urged that this was in fact a transfer as called for by the ordinance, and that to have required the conductor to go through the car, punching and distributing transfers, would not only have accomplished no good purpose, but would have delayed the service as a whole and that of these passengers in particular. But the court said, in part:

It is evident that the company did not comply with the letter of the law as to transfers, compliance with which was also a condition precedent to the right to turn the car, and in our opinion it did not comply with the spirit of the law. It has been repeatedly held that it is the duty of passengers to secure evidence of payment of fares, and that a conductor is under no legal obligation to accept their statements that they have paid such fares [citing several cases]. The ordinance manifestly intended that the usual paper transfers should be delivered to the passengers, as conclusive evidence of their rights, before the company should have the right to turn the car. If the consent of the passengers that the company might violate the provisions of the ordinance would furnish a complete protection to it for such violation, certainly such consent must be shown or facts from which it would be necessarily implied. While the passengers did not demand transfers, and perhaps did not remain on the car for that reason, still they were entitled to them, and, before the conductor could legally insist upon their leaving the car and taking the following car, it was his duty to comply with the provision for transfers. The passengers were insisting upon their right to remain upon this car and go through to their destination, and they waived none of their rights. There is no evidence that they knew of the conversation between the two conductors as to transfers, or of the practice of the company to only give transfers when there was no car following. The company could not compel the passengers to accept its practice in place of the ordinance method. They were entitled to the printed evidence of their right which the ordinance required.

Similar ordinances, it might be said, prevail in most large cities, and the decision is along the lines of one in New York a decade or so ago, where a conductor, by mistake, had given a passenger a transfer which appeared on its face to have expired by limitation, and the conductor on the connecting line attempted to eject the passenger. In a civil suit the company was held liable. So, too, in New Jersey, where a street railway company had established, by practice, a right in its passengers to change from one car to another without a transfer ticket, it was held that the company could not change such practice without notice to the passengers.

The Michigan decision also recalls an action defended a few years ago by one of the surface railway companies in New York. The city sued under an ordinance for a money penalty on complaint of three passengers, who refused to leave a car which was run into the barn before reaching the destination marked on its sign. The counsel for the company believed he had a good defense because the car was reported disabled. The foreman produced his record book of necessary and immediate repairs to the brakes, but in rebuttal two of the complaining witnesses qualified as experts and testified that during the night, while remaining on the car in the barn, they had tested the brakes and found them in good condition! There was a ripple of surprise in court; cross-examination seemed useless, and the penalty was paid without appeal. The tendency of the courts to a strict construction of these ordinances is apparent, and the law seems well settled in this regard.

### The Investigation in Detroit

The Committee of Fifty appointed by Mayor Breitmeyer, of Detroit, to investigate the street railway question, has made steady progress in the consideration of the large problem upon which it has entered. It appears from the outline of the organization of the committee, whose plans have been given full publicity, that its investigation will include an inquiry into the fundamental questions of the average cost of carrying a passenger and the tangible and intangible values of the properties of the Detroit United Railway located within the city of Detroit. That the committee has ignored no important subject, however, in preparing for its labors is indicated by the titles of the 11 sub-committees: Ways and means, statistics and regulation, appraisals, cost of service, legal, franchise, schedules, conference, extensions and rearrangement, municipal ownership, taxation and paving. The committee as a whole is composed of men who represent different walks of life, prominent business enterprises as well as the labor element, and its efforts are founded on a desire of the citizens to effect a real settlement of the street railway question. To assist in this end the company is offering the committee every facility within its power.

In any fair solution of this question full consideration should be given to all of the various and somewhat conflicting interests involved. From whatever just standpoint the subject is treated there can be no satisfactory settlement which does not comprehend a fair measure of equity for each interest. What is usually termed the public in a case of this character is, after all, but one element in the great body politic of the community. The passengers who ride on the cars are not more of an element of the public than the employees and officials of the corporation or the investors who buy the stocks and bonds of the property.

Accepting, however, the common designation of the public as the passengers on the cars, it requires no emphasis to show that its chief interest is in the quality of the service given. Irrespective of the rate of fare charged, the traveling public desires a service that is dependable, reasonably rapid and safe. This was shown clearly by the recent experience in Cleveland. If satisfactory service is rendered, the public of this country is willing to pay its cost, and it needs no special ability to understand that the same quality of service is not possible for a low fare as for one that permits the payment of all expenses and charges and a fair return on the investment.

The solution of the problem in Detroit is of no less importance to the traveling public than to the employees. The welfare of the employees is dependent upon the success which follows the operation of the property to a greater degree than many realize. A duty is owed by the working forces to the corporation which employs them and, because of the public service in which they engage, to the traveling public which makes use of the facilities provided by the corporation.

Separated in a measure from the classes of the public outlined, dependent upon the officials and employees of the corporation for the faithful discharge of obligations, and upon the revenue from passengers in order that a

fair return may be realized from the funds exchanged for stocks and bonds, are the investors. Public justice demands that the capital which they place in a public service corporation shall receive recognition, and if the service rendered by the corporation meets a need of the community there should be no question, with reasonably good management and proper accounting and financial methods, of the right of the capitalists concerned to a full protection of their principal and payment of regular interest thereon.

It is in the best interest of the whole public that the street railway problem in Detroit be settled promptly and equitably.

### Electric Railway Maintenance

Following the plan adopted last year, this issue of the *ELECTRIC RAILWAY JOURNAL* for the first week in April is devoted largely to a presentation of the matters pertaining to the maintenance of the physical property of electric railway companies. The time is opportune, because at this season of the year active work is begun in all departments to put in order the track, overhead line, cars, power houses and other equipment after the long winter, and to prepare for heavy summer traffic. For the past 18 months maintenance expenditures on most roads have been kept down to the lowest point in an effort to reduce operating expenses proportionately to the general reduction in revenue. Expenditures for maintenance cannot be deferred too long, if the property is to be kept in operating condition. The deficiencies of last year must be made up sooner or later, and the improvement in business conditions, the prevailing low prices for material and labor, and the greater efficiency of labor, offer inducements for planning maintenance and improvement work for the coming summer on a large scale.

The special articles in this week's issue cover a wide range of subjects; each relates, however, to some phase of maintenance of electric railway equipment. A typical example of the development of an economical system without the expenditure of much money is found in the description of the car repair and inspection methods of the South Side Elevated Railroad, of Chicago. This company is operating many old cars, and its repair shops are inadequate. By careful and systematic inspection and the elimination of all unnecessary delays and expenditure of labor in the shops, largely through the adoption of specialized piece work, the facilities available have been made to serve efficiently.

The description of the remodeled shops and car house of the Third Avenue Railroad, of New York, presents the other side of the problem of economical maintenance. The physical rehabilitation of the street railways in New York has been taken up systematically by the receivers of both the Third Avenue and the Metropolitan systems. In each case the belief is evident that the preservation of the properties and the economical operation of the cars are impossible without proper maintenance, and that real economy lies in liberal appropriations to the repair account. We published a few weeks ago some curves on the cost of maintaining different parts of the equipment of the Third Avenue Railroad, illustrating some noteworthy reductions. A full understanding of the way in which these results have

been secured is made possible by the account of the shop facilities of the company contained in the article published this week.

One of the most effective methods of reducing the average expense of maintenance is the adoption of standards of construction. The work of the standardization committee of the American Street & Interurban Railway Engineering Association has paved the way for the adoption by many companies of the fundamental details of cars, including wheels, axles, journal boxes, brake shoes and couplers. These standards are based largely on those adopted by the steam railways. Companies which have any intention, now or in the future, of interchanging equipment with steam roads must adopt these standards. The Illinois Traction System has begun a systematic overhauling of all of its cars with a view of equipping them throughout with standard steam railway parts, which will permit cars to be offered and accepted at interchange points. This and other interesting details of the Illinois Traction System's rolling stock maintenance work are described on another page.

A new and profitable field for standardization has been entered by the Connecticut Company, whose standard details of overhead line construction, adopted recently, are described in this issue. The preliminary steps in this elaborate work involved a selection of the best designs of various manufacturers and the submission of the draft of the proposed standards to these manufacturers for criticism and suggestions. As a result, all new work and renewals will be carried out with apparatus which costs no more than under the old plan of using many different patterns of the same parts. The saving in maintenance by reason of the elimination of weak and unsatisfactory designs and the very large reduction in the amount of stock required to be kept on hand for emergency repairs will amount, it is believed, to a considerable sum. These standards might well prove a basis for future profitable consideration by the standardization committee of the Engineering Association.

The largest element of cost in the current maintenance of overhead lines is the renewal of decayed or corroded poles. The paper of Mr. J. M. Nelson, read last week before the Central Electric Railway Association, is a clear exposition of the causes of decay in wooden poles and cross-ties, and describes an economical method of preservative treatment which will yield large returns on the small additional investment required. Timber preservation is not a philanthropy. Assistance in the conservation of the forest resources of the country is to-day a commercial necessity. Its importance will increase from year to year as the supply of poles and ties decreases. The statement that at least three times as many ties and poles are consumed as are produced annually by the forest growth is significant and sinister.

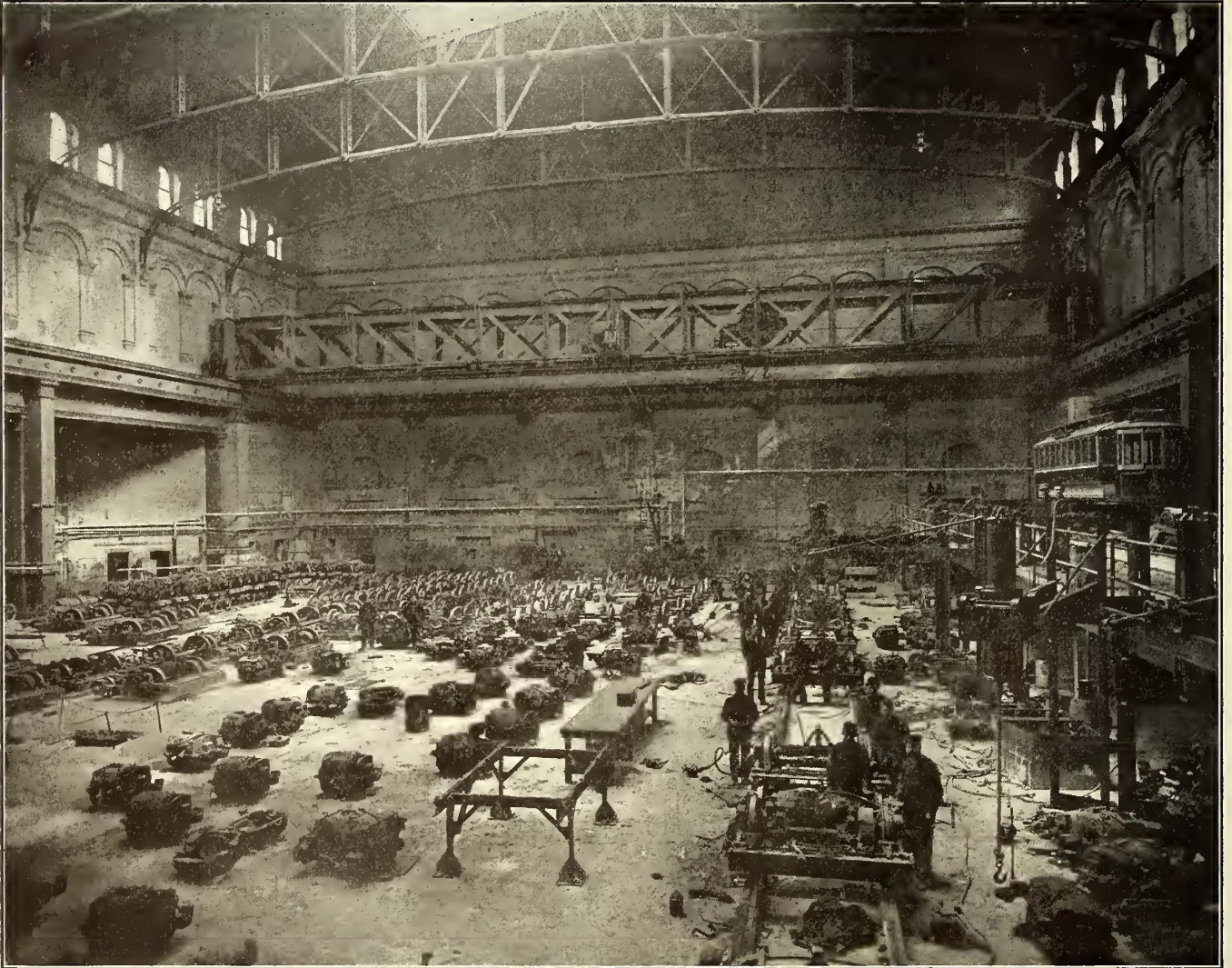
It is not possible here to comment on all of the other interesting articles in this week's issue. The two methods of reinforcing poles which are described, the painting practice of the Boston Elevated, the Harrisburg shops of the Central Pennsylvania Traction Company and the machine used in Philadelphia for grinding corrugated rails are particularly worthy of mention.

## THE RECONSTRUCTED CAR HOUSE AND SHOPS OF THE THIRD AVENUE RAILROAD COMPANY

The Third Avenue Railroad Company is now completing the reconstruction and rearrangement of its main shop buildings which occupy the block bounded by Third Avenue, Second Avenue, Sixty-fifth and Sixty-sixth Streets, New York. These structures have passed through a great many changes, the car-house building having been erected in 1861 for the general offices of the Third Avenue Railroad Company. The original walls, which are still standing, are of brick; the roof framing and floor supports were made up of round cast-iron columns, wrought-iron

The changes made in the construction of the car house facing Third Avenue were of particular importance, first, because of the necessity of strengthening the floors to carry heavier cars, and the attention given to fireproof construction. It is very creditable to those who have carried out the work along these lines that the buildings in their present condition show very little signs of patchwork, and if they had been built anew they could not be more substantial or better arranged.

The building consists of three continuous structures with several different ground levels, because of the steep grade between Second and Third Avenue. The portion fronting on Third Avenue consists of a basement, street



Third Avenue Shops and Car House—Truck Overhauling Shop, with New Gallery at the Right

I-beams and trusses, and the floors were of brick arches covered with wood. As cable and electric conduit systems successively followed the abandonment of animal traction, a cable power station and electric substation were added, and later were adapted for shop purposes without any radical building changes.

When the Third Avenue Railroad Company was placed in the hands of F. W. Whitridge, as receiver, it was determined to reconstruct the entire installation of 625 ft. x 200 ft. to convert it into a thoroughly equipped headquarters for the repair and maintenance of all rolling stock. The buildings are now used in their entirety for these purposes, the general offices having been removed to 129th Street and Third Avenue.

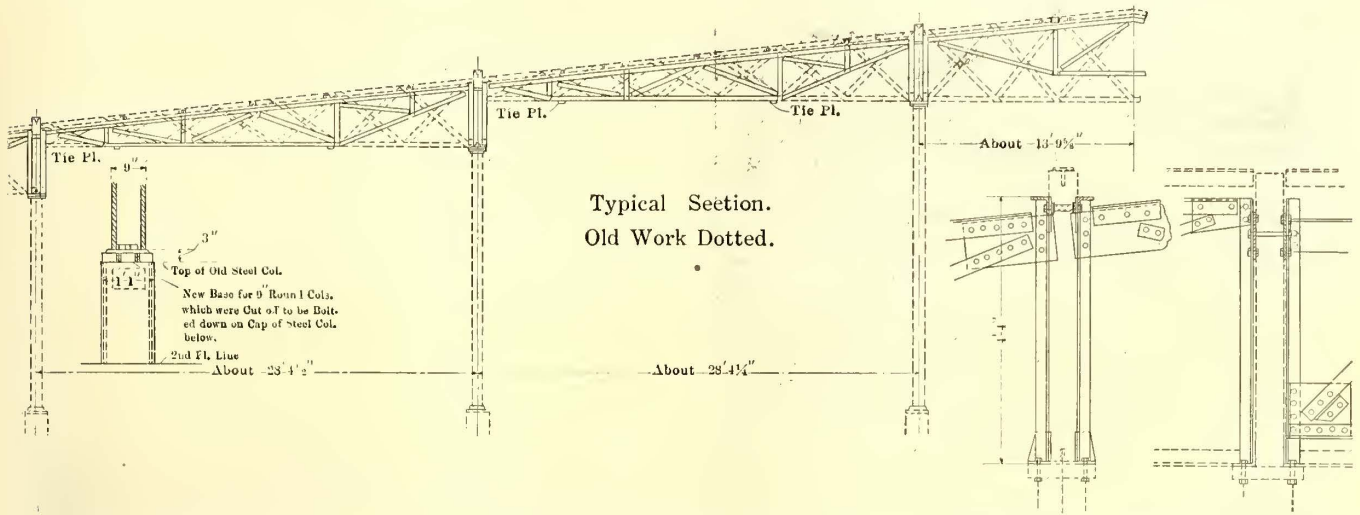
floor and second floor, extending as far as the new truck shop, which originally was an engine room for cable service. Excepting a gallery on the Sixty-fifth Street side, this truck shop has no intermediate floors from the floor to the roof, but it is bounded on three sides by several shop departments, flush with the second floor of the car house and in communication therewith. Beyond the truck shop is another building with several floors containing other shop departments. The following paragraphs describe the changes in detail:

### CAR-HOUSE ROOF

The roof covering of the car house, which has not been altered, consists of 2-in. planking and slag, but it is intended to replace this eventually with a concrete or fire-

tile construction. The roof trusses, however, were found to be too light to carry the additional weight of the sprinkler piping and therefore were reinforced with new trusses. The reinforcement has been designed to take 50 lb. of the total live and dead load of 75 lb. per sq. ft.

bolted to the new trusses on both sides of the old truss to make the latter absolutely rigid. In putting up the new trusses it was not deemed advisable to drill the old cast-iron pedestals which rested on cast-iron columns and carried the old trusses. This connection, therefore, was made



Third Avenue Shops and Car House—Typical Section Showing Old and New Roof Trusses; also the Connections of the Trusses to the Columns

Since the old trusses had tie members, it was found unnecessary to use such sections on the new lattice trusses. This difference in construction is illustrated herewith. The diagram shows how the new trusses were carried up at an angle at the ends to save unnecessary members.

by means of a new steel strut consisting of four angles which rested on the bottom flange of the square pedestal. These angles are battened together top and bottom and bolted to the cast-iron base.

To connect the old and new steel framing, cast-iron

The longitudinal struts which run from column to column at right angles to the trusses are of the latticed type.



Third Avenue Shops and Car House—View in the New Truck Shop Looking Toward the Car House

shoes of the type shown on page 582 were installed at all junctions of the purlins and trusses. This cast-iron shoe was shimmed up with 1/16-in. or 1/8-in. steel plates inserted between the shoe and the new trusses until the new and old trusses together carried the load. The shoes were

They have been reinforced like the trusses and connected to the columns in the same way. The sprinkler storage tanks are independently supported by a steel tower construction resting on a special foundation.

Another change in the roof framing was required by the

installation on the top floor of a north and south transfer table 30 ft. long. As the largest cars to be handled are 41 ft. in length and the longest bay was only 29 ft., it was necessary to change two bays into one. Consequently, one

9-in. diameter and were strong enough to be kept in place without change.

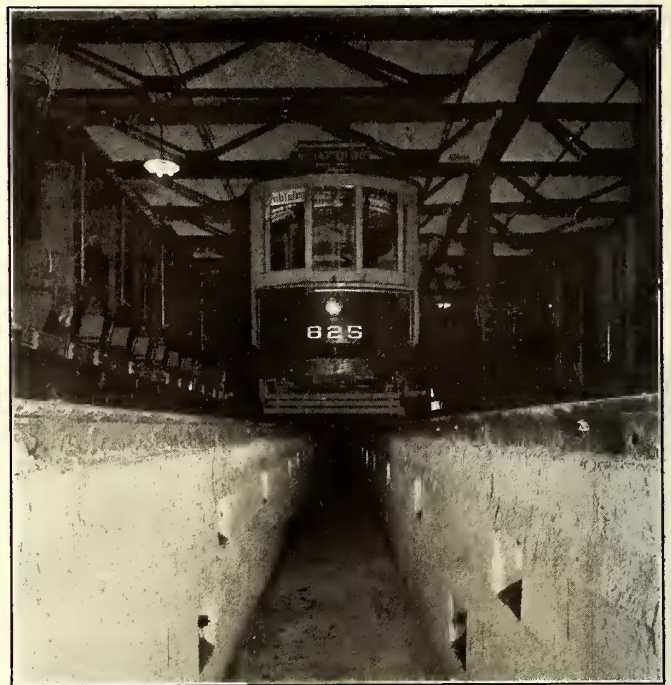
CAR-HOUSE SECOND FLOOR

The second floor of the car house is composed of 15-in. I-beams arranged in 29-ft. spans with brick arches. The spacing of the I-beams is 7 ft. center to center, and the carrying capacity was figured at 110 lb. live and dead load per square foot. This floor originally was used for the storage and repairs of the old-time light cars, and it was necessary to make it strong enough to carry the new 18-ton cars. The old beams have been reinforced their full length by installing latticed girders 2 ft. 5 in. deep beneath them. The new trusses were designed to carry the wheel loads and the old trusses to carry the dead load and any additional live load. In order to make the trusses carry their portion of the load before the I-beams deflected, they were built so that the assembled truss would have a slight camber in the top chord. The top chord was erected alone while it was straight and then the lower part was con-

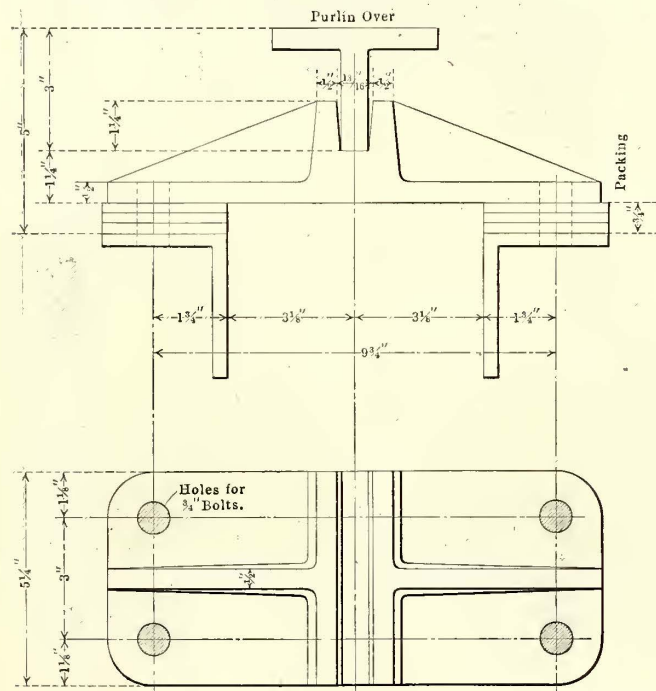


Third Avenue Shops and Car House—Reinforced Ceiling, Concrete Floor and Pit in the Car Inspection Quarters

row of six columns was taken out and the load is now borne by 47-ft. 6-in. span trusses running east and west. Angles that would have been carried on the old columns



Third Avenue Shops and Car House—Pay-as-You-Enter Car over New Pit



Third Avenue Shops and Car House—Chair and Shims Used to Connect the Old and the New Trusses in the Car House

are carried from the new trusses. The 7-in. columns at the western end of the new trusses were also replaced by 9-in. columns, but the eastern columns were originally

nected up, which, of course, resulted in the return of the camber. The trusses are attached to the floor beams by 7/8-in. diameter turn bolts.

In order that the wheels of the transfer table might be carried directly on I-beams four of the original brick arches under the site of the transfer table were torn out for a length of over 200 ft. and four 18-in. 55-lb. I-beams were installed. The brick arches were then replaced with flat concrete arches 4 1/2 in. thick. The longitudinal plate girders under the transfer tables on this floor were of comparatively recent construction and were found strong enough for the new conditions. The cast-iron columns used on this floor also were kept in place.

The middle bay of this floor, where sidewalk lights are installed, has been strengthened with channels placed at right angles to the I-beams, each channel going under the middle of one of the two tracks in this bay, so that the wheel load instead of being concentrated on one I-beam is divided among the adjoining ones. Cars are taken up to this floor for carpentry and painting on an elevator behind the transfer table near the Sixty-fifth Street side.



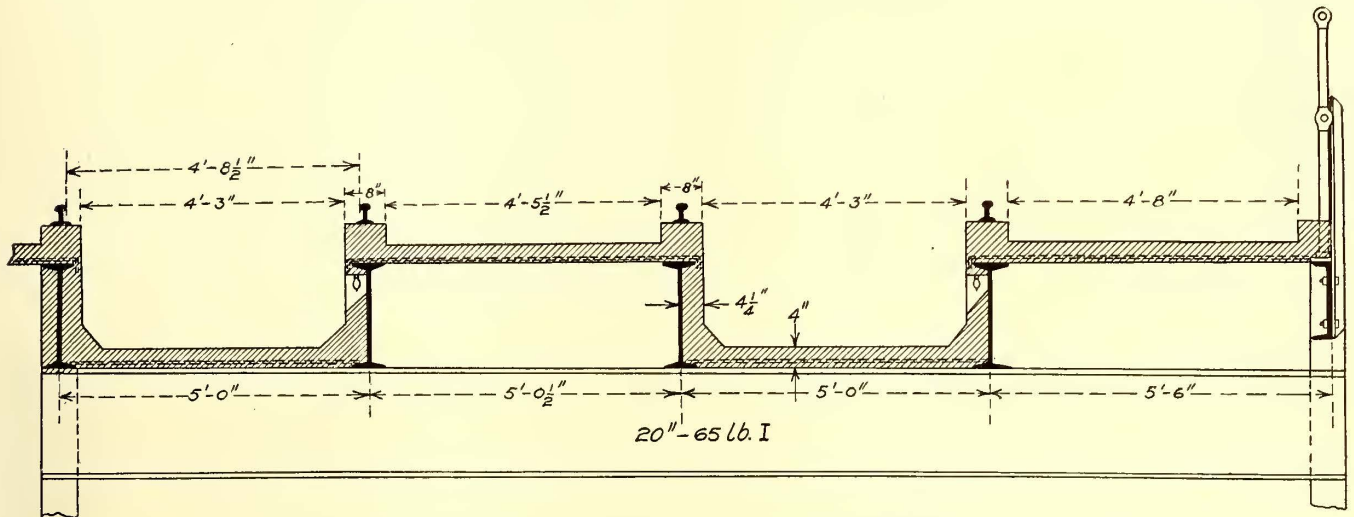
CAR-HOUSE FIRST FLOOR

The first story was originally a horse-car barn and the animals were kept in the cellar. The floor was made up of 6-in. I-beams spaced 4 ft. on centers with brick arches. These I-beams were supported on 4-in. cast-iron columns every 4 ft., thus dividing the cellar into 4-ft. squares. Nine-inch columns were also installed in the cellar at intervals to form 26-ft. squares.

When cable operation began the cable conduit was

that an electric-car house was being operated with wooden construction covering an area of over 60,000 sq. ft. and that fires occurred with undesirable frequency.

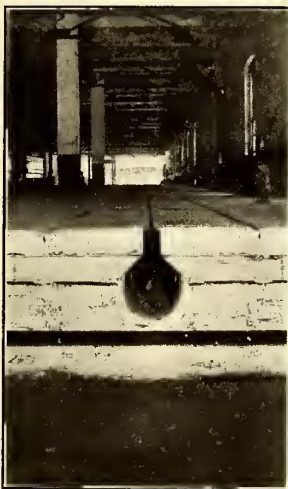
It was determined, of course, to eliminate wood in all the overhauling. The small columns and I-beams were taken out and only the heavier members erected within the last 10 years were allowed to remain. The old iron posts were replaced by plate and angle columns which have reinforced concrete footings and are set under the



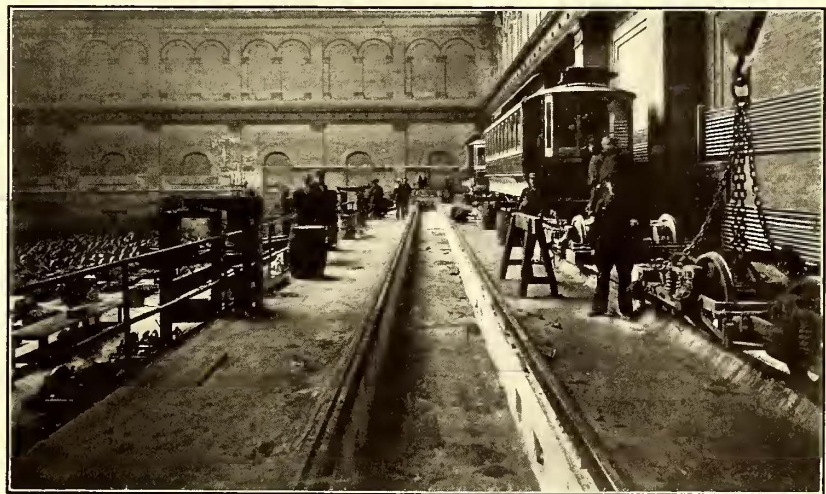
Third Avenue Shops and Car House—Cross-Section of Gallery in Truck Shop

formed by building a new wood floor 2 ft. above the brick arches, this floor being carried on wooden posts and stringers. Later on, when the lines were changed to electric conduit operation, the flooring in the front portion was left practically as before except that conductor rails were installed in place of the cables. Beyond the new transfer table inspection pits were made by tearing out the old 6-in. I-beams and brick arches and substituting for this a heavy floor built of 18-in. 55-lb. I-beams and brick arches.

center line of the tracks in such a way that two columns carry two tracks. The transverse girders resting on two of these columns are made of two 15-in. channels back to back so that the plate of the column runs up between them. These girders carry longitudinal I-beam stringers. On top of these stringers and at right angles to them are 7-in. I-beams spaced 4 ft. 6 in. centers and running from center to center of the tracks. The floor is made up of 4-in. slabs reinforced with twisted rods and is strong enough to



Section along Transfer Table in the Car House



Third Avenue Shops and Car House—Concrete Gallery for Cars Brought into the Truck Shop

The level of this floor was 5 ft. below that of the rest of the car house. On top of the new floor and directly under each rail brick walls were built for the pit sides. The floor between the tracks rested on top of these walls and was of wood.

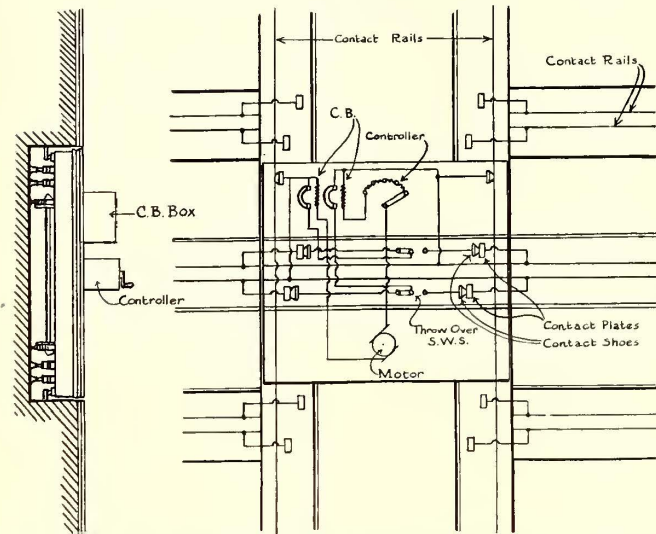
Later a center bay was torn out in the cellar for a storage room and a floor of heavy I-beams and brick arches installed with the same double floor as in the adjoining sections. The final result of these earlier changes was

carry 150 lb. live load and 50 lb. dead load per square foot. The 7-in. I-beams under the rails are cantilevered over the stringers to receive the conduit supports, which are formed of angles bent to the exact shape of the conduit and bolted to the bottom of the 7-in. I-beams.

A distinctly novel feature of the conduit construction was the use of reinforced concrete instead of longitudinal steel members between the conduit angles. The concrete is reinforced by Kahn "Hi-Rib," which is a metal lath with

ribs at intervals of about 6 in. It was found that this material lent itself very readily to building the odd shape required for a strong, fireproof and economical conduit.

Four inspection pits, each 200 ft. long, were added in the front part of the building, with side walls of latticed girders imbedded in concrete 12 in. thick. The new pits are 5 ft. deep and can take a 4-ton jack load at any point on

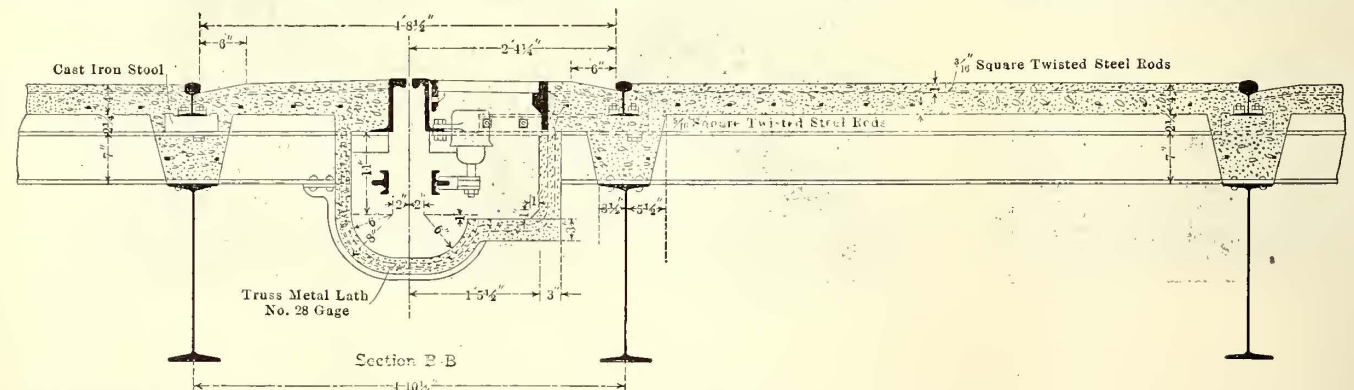


Third Avenue Shops and Car House—Wiring Connections between Transfer Table and Tracks

the floor. All of the woodwork between the old pits in the back of the car house has been replaced by reinforced concrete, but no change was needed in those built with recesses for wheel changing. Some of the old pits have check-plate-covered openings between them at intervals of about 18 ft. and others have such passageways bridged with reinforced concrete. Beveled recesses are installed in all pit walls for lamps and jumper plugs. It was not considered necessary to heat the pits directly, as the structure is steam heated.

GENERAL FEATURES OF THE CAR HOUSE

In setting up the new steel trusses in the car houses the precaution was taken to have the steel erectors provide holes for carrying hangers for sprinkler pipes, wiring conduits and other lines of piping which may be installed from time to time in the building. Ordinarily trusses are



Third Avenue Shops and Car House—Cross-Section of First Floor, Showing Reinforced Concrete Floor and Conduit

put up without regard to future pipe lines, and it is left to the shop personnel to drill holes through the trusses without regard to dangerous weakening of their strength. In this case not more than a single rivet hole has been left in any one section and there will be no excuse for tampering with the trusses.

It was decided to install doors so that in winter the car house would be kept warm. The arrangement of two of the four doors required is rather unusual as they have been placed inside a distance of 45 ft. from the front of the building. This was done to avoid having entering cars block the street while waiting for the car doors to be opened. Third Avenue is a busy thoroughfare and if this method were not used it would be necessary either to have the doors open all the time or cause annoyance to traffic. These doors are of the sliding type and are made of wood covered with crimped iron for fire protection. The swinging doors used where room is limited are of similar construction.

A very important feature of the electrical arrangement in this building is the system of having all the tracks dead except the one which happens to be directly in line with the transfer table. In the past considerable fire danger and appreciable waste of current resulted from the carelessness of motormen and conductors who left their cars with the lighting and heating switches in circuit. As shown in the accompanying wiring diagram, all tracks are dead until contact is made by closing by hand two circuit-breakers mounted on the transfer table. The tripping coils of these breakers are in circuit with the transfer table motor, so that as soon as current is supplied to that motor the tripping coils open the breakers on the first notch of the transfer table controller, leaving the track dead. Two circuit-breakers are required, because the circuit is not grounded. It will be understood that this method of keeping the tracks dead can be applied in any type of car house having a transfer table, whether the latter takes current from contact rails in the pit or from an overhead trolley.

THE TRUCK SHOP

The truck shop occupies an area of 170 ft. x 149 ft. with a free headroom of 80 ft. except for the new gallery on the Sixty-fifth Street side. This gallery carries two truck-overhauling tracks extended from the street floor of the car house. When this structure was erected the central portion was used for a cable station and the machinery was set on large brick piers. After the cable engines were removed the space between the piers was bridged over and the entire area covered with a wooden floor. This floor now has been removed completely and replaced by I-beams covered with 5-in. concrete slabs which are reinforced with

Kahn rib metal to support a live load of 200 lb. per square foot. The floor was given a granolithic finish at the same time that the concrete was laid and a similar finish 1 in. thick was placed over the rough concrete laid on the brick piers.

The gallery is 10 ft. 4 in. above the main floor, extend-

ing the full length of the shop. It is 26 ft. 2½ in. wide and is carried from the wall on transverse box girders framed to plate and angle columns. The longitudinal I-beams above these girders which carry the rails and flooring were deep enough to permit the construction of 2-ft. 4-in. pits. The concrete stringers bring the head of the rail 7 in. above the devil-strips for greater convenience in working alongside the trucks. The pits and flooring are made of reinforced concrete slabs. An angle-iron guard along the outer edge of the gallery prevents tools or other objects from dropping into the truck shop.

Part of the truck-shop basement opening on Sixty-sixth Street has been made available for a new blacksmith shop by removing an interior brick wall 16 in. thick and carrying the floor beams on steel columns. The floor of the blacksmith shop and the basement of the car house have been brought to the same level by transferring soil from the latter to the former. The blacksmith shop has abundant light from large side windows. It has a paved run-

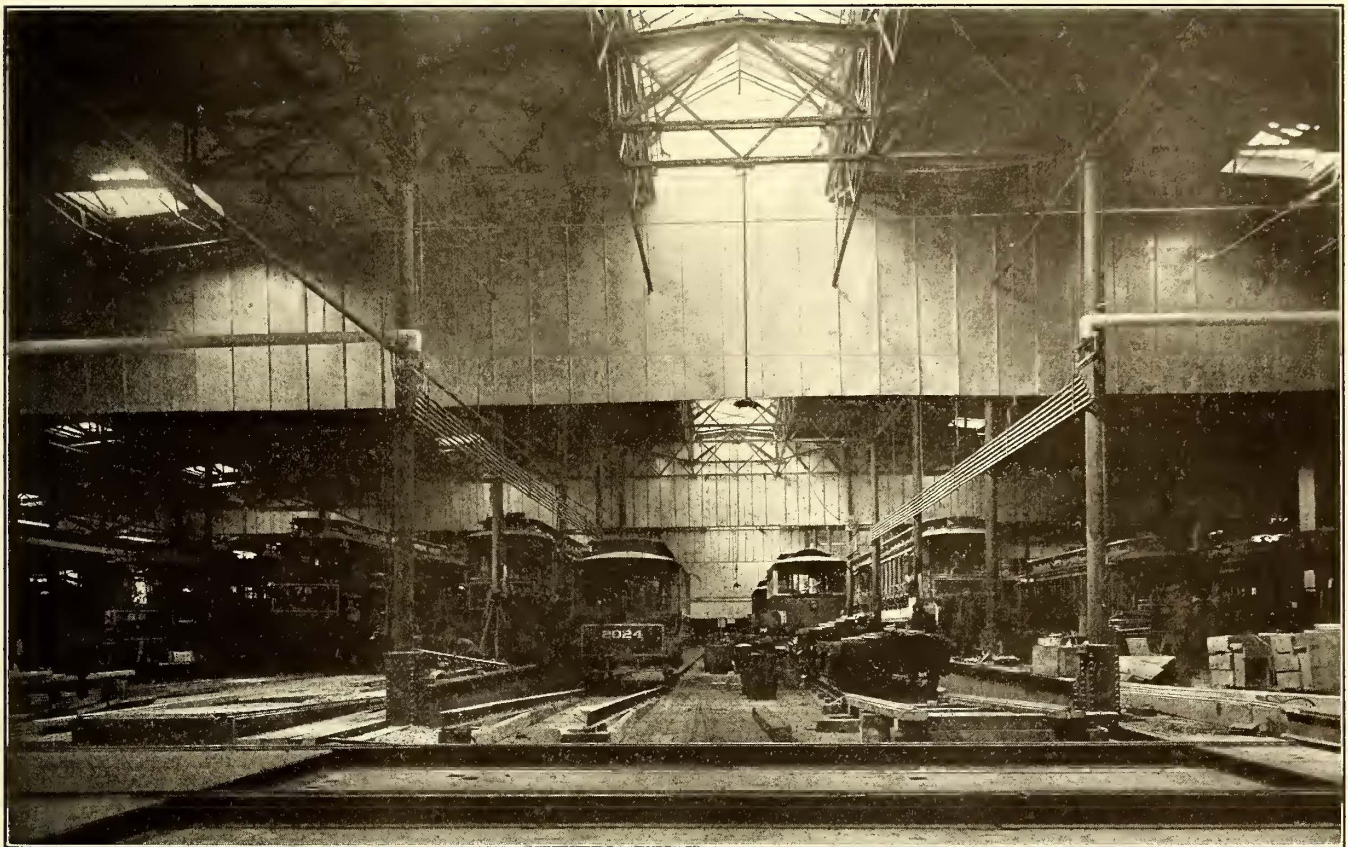
gallery. The supply quarters are isolated by heavy wire screens from the hallways.

All employees reporting for duty enter the building via the driveway at Sixty-fifth Street and proceed up the double school-type fireproof stairways with intervening barrier, which are carried from the cellar to the upper floors and communicate directly with nearly all the shops.

Several utility rooms are behind three sides of the solid walls of the truck shop on a level with the second floor of the car house. The space is now occupied in the following order: Pipe-bending and plow shop, on the Sixty-fifth Street side; blacksmith and machine shops at right angles thereto, and the carpenter shop and millroom, on the Sixty-sixth Street side. The machine tools are to be transferred to the truck shop, and as the blacksmith shop will also be in new quarters, the space thus made will be used for mill-room storage.

#### SUBSTATION BUILDING

The last structure in the group is known as the sub-



Third Avenue Shops and Car House—Second Floor of Car House at Transfer Table, Showing Fire Curtains

way to an adjacent iron storage chamber on the car-house end.

A driveway for supplies extends between Sixty-fifth and Sixty-sixth Streets about 10 ft. below the level of the truck-shop floor. Heavy materials unloaded in this passage are kept in a storeroom under the truck-shop floor and all other wood and metal stores are carried to other storerooms above. Paint and oil are kept in separate storerooms on the Sixty-fifth Street side.

The section above the driveway level with the truck-shop gallery floor is used for general stores except an area of 78 ft. x 15 ft., where cars receive sand from chutes above. A 6-in. wall of terra-cotta separates these compartments except for the opening protected by a sliding fire-door. The other storeroom on this floor is on the Sixty-fifth Street side below and in back of the truck-shop

station building. It is three stories in height. The substation apparatus is on the first floor on the Sixty-sixth Street side, the balance of the floor serving for a boiler room and coal storage. The second floor is divided into an armature shop and a sand storage. The third floor is also used for sand storage.

#### FIRE-PROTECTION FEATURES

It will be apparent from the foregoing description that the changes in construction have all contributed to the decrease in the fire risk. In addition, all openings in the car house and between buildings are protected by approved automatic sliding fire doors, except that rolling steel doors close the entrance to the truck-repair shop. Galvanized sheet-iron fire curtains have been hung from the trusses over the second floor of the car house, as shown above.

The principal fire protection for all parts of the installa-

tion except the truck shop, substation, boiler, armature and battery rooms is afforded by sprinklers installed by the Worcester Fire Extinguisher Company. As the second floor of the car house is fully enclosed and heated in the winter, it was equipped with the wet system of sprinklers, whereas the dry system is installed on the ground floor. On both floors the sprinkler heads are of the ceiling type and are placed about 10 ft. apart, or about four per 100 sq. ft. The complete sprinkler installation consists of 2600 sprinkler heads, six dry and nine wet valves. In general the sprinkler heads are set to open at the standard temperature of 150 deg. Fahr., but those in the blacksmith shop are arranged for 160 deg. Fahr. The water for the

that is, the same box can be used for both local and city fire-department alarms. About 29 fire-alarm gongs are distributed throughout the buildings.

The home fire-fighting force comprises several companies, each numbering 15 to 30 men, including a chief and

## THIRD AVENUE RAILROAD COMPANY

42nd STREET, MANHATTANVILLE AND ST. NICHOLAS AVE. RAILROAD CO  
DRY DOCK, EAST BROADWAY, AND BATTERY RAILROAD CO.

### GENERAL FIRE RULES.

1. Men in charge of buildings, or sections thereof, will be held responsible for the proper condition of fire apparatus, which should be frequently tested, and for the clean and tidy condition of the premises of which they have charge. They must make daily surveys thereof, repair minor defects at once, and report serious ones to proper authorities.
2. Free access to fire pails, extinguishers, hose reels, standpipes, alarm boxes and all other fire equipment must be had at all times.
3. Fire pails and all other fire apparatus will be used only for fire purposes.
4. Electric circuits must not be changed nor tampered with, except by the electrician in charge. Under no circumstances is copper wire to be used to replace blown out fuses.
5. Rubbish and debris of every sort must not be littered around, but must be put in the proper receptacles. Dirt or rubbish must never be swept into the conduits or track pits. Stairways, hallways, closets, cupboards, etc., must not be blocked up by nor used for storage of rubbish of any kind. Rubbish boxes and waste cans must be emptied daily, or oftener, if necessary, and the accumulation therefrom disposed of.
6. Ashes must be placed in metal receptacles which must be emptied once a day. Ashes must not be allowed to accumulate under the grate bars of boilers or stoves.
7. Steam or other heated pipes must not be in contact with wood or other inflammable material. Special care must be used to see that dirt, paper or other rubbish does not accumulate around, under or near radiators, steam or other heated pipes, or stoves. Stoves must be set on stone, brick or metal, and all woodwork near stoves or pipes must be protected by metal. Flues and stove pipes must be examined regularly and be kept in good condition.
8. Pits should be kept clean, and trolley slots cleaned thoroughly once a week.
9. Oily or greasy waste, greasy rags and paper, or other inflammable material must be put in the covered metal cans supplied for the purpose. Such supplies must not be mixed with clean material of like character.
10. Oils, paints, surplus supplies of oily waste and similar material must be kept in fireproof rooms provided for this purpose, except when actually being used. Benzine, gasoline, naphtha, or other similar highly inflammable substances must not be allowed on the premises except where actually needed. At such places only the minimum quantities necessary will be kept on hand. These substances will be handled with the greatest care, being kept in fireproof rooms whenever possible.
11. Gas lights and brackets must be protected so that they cannot be swung against woodwork, papers, curtains or other inflammable substances. Lamps and lanterns must be kept well filled with wicks in good order, for when oil is low it generates gas, which is liable to explode. Lamps or lanterns must not be filled after dark, or near fire or flame.
12. If oil or like substances are on fire, use sand; never use water, for water spreads the burning material. Use sand when live wires, short circuits, or charged rails are involved.
13. Sand only must be used on floors, in spittoons, or for catching oil drippings.
14. Smoking is prohibited in this building.
15. All shutters and all fire doors must be kept closed at night.
16. All clothing must be kept in lockers provided for the purpose, and only clothes actually used and needed may be kept on the premises.
17. Remember that most fires are caused by neglect and carelessness. Familiarity with these rules is enjoined upon all employees.

EDWARD A. MAHER, General Manager.

April 10, 1908.

### Third Avenue Shops and Car House—General Fire Rules

sprinkler supply consists of two gravity tanks, each having a capacity of 30,000 gal., and three pressure tanks of 7500 gal. capacity each. Through the medium of National air compressors, the latter tanks are kept at 91 lb. pressure. The tanks are always two-thirds full and are connected up to steam piping to prevent freezing. The pressure tanks are in a concrete structure on the car house and the gravity tanks are mounted on the steel framework above, as shown on this page. As previously noted, the weight of the storage tanks is supported independently of the car house.

Besides sprinklers, the car house is supplied with 39 2½-in. diameter standpipes with the usual water and sand pails, extinguishers, axes, etc. Similar protective apparatus is installed in the other buildings. The fire-alarm system comprises 82 Gamewell boxes of the combination type—

#### FIRE DRILL REPORT.

#### Third Avenue Railroad Company.

Depot. 190  
Still Alarm Sounded at \_\_\_\_\_ A. M. \_\_\_\_\_ P. M.  
Alarm Box Number \_\_\_\_\_ Located \_\_\_\_\_  
Number of Men responded \_\_\_\_\_ Pails \_\_\_\_\_ Axes \_\_\_\_\_  
Chemical Extinguishers \_\_\_\_\_ Hosemen \_\_\_\_\_ Transfer Table Men \_\_\_\_\_  
Car Shifters \_\_\_\_\_ Elevator Men \_\_\_\_\_ Condition of Fire Apparatus \_\_\_\_\_  
Total Number of Fire Extinguishers (Chemical) \_\_\_\_\_  
Total Number of Sand Pails on premises \_\_\_\_\_  
Total Number of Water Fire Pails on premises \_\_\_\_\_  
Total Number of Rubbish Cans \_\_\_\_\_ Oily Waste Cans \_\_\_\_\_

#### REMARKS.

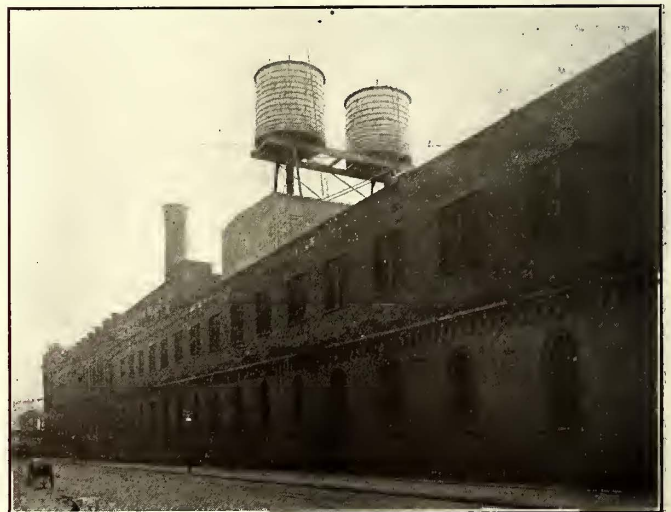
After filling out please forward to  
Superintendent of Buildings.

Baro, Foreman.

Superintendent of Buildings.

### Third Avenue Shops and Car House—Fire Drill Report

assistant chief. Every man is trained for a specific task, such as the shifting of cars, handling buckets, hose or axes, etc., and consequently knows just what to do in emergencies. Fire drills are held from two to five times a week, so that both old and new men will not lack experience in handling the available fire-fighting apparatus.



Third Avenue Shops and Car House—View Along Sixty-sixth Street, Showing the Gravity Sprinkler Cisterns Over Concrete House Containing the Pressure Tanks

Much attention is given toward keeping the structures clean, self-closing waste and rubbish cans being provided for the inevitable odds and ends of inflammable matter. The reinforced concrete conduit has minimized the danger from the conductor rails and elsewhere all wiring circuits are run in conduit.

One day and one night man besides the watchman are assigned to this installation to examine the fire-protection

care of individuals who make it their specialty, the company has the assurance that the least impairment of the fire-protection apparatus will be discovered and corrected immediately.

The accompanying blanks are those used to record the surveillance and operation of the fire-protection equipment. One is a daily report on the automatic sprinkler system and covers the condition of the pressure tanks, gravity tanks, dry valves and main valve-controlling header system. The automatic sprinkler protection, maintenance and inspection report is made out at irregular intervals and goes into much more extended detail on the condition of the apparatus. Any fires which occur in the car house are reported on a form which must be signed by the car-house foreman and superintendent of equipment. Besides describing the cause and extent of the fire, this report shows how many employees responded to the alarm and when the city fire department was called. The fire-drill report, signed by the car-house foreman, goes to the superintendent of buildings with all necessary details as to the number of men and character of apparatus available to answer an alarm. The general fire rules posted throughout the buildings are reproduced in full to illustrate other practices which tend to diminish the fire risk. The superintendent of buildings gives particular attention to the absolute enforcement of these regulations, which are also prescribed for the other car houses of this company.

ENGINEERING AND CONSTRUCTION

The entire reconstruction of these buildings was carried out under the direction of E. A. Maher, general manager, and T. F. Mullaney, chief engineer to F. W. Whitridge, receiver. The architectural plans were prepared by Axel S. Hedman; the steelwork in the car house was fabricated and installed by Post & McCord and that in the truck-repair shop by Levering & Garrigues; the concrete work was done by the Turner Construction Company; the school stairways and part of the blacksmith shop by John H.

Mr. EDWARD A. MAHER— General Manager. Date... Beg to report that fire was discovered in Car Barn at ... A. M. ... P. M. by ... Car No. ... was on fire on track No. ... Fire was extinguished by the use of Chemical Extinguisher or ... Local alarm was ... sounded at ... A. M. ... P. M. No. Men responded ... City Department was ... called at ... and arrived at ... Services ... needed. The damage consists of ... The cause of fire was ... REMARKS (Make detailed report of facts.) After filling out please forward to Supt. of Buildings. Barn Foreman. Supt. Equipment. This report to be made out for every fire and forwarded to Supt. of Buildings.

Third Avenue Shops and Car House—Report on Car House Fire

Automatic Sprinkler Protection, Maintenance and Inspection Report.

LOCATION... NAME OF INSPECTOR... DATE OF INSPECTION... TIME MAKING INSPECTION... Describe any changes to equipment since previous inspection... State if protection impaired since previous inspection... VALVES CONTROLLING SUPPLIES... VALVES CONTROLLING SYSTEMS... VALVES CONTROLLING HEADERS... DRY VALVES... VALVE HOUSES... (1904)

GRAVITY TANKS... PRESSURE TANKS... STEAMER CONNECTIONS... FILLING PUMP... AIR COMPRESSORS... ALARMS... Did all bells ring properly?... Condition of Curtain Boards... Watchman's records good... Any broken wood flooring about premises... What disposition of receptacles for oily waste?... Bensine or Gasoline... Wired glass windows... Shutters... Standpipes and hose... Fire Pails... Chemical Extinguishers...

DAILY REPORT. AUTOMATIC SPRINKLER SYSTEM.

LOCATION:--129th-130th Streets and 3rd-Lexington Avenues, N. Y. C.

Table with columns for Pressure Tanks, Gravity Tanks, Dry Valves, and Main Valve Controlling Header System. Includes rows for No. 1 through No. 5 and No. 1 through No. 9.

Third Avenue Shops and Car House—Detailed Report on All Fire Protection Apparatus

equipment every day and report its condition to the general manager. By placing this important department in the

Parker & Company, and the remodeling of the repair shop by John Weber & Son.

## ADVANTAGES AND COSTS OF OPERATING LIGHT CARS IN DENVER

BY JOHN A. BEELER, VICE-PRESIDENT AND GENERAL MANAGER, DENVER CITY TRAMWAY COMPANY

The ordinary surface car should be light, strong and durable. All unnecessary weight should be eliminated. The cost of moving a passenger car on the tracks for one year has been variously estimated at from 5 to 10 cents per pound. These figures include fixed charges, cost of distribution, etc., but it readily will be seen at a glance that it is of the utmost importance that all unnecessary dead weight be eliminated.

The heaviest car we use in Denver is a four-motor car 43 ft. long over all, which weighs 43,400 lb. and seats 52 passengers. This represents a dead load per seated passenger of 834 lb. During the rush hours we attach to these cars a 38-ft. enclosed trailer with a seating capacity of 46 and a total weight of 13,000 lb., which represents a dead weight per passenger of 282 lb. This brings the average dead weight per seated passenger for the two-car train down to 575 lb. On our standard combination 39-ft. and 40-ft. cars, which are used without trailers, the dead weight per seated passenger varies from 575 to 623 lb.

The cars of this company are built with a combination steel and wooden frame floor, the I-beams extending from the extreme front to the rear of the vestibule. There are

connection with the trailer operation were reduced in this or greater proportion. The importance of using trailers under proper conditions can be seen readily.

The following discussion of this subject by W. H. McAloney, superintendent of rolling stock, Denver City Tramway Company, introduces some figures to amplify my remarks:

### TRAILER OPERATION

BY W. H. McALONEY

A recent editorial in the *ELECTRIC RAILWAY JOURNAL* stated that the cost for power was one of the largest factors in operating expense. Surely the high proportionate cost for power with some roads is brought about from either or both of the following reasons: (1) Excessive weight of cars; (2) poor controller handling by motormen. Both of these power-consuming factors may be made less. The experience of the Denver City Tramway Company with light cars may be of interest in illustrating the value of light-weight cars. The problem of controller feeding will always be vexatious to handle until automatic acceleration apparatus for all classes of cars is fully developed.

One of the first questions confronting the designer of rolling-stock equipment is to determine whether two-motor cars or four-motor cars and trailers shall be used. We have seen records of various tests which showed that the two-motor equipments were the most efficient; this result, of course, being dependent on grades, climate and general

CAR WEIGHTS AND SEATING CAPACITY.

Type.	Length over all.	Motors.		Body complete.	Weights.			Gear ratio.	Speed cap. level track.	Seating capacity.	Dead wt. per pass. seat. cap.	
		No.	Total H.P.		Trucks.	Motors.	Total.					
39-ft. combination.....	39 ft. 6 in.	2	75	12,000	9,000	4,300	25,300	{ 17-67 3.9 to 1	20	44	575	
40-ft. closed.....	40 ft. 3½ in.	2	100	13,794	10,600	5,506	29,900	{ 15-69 4.6 to 1	22½	48	623	
41-ft. closed.....	41 ft. 6 in.	4	150	17,800	10,600	8,600	37,000	{ 17-67 3.9 to 1	21	48	771	
43-ft. closed.....	43 ft. 3½ in.	4	172	18,760	13,500	11,140	43,400	{ 17-67 3.9 to 1	22½	52	834	
38-ft. closed trailer.....	38 ft. 1 in.									8,000	5,000	13,000
41-ft. 4-motor car and trailer.....											94	532
43-ft. 4-motor car and trailer.....											98	575

no drop platforms to telescope or collapse in case of collisions. Entrances are made near the center of the right-hand side of the car. This form permits of light but very durable construction.

As Denver is a comparatively level city, it is particularly adapted to the use of trailers. The trailers used are enclosed, 38 ft. long, with side entrances. Passengers and employees neither can step from one car to another nor are they allowed to transfer from one car to the other.

The advantages of these light trailers during rush hours are very marked. The regular carrying capacity can be doubled by the addition of a single trailer in charge of one conductor; and, although doubling the car capacity, the increase in the platform expense is but 50 per cent, the power consumption increase about 40 per cent, and car repairs and maintenance about 33 per cent, instead of an increase in these items of 100 per cent in case extra motor cars were employed. Accidents also are reduced, for the reason that the regular experienced motormen handle these units, doing away with the less efficient and less experienced motormen handling the extras.

During the year just passed for one of our principal lines operated by single units, it required approximately 22 per cent of the passenger receipts to pay the trainmen. On a similar line, operated with trailers during the rush hours, it required only 16 per cent of the passenger receipts to pay the trainmen, which alone meant a saving of 6 per cent in operating expenses. Nearly all other expenses in

track and operating conditions. In a Western city where the soil is sandy, traction is good 95 per cent of the time and two-motor equipments with the consequent reduction of care and attention are no doubt economical. In 1905 our company considered the number of motors to be used per car and found that the "electrical equipment" (standard expense account No. 7) on our two-motor cars for the year cost 0.63 cent per car-mile, whereas the four-motor cars cost 0.88 cent per car-mile, the seating capacity and earning power of the rolling stock being practically the same. As a result of these comparisons it was determined that the four-motor cars should increase their earning capacity by hauling trailers for the rush-hour work, these trailers to be about equal in seating capacity to the motor cars (see accompanying table). This table shows that the dead weight per passenger on the basis of seating capacity on our heaviest four-motor cars is 834 lb. and that when hauling a trailer the dead weight is cut down to 575 lb. per passenger seating capacity.

The average current consumption at the motor on four-motor cars is 2.5 kw-hours per car-mile and with the standard trailer added this increases to 3.5 kw-hours, an increase of power of only 40 per cent with no appreciable lessening of the schedule time. We have a recent record of a 40-ft. two-motor car seating 48 passengers, requiring 2.42 kw-hours per car-mile, while on the same day and line a 41-ft. four-motor car with the same seating capacity used 3.78 kw-hours per car-mile, showing an excess cur-

rent consumption over the two-motor car of 56 per cent. Denver's heaviest car (43 ft., see table) was designed for city and short interurban work. It has four 43-hp motors and weighs 43,400 lb. empty. On the basis of 10 cents per pound per year for operation the cost for service with this car is \$4,340. The combined weight of the same car with a 13,000-lb. trailer is 56,400 lb., which, on the basis of 10 cents per pound, costs \$5,640 per year. This shows an increase in cost of only 31 per cent, yet the carrying capacity is increased practically 100 per cent. On this basis of calculation, referring to the above-mentioned weights of the two-motor 40-ft. car and the 41-ft. car, it will cost \$2,990 per year to operate the two-motor car weighing 29,900 lb., whereas it will cost \$3,700 to operate the four-motor car weighing 37,000 lb. The two cars have practically the same earning power as single units, but on the power basis the four-motor car costs 24 per cent more to operate.

It has been shown that with the conditions in Denver the use of trailers is the cheapest solution of the rush-hour problem and by their use the company is fully prepared to meet fluctuating conditions in travel. The headway easily may be kept uniform, accidents have been reduced and, as the city grows and traffic congestion becomes more troublesome for the operation of street cars, the two-car units become more valuable.

The original first cost of a trailer is one-third and the upkeep is about one-third of that of a motor car. Also, the increase in power required is only 40 per cent and

Car.		Weights.			
Type.	No. Trucks.	Motors.	Body.	Air brake.	Totals.
34-ft. comb. ....		2	5,000 lb.		23,000 lb.
39-ft. comb. ....	9,700 lb.	2	5,125 "	None	25,300 "
41-ft. comb. ....	9,700 "	2	5,125 "	None	28,300 "
41-ft. comb. ....	11,150 "	4	10,000 "	500	36,800 "
43-ft. comb. ....	13,500 "	4	13,000 "	800	42,500 "
38-ft. trailer....	4,900 "		8,100 "		13,000 "
Open St. L. trailer					5,750 "
Combination ... 1		4	5,200 "		33,700 "
Colfax Ave.....		2	5,000 "		23,600 "
Brill-Recon. ....		2			20,300 "
West End.....		2	5,125 "		24,570 "
Open Berkeley...		2			21,500 "
Open Woerber...		2			21,500 "

labor 50 per cent when trailers are operated, while their use at the same time assists materially in solving the extra list problem.

The trailer used in Denver (which, owing to favorable climatic conditions, may be lighter than could be used elsewhere) weighs only 13,000 lb. complete, and has a seating capacity for 46 persons, making a dead weight per passenger (seating capacity) of 282 lb. After four years of service it has not been found necessary to increase or to strengthen any part of this car.

When attempting to reduce power costs for car operation great care should be taken to secure that equipment best suited for the service and local conditions. Dead mileage causes a severe increase in power consumption as well as bringing about unnecessary wear and tear on the rolling stock. Therefore, to keep maintenance cost and platform expense low it is required that car houses and storage points should be located convenient to the district served.

Low initial cost should by no means be the governing factor in buying equipment, material or supplies, and manufacturers as well as the railway companies should collect and study all available data possible bearing on the proposed service. Maintenance is a great big word and there are no doubt times when in studying operating figures it becomes magnified by comparisons. In a few years when street railway systems are more closely allied by standards

this question will be more seriously studied. As the costs for power and upkeep of equipment are the heavy items of expense, no doubt before long we shall see the motormen under the supervision of the mechanical departments. In addition to this, better and more improved methods of work and inspection on cars should have a tendency to reduce equipment repair charges.

### METHOD AND COST OF PAINTING A LARGE ELEVATED RAILWAY STRUCTURE

The Metropolitan West Side Elevated Railway, Chicago, has 26 miles of double-track elevated structure, which is repainted every five years. Succeeding portions of the structure, amounting to about one-fifth of the total length, are painted every fifth or sixth year, so that the work proceeds from section to section each year. Three kinds of paint are used: The column bases are protected by a coal tar paint and the superstructure is given two coats of paint made up from two different formulas, presented later.

#### PAINTING COLUMN BASES

The bases of the large columns which support the elevated structure are frequently found to be affected by moisture, ammonia from refuse and ashes piled about them in alleys. Some of these bases are so corroded that a cleaning with wire brushes and chipping hammers will not serve to remove all the scale and dirt. Because of the difficulty of cleaning these badly corroded bases, the company has built a sand-blast outfit which may be drawn from post to post and operated by current taken from the third-rail. Compressed air for blowing the sand is had from two large car-equipment air compressors. With this sand-blasting outfit the company's men so thoroughly clean the scale from the steel work that it is said to be as bright as new silver. Soon after, cleaning, the steel is coated with a paint made according to the following formula:

#### COAL TAR PAINT FORMULA

The coal tar paint for use in covering the column bases and those parts of the structure over steam railroad tracks is made up of the following ingredients: Coal tar, 16 parts; cement, 4 parts, and kerosene, 3 parts by volume. These proportions are varied slightly according to the original consistency of the tar and the use to which the paint is to be put. The variations should not exceed the following proportions:

Eight parts coal tar, 1 part Portland cement, 1 part kerosene.

Sixteen parts coal tar, 4 parts Portland cement, 3 parts kerosene.

The Portland cement first should be carefully stirred into the kerosene oil to form a creamy mixture; then this mixture should be well stirred into the coal tar. To obtain the best results especial care should be used in mixing and stirring. The paint may be used after it has been mixed for some time, but it is impossible to state what results will be obtained without first experimenting. The cost of the paint is about 15 cents per gallon.

#### PAINTING THE SUPERSTRUCTURE

The regular schedule for painting the superstructure requires that 10,000 tons of steel be covered per year. This amount does not include the painting of the stations, but only the elevated structure, which has solid plate girder spans with latticed channel columns. The structure weighs about 800 lb. per running foot.

Above the column bases the steel work, if corroded, is first gone over with chisel-end hammers and 4-in. scraping

knives to remove scale and other loose dirt. Then the steel work is cleaned with stiff wire brushes, which leave it ready for the application of paint. As done by the company's forces, the cleaning of the steel work costs 40 cents per ton.

After this thorough cleaning two coats of structure paint are applied. The specifications according to which this paint is made follow:

#### FIRST COAT STRUCTURE PAINT

Paint to be delivered in barrels on the right of way of the railway company or at its storehouse, 139 Throop Street, Chicago, Ill.

Paint to be made in accordance with the following formula:

Two parts by weight "Double Brand Prince's Metallic," one part strictly pure red lead, one part graphite. This pigment to be ground in 25 per cent of raw linseed oil to form a thick paste; the paste so formed to be reduced and reground in raw linseed oil; the finished product to be in liquid form weighing 12 lb. to the gallon.

The "Double Brand Prince's Metallic" to be the highest grade of this kind of material; the graphite to contain not less than 60 per cent pure carbon.

A small amount of turpentine oil Japan may be used to accelerate drying if weather conditions require same.

#### SECOND COAT STRUCTURE PAINT

Paint to be delivered in barrels on the right of way of the railway company or at its storehouses, 139 Throop Street, Chicago, Ill.

Paint to be made in accordance with the following formula:

Pigment to consist of 52 per cent strictly pure American zinc, 40 per cent strictly pure carbonate of lead, 8 per cent coloring matter.

Coloring matter shall consist of best French yellow ochre and lampblack.

The above percentages have reference to weights of substances. The grinding and mixing of paint shall be done in an approved and thorough manner and will include chasing. The zinc and lead in above proportions shall be ground first in paste form in a sufficient quantity of pure raw linseed oil to make a thick paste; this paste then to be reground and thoroughly mixed, including the chasing above specified, with the proper amount of coloring matter and raw linseed oil with best turpentine Japan drier. This amount of drier used in any given mix shall not exceed 1 gal. to every 10 gal. of linseed oil used in the entire paint mixture.

No turpentine shall be used in paint except that contained in the drier.

The paint when ready to put into barrels shall weigh not less than 13 lb. per gallon and not more than 14 lb. per gallon.

The paint required under these specifications shall be mixed in quantities of 500 to 1000 gal., which mixing shall be done subject to the inspection of the railway company's inspectors, and contractor shall afford the inspector all necessary facilities for the purpose of measuring and estimating the amounts of the various materials placed in the mixture.

The finished paint, as well as the elementary parts of same, shall be subject to such tests as the railway company's inspector may deem necessary, and the contractor shall furnish samples of oil or pigment when required for such purpose. The color of the paint shall be as per Metropolitan second coat color, sample of which will be furnished contractors.

No other oil than linseed oil shall be used except in case of drier, which drier shall consist of turpentine Japan.

When paint is mixed according to these formulas its compounding is carefully watched by the company chemist, who analyzes the raw materials, examines their brands and checks the grinding at the factory. Each barrel of paint is numbered by its manufacturer, and when received by the railway company sample cans are filled from the barrels and correspondingly numbered. One sample taken

from each barrel is analyzed by the company chemist. By this procedure the company has a complete check on the character of the paint from the time of the receipt of the raw materials at the paint factory until the application to the steel structure.

These methods have been used for first and second coats to protect the Metropolitan Elevated structure for 15 years, and the results have been satisfactory. The preparation of tar for the column bases has been used for two years, and the results have been satisfactory to date. Just how long it will stand is yet to be determined by the future.

The cost of applying what is known as a spot coat, covering spots where the steel is bare, and then a full second coat over this spot coat is, with the company's forces, 35 cents per ton, and the cost for the paint and paint brushes is 41 cents per ton of structure.

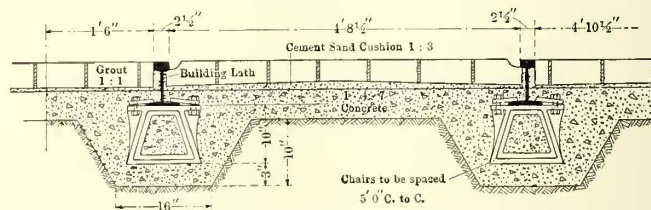
These detail costs, when added to the cost of 40 cents per ton for cleaning, give \$1.16 per ton as the total cost of the work when done by the company forces. In years past, when the cost for labor was higher than it is now, the structure has been painted by contract to the same standards at about the same cost per ton.

The work of painting the elevated structure of the Metropolitan West Side Elevated Railway is carried on under the supervision of B. J. Fallon, engineer maintenance of way. Acknowledgment is made to B. I. Budd, general manager, for information contained in this article.

## CONCRETE GIRDER TRACK CONSTRUCTION IN SEATTLE

The Seattle Electric Company has experienced trouble with track laid several years ago in which wooden ties were used, and therefore has decided to experiment with a more permanent type of track substructure. The accompanying illustration shows the track design which is now being followed for track laid in brick paving. Similar designs have been prepared where granite or asphalt is used.

The substructure under each rail comprises a stringer of concrete 16 in. wide at the bottom and increasing in width to about 24 in. at the base of the rail. The stringers be-



Concrete Girder Track Construction of the Seattle Electric Company

tween tracks and between rails are tied together with a floor of concrete 5 in. thick. The rails are anchored to the concrete stringers with cast-iron chairs having lugs which bolt over both bottom flanges at each chair. The chairs are similar to those used in Philadelphia. Tie rods and chairs are spaced on 5-ft. centers. In placing the brick or granite pavement a cushion of sand and cement, mixed in the proportions of 1 to 3, is used. The concrete mixture for the general substructure has proportions of 1 of cement, 4 of sand and 7 of broken stone.

George P. James, chief civil engineer of the Seattle Electric Company, to whom acknowledgment is made for the accompanying information, has stated that if this type of track is found to be satisfactory for local conditions in Seattle it will be adopted as standard for future work.



## THE CONNECTICUT COMPANY'S STANDARDS FOR THE OVERHEAD CONSTRUCTION OF 500-VOLT, D. C. RAILWAYS

Under direction of Vice-President E. H. McHenry, in charge of engineering and construction, there has been prepared for the Connecticut Company, which operates over 600 miles of electric railway track in Connecticut, a very interesting set of specifications, which are being applied on all of its new overhead line construction and renewals on 500 to 550-volt d.c. railways of city, interurban and electrified steam types. Primarily, these regulations have been adopted to obtain uniform construction standards, but the company has also borne in mind that the installation methods and materials chosen should be of a nature requiring the least expense for maintenance and replacement.

The work has been done under the immediate direction of the construction department of the New York, New Haven & Hartford Railroad, Edward Gagel, chief engineer, by Charles Rufus Harte, assistant engineer in charge of trolley construction, and his assistant, R. E. Wade, in conjunction with L. L. Gaillard, superintendent of power and lines of the Connecticut Company. A rather unusual feature was the submission of the first draft to various contractors, engineers and manufacturers, with the request for free criticism, consideration of which very materially strengthened and broadened the specifications.

In undertaking to prepare these specifications it was realized that, aside from catenary construction, d.c. overhead line material had attained such a ripe stage of development that it would be futile to expect the manufacturers to make radical changes in design unless the customer was willing to put up with high prices and longer deliveries. Hence it was determined to find what standard designs of the different makers were best suited to the company's needs, and then to find what variations were permissible in order that all bidders would be placed on the same footing. The investigation comprised laboratory tests in New Haven of various materials submitted, observation of such materials in service, frequent visits to line material factories to study the conditions of manufacture and numerous conferences with manufacturers relative to their ability to conform to the company's ideas. When the process of selection was completed it was found that almost every part was standard with at least one supply house. Here and there it was desirable to call for slight variations in dimensions or shape, but in every instance the practicability of the change was discussed with the manufacturers before it was specified.

As the net result of this work there has been developed a set of specifications which are believed to cover the best designs in each field, yet costing no more than before, and embodying all the advantages of interchangeability and prompt delivery. It should be added that The Connecticut Company had the cordial co-operation of all the important manufacturers in its endeavor to improve and codify line material standards.

The following paragraphs describe in detail the general rules laid down for both the line material and the general methods of installation. The first draft of the specifications covering the line material proper referred to a given item as the — Manufacturing Company's design No. —, or equivalent. In the revision all trade names have been omitted, and instead each design is identified by an accompanying numbered drawing. As the latter

also shows the permissible variations in size and shape, the bidders know just what is meant by the use of the term "equivalent." All of the drawings accompanying these specifications are bound in handy form in a book of blueprint sheets, 7½ in. x 12 in. in size.

### TYPES OF SUSPENSION

Bracket construction shall be used on all single-track lines unless otherwise specified. Span construction shall be used on all double-track work, including turn-outs, and on all curves of less than 300 ft. radius; also where local conditions require such construction.

### POLES, POLE FRAMING AND POLE SETTING

Poles shall be of commercially straight, round chestnut and conform to following dimensions:

Length in feet	Circum. top in inches	Circum. 5 ft. from butt in inches
30	22	36
35	22	38
40	22	44
45	22	47
50	22	50
55	22	53
60	22	56
65	22	58
70	22	58

Poles are to be delivered barked and with knots trimmed. They shall be sound and free from butt rot or hollows in butts which would impair strength above ground. They shall be free from unsound knots and shall have no more than one crook, this crook to be in one way only. Contractor shall point the tips, saw the butts off square, smooth all knots with draw knife, shave the entire pole, if so directed by the engineer, and paint the tips and gains of each pole with two coats of an approved metallic paint before installation. All poles are to be inspected and approved by the inspecting engineer when delivered along the line of work.

Poles shall be framed as shown on blueprint accompanying these specifications. Gains shall be ¾ in. deep, face of gain to be slightly hollowed to prevent rocking of cross-arm.

### POLE SETTING AND KEYING

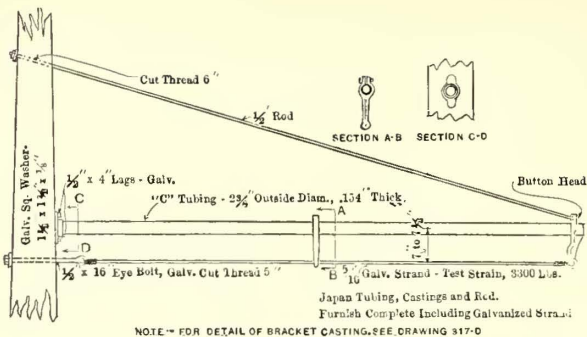
Poles shall be spaced 100 ft. apart on tangents, and shall have a rake of 6 in. away from track at a height of 24 ft. above top of track rail with bracket construction. With span construction the rake shall be 12 in. at same height above top of rail. Poles to have above rakes after taking final strain.

Holes for all poles shall be excavated to the following depths:

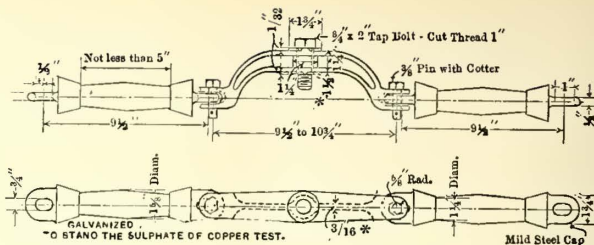
Length of pole in feet	Depth in earth in feet	Depth in rock in feet
30	6.0	5.0
35	6.0	5.5
40	6.5	5.5
45	6.5	6.0
50	7.0	6.5
55	7.5	6.5
60	8.0	7.0
65	8.5	7.0
70	9.0	7.0

For longer poles and on side banks and fills, depths will be determined by inspecting engineer. Face of pole shall be spaced at a minimum distance of 5 ft. from outside of rail head, and shall not exceed this measurement to appreciable extent unless conditions so require.

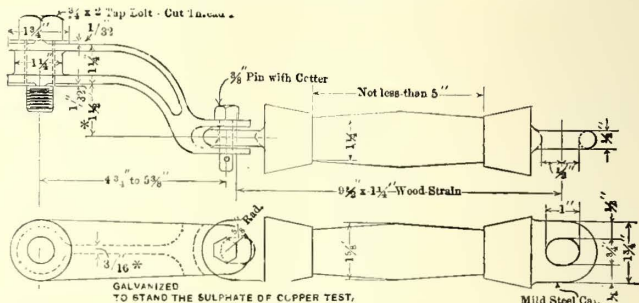
The earth around poles shall be thoroughly tamped with suitable tampers. When poles are set in concrete



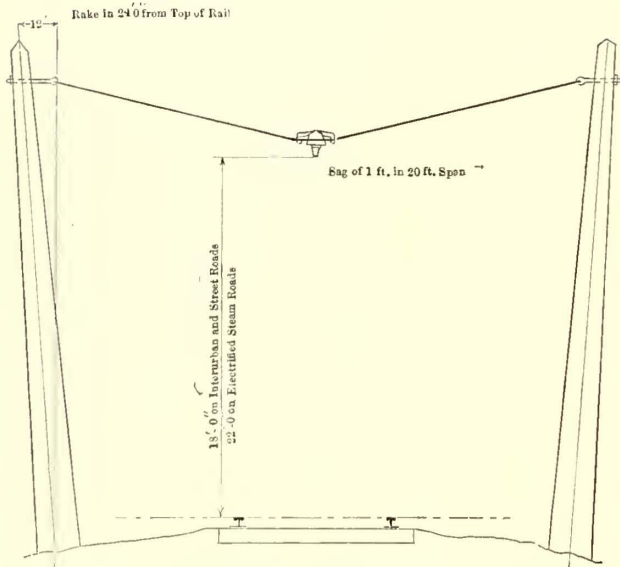
Drawing No. 317-C—Bracket for Wooden Pole



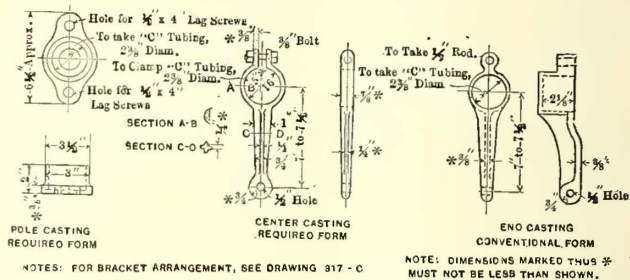
Drawing No. 315-D—Double Curve Pull-over of Galvanized Malleable Iron (Dimensions Marked Thus \* Must Not Be Less than Shown)



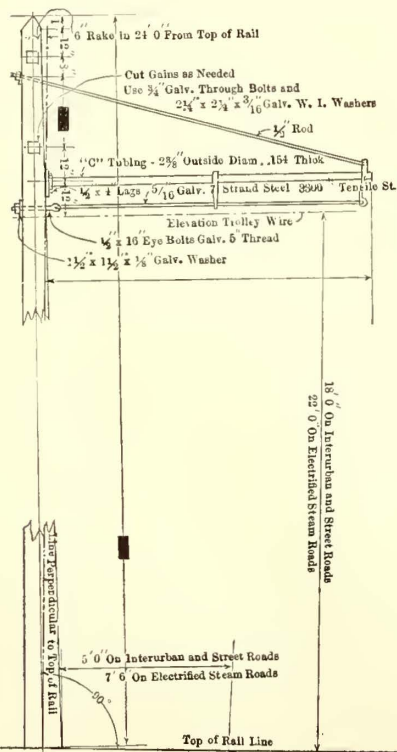
Drawing No. 315-C—Galvanized Malleable Iron, Single Curve Pull-over (Dimensions Marked \* Must Not Be Less than Shown)



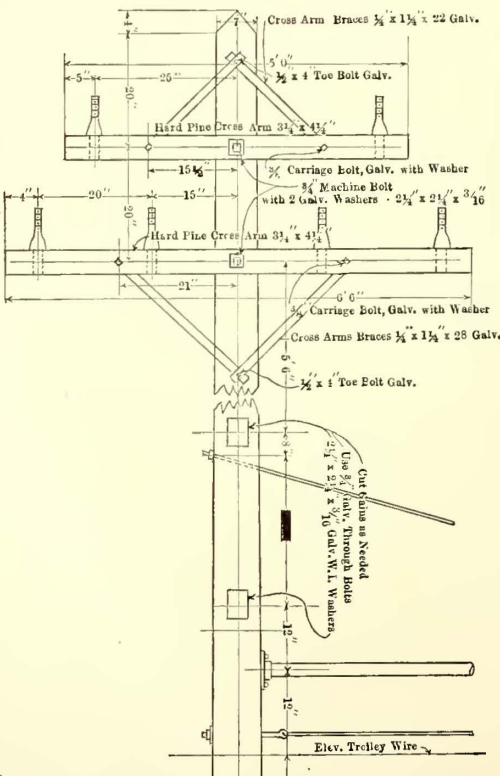
Drawing No. 318-C—Span Construction for One No. 0000 Trolley Wire



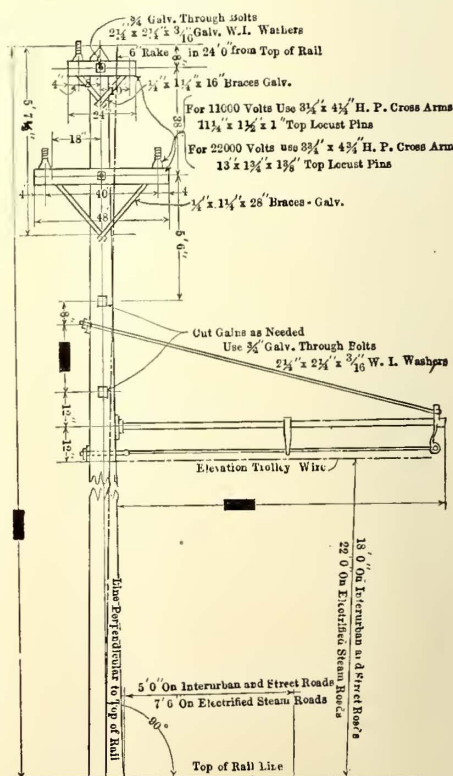
Drawing No. 317-D—Japanned Malleable Iron Bracket Casting for Wood Pole



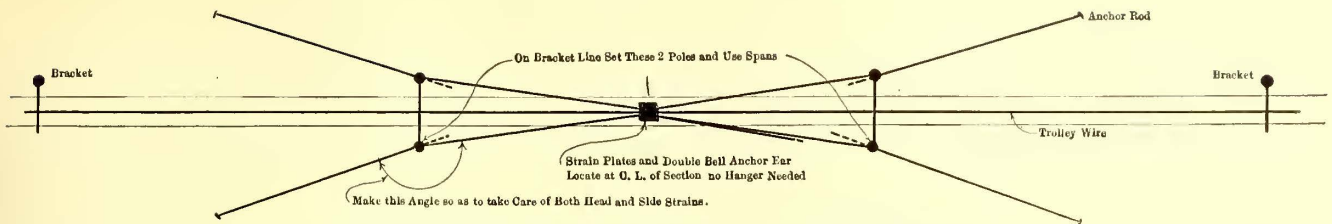
Drawing No. 318-D—Pole Top Construction for Bracket Lines



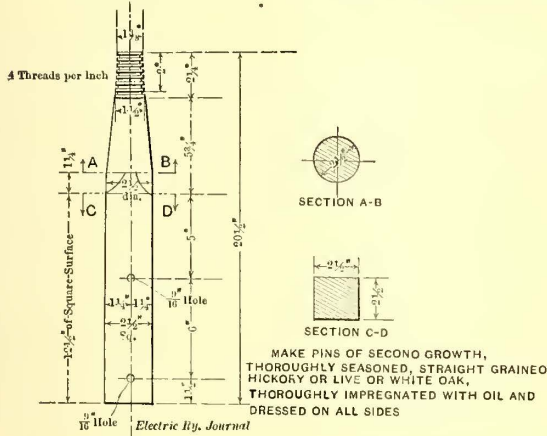
Drawing No. 319-D—Pole Construction for Two-Circuit, Three-Phase, 11,000-Volt Transmission Line



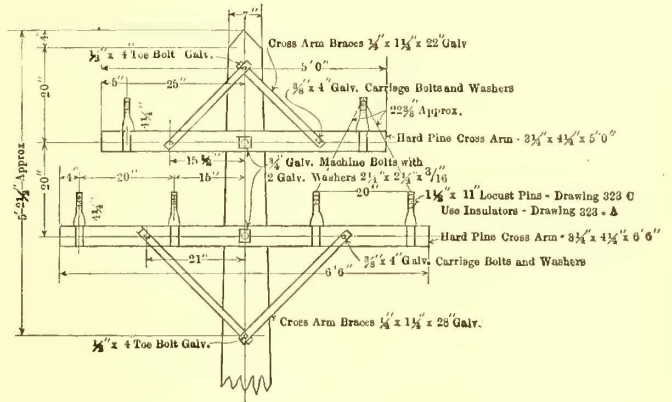
Drawing No. 319-C—Pole Construction for Combined Trolley and One-Circuit Transmission Line



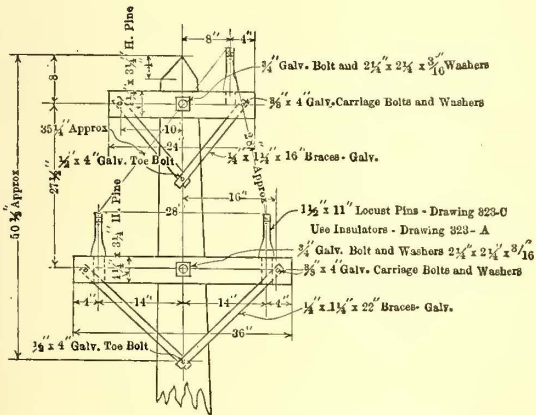
Drawing No. 319-B—Anchorage Points for Trolley Wire



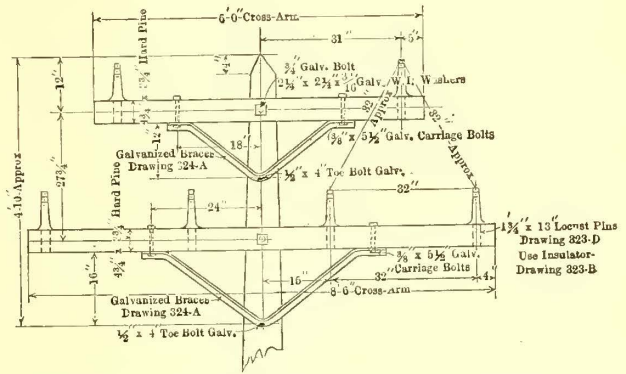
Drawing No. 324-C—Wood Pole Top Pin for 22,000-Volt Transmission Line



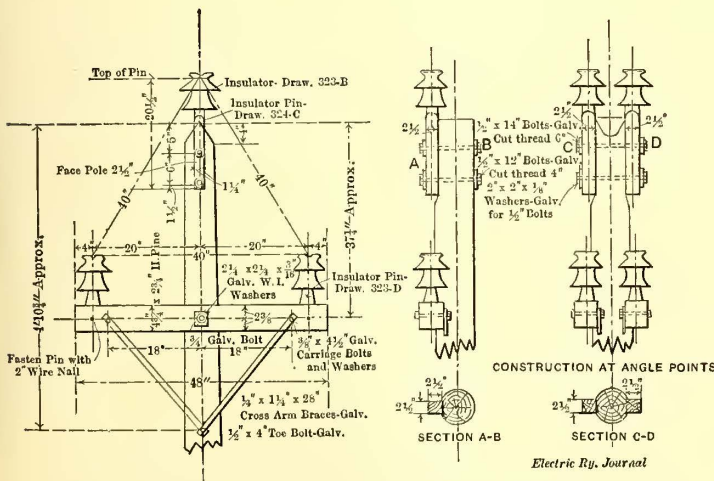
Drawing No. 321-A—Pole Top Construction for Two-Circuit, Three-Phase, 11,000-Volt Transmission Line



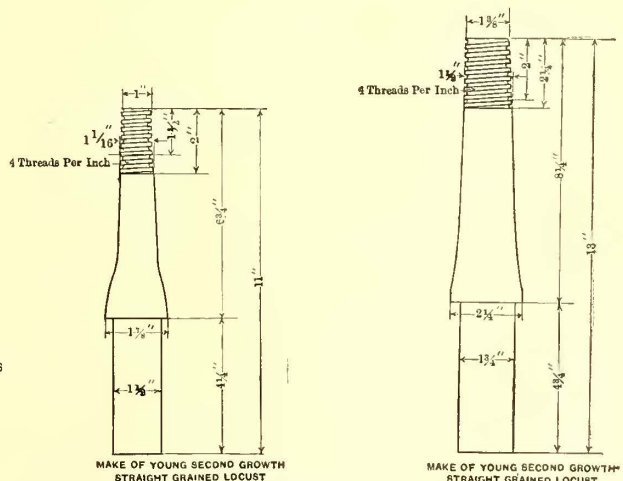
Drawing No. 321-B—Pole Top Construction for One-Circuit, Three-Phase, 11,000-Volt Transmission Line



Drawing No. 321-C—Pole Top Construction for Two-Circuit, Three-Phase, 22,000-Volt Transmission Line

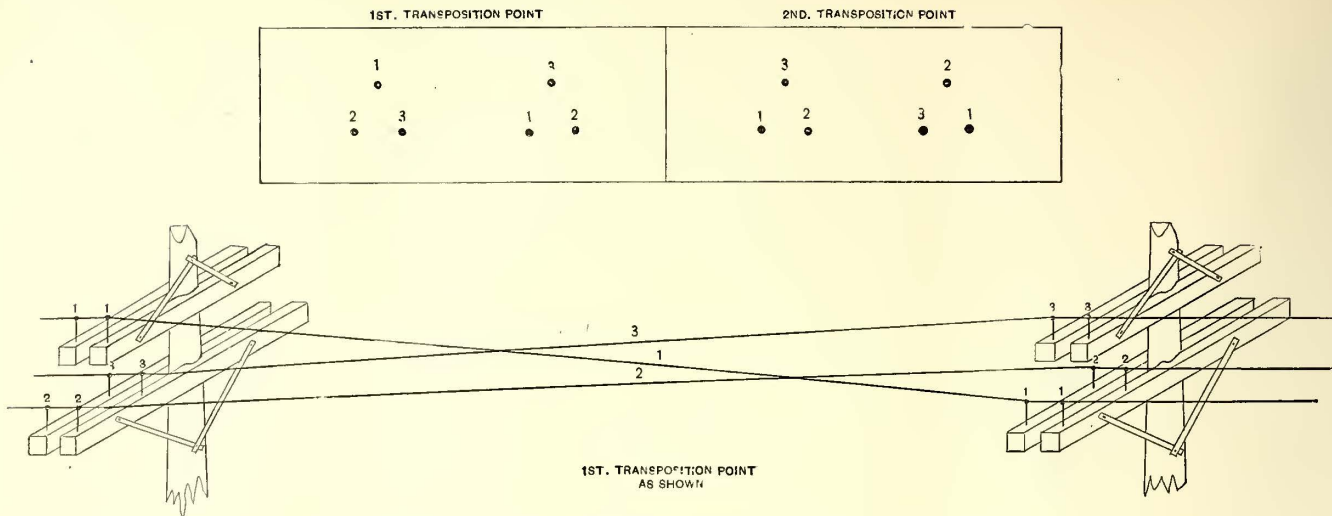


Drawing No. 321-D—Pole Top Construction for One-Circuit, Three-Phase, 22,000-Volt Transmission Line

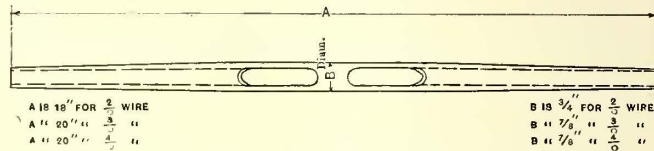


Drawing No. 323-C—Cross-Arm Pin for 11,000-Volt Insulator

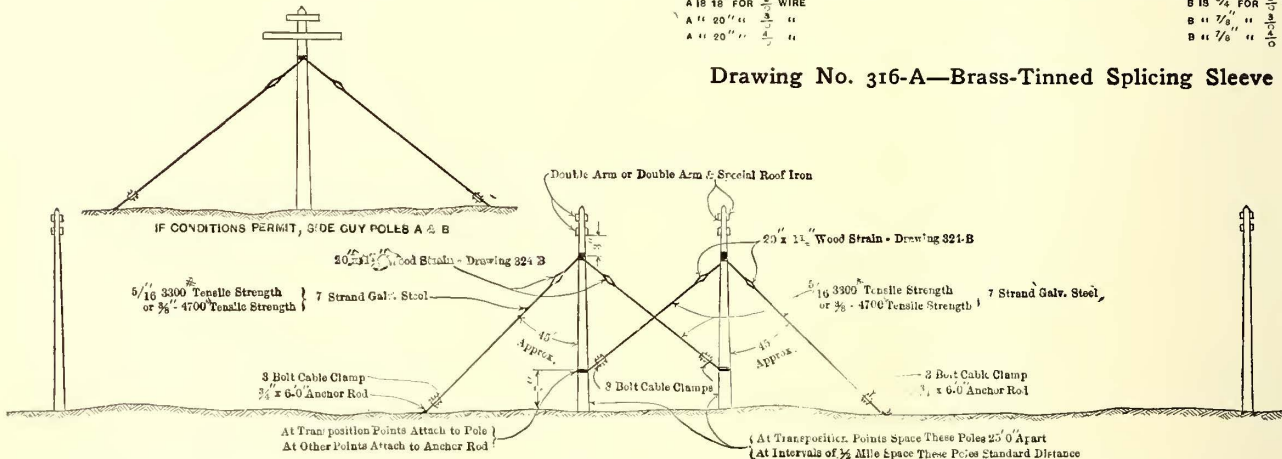
Drawing No. 323-D—Cross-Arm Pin for 22,000-Volt Insulator



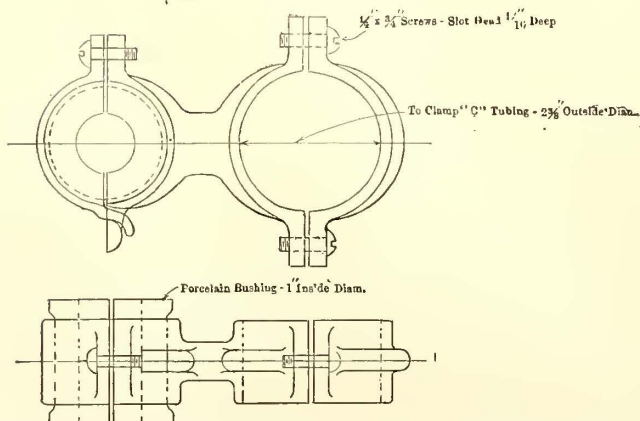
Drawing No. 322-A—Method of Transposing Power Transmission Lines



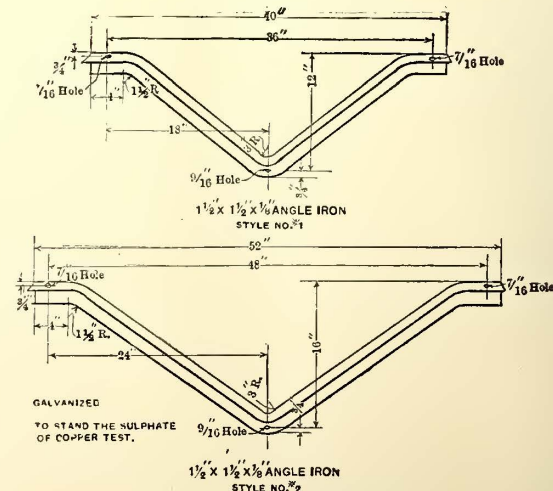
Drawing No. 316-A—Brass-Tinned Splicing Sleeve



Drawing No. 322-B—Method of Guying at Transposition Points and at Intervals of One-Half Mile



Drawing No. 317-B—Feed Tap Insulator of Malleable Iron ("C" Tubing, 2 3/8 In. Outside Diameter)



Drawing No. 324-A—Galvanized Cross-Arm Braces

the concrete shall consist of one part of an approved brand of Portland cement, three parts clean sharp sand and five parts broken stone, which will go through a 2-in. ring. Amount of concrete to be determined by inspecting engineer, and concrete to be put on in layers of 6 in. and each layer thoroughly tamped. Top of concrete filling to be above ground and sloped off from pole with smooth finish so as to shed water.

All bracket poles on curves with radii between 900 and 2400 ft., and such others as may be designated by the inspecting engineer, shall be provided with suitable keys of timber or stone. One key to be located in front of pole just below surface of ground, and if of timber to be 4 ft. long and not less than 4 in. thick, with 36-in. cross-section. The other key to be located back of pole at bottom and to be not less than 2 ft. long and 4 in. thick with 36-in. cross-section.

Stone keys shall be used unless specifically provided otherwise.

#### CURVE CONSTRUCTION

Pull-offs on curves shall be spaced according to following table:

Radius of curve in feet	Distance between hangers in feet
40	5.0
50	5.5
60	6.0
75	6.5
85	7.0
100	7.5
200	10.0
300	15.0
400	20.0
550	25.0
680	30.0
800	35.0
900	40.0
1000	45.0
1500	60.0
1910	80.0

The distance between poles on curves is dependent on weight of feed wire, length of curve, and in towns on local conditions. In general, the minimum distance between poles shall be 50 ft. Up to 1910-ft. radius space poles from 50 to 90 ft. Above 1910-ft. radius space poles 100 ft. apart.

It is desirable to have suspension poles at P. C. and P. T. of all curves. Poles must be so located on all curves with radius of 900 ft. and under.

For bridle use  $\frac{3}{8}$ -in. seven-strand galvanized steel cables, tensile strength, 4700 lb., fastened to back side of each pole with standard galvanized three-bolt cable clamp and  $\frac{1}{2}$ -in. x 4-in. galvanized lag screw. For pull-off wire use  $\frac{1}{4}$ -in. seven-strand galvanized steel cable. Pull-offs to be in line with radii of curves. In towns and cities pull-offs to be laced or tied together with  $\frac{1}{4}$ -in. galvanized strand. In dead ending bridles take three wraps around the pole instead of using eye bolt.

#### GUYING AND NUMBERING

Poles on curves of less than 900-ft. radius, at angles, and at any other point specified by the engineer, shall be back guyed, making use of  $\frac{5}{16}$ -in. or  $\frac{3}{8}$ -in. seven-strand galvanized steel cable as directed by engineer. Use shall be made of  $\frac{3}{4}$ -in. x 6-ft. galvanized anchor rods with  $3\frac{1}{2}$ -in. x  $3\frac{1}{2}$ -in. x  $\frac{1}{4}$ -in. washers and chestnut dead men not less than 4 ft. long and 6-in. x 8-in. cross-section. Dead men to be buried not less than 5 ft. below surface of ground, with at least 3 ft. of rock filling and the remainder of earth well tamped. (Note—Mechanical type anchors

are not specified, owing to the poor condition of the soil, which is usually full of boulders.)

In making up guy, take three wraps around pole and make wrap joint. Use galvanized open thimble and three-bolt galvanized clamp at anchor rod. A  $9\frac{1}{2}$ -in. x  $\frac{1}{4}$ -in. wood strain insulator to be cut in guy 5 ft. from pole. All guying to be done before installation of trolley or feed wire is begun. Anchor rods must be installed so they will point in the direction in which guy will pull.

When poles carry high-tension wires 20-in. x  $1\frac{1}{4}$ -in. wood strains shall be used in anchors and guys. When anchor is in rock or ledge, use 1-in. x 18-in. eye bolts poured with lead or sulphur and with hole in rock inclined away from pole.

Contractor shall paint numbers on poles as directed.

#### BRACKETS

Brackets are to be of flexible-suspension type similar to drawing No. 317-C, with 2-in. tube arm, over support of  $\frac{1}{2}$ -in. round iron, the flexible suspension to be of  $\frac{5}{16}$ -in. seven-strand galvanized steel cable, tensile strength 3300 lb. The end casting of bracket to be provided with eye instead of eye bolt, the eye bolt passing through pole to be galvanized  $\frac{1}{2}$  in. x 16 in. long with thread cut 5 in.

The distance between tube and over-support at pole to be not less than 3 ft. with 9 ft. 6 in. bracket. With longer brackets this distance to be increased at the discretion of inspecting engineer. With bracket line on outside of curve, use extra long bracket to allow for pole rake and elevation of rail, so hanger shall be 1 ft. 6 in. from end of bracket when properly set with regard to track. When installed, outer end of 9 ft. 6 in. bracket to have upward rake of at least 2 in.; longer brackets in proportion. Intermediate castings to be so that hangers will be half-way between intermediate and end castings, except at feed taps, where casting must be located to suit.

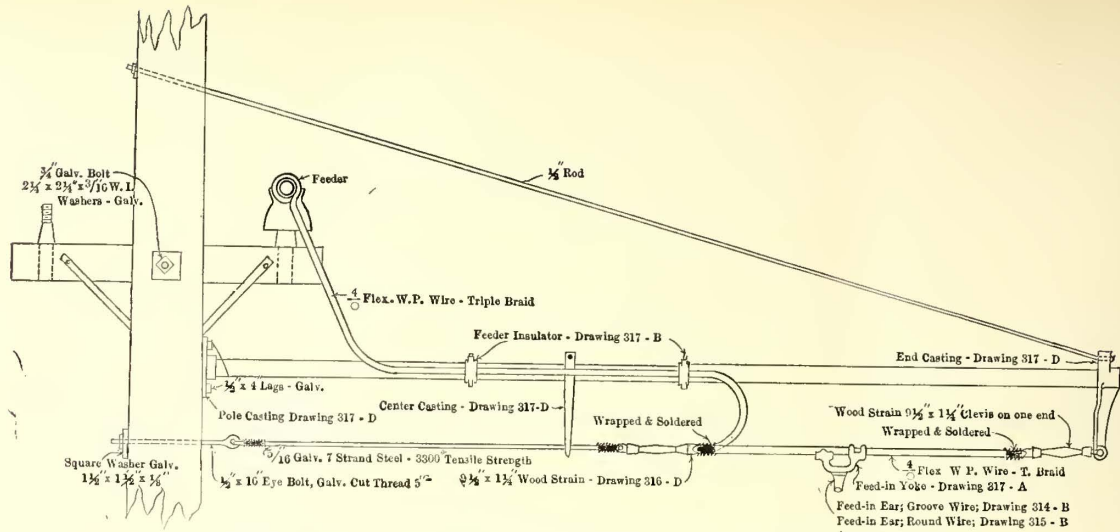
#### SPAN CONSTRUCTION

On single-track street railway lines use  $\frac{5}{16}$ -in. seven-strand galvanized steel cable, tensile strength not less than 3300 lb.; on double-track street railway lines and on electrified steam lines use  $\frac{3}{8}$ -in. seven-strand galvanized steel cable, tensile strength not less than 4700 lb., and use  $\frac{3}{4}$ -in. x 16-in. galvanized eye-bolts with thread cut 5 in. All spans to be installed with eye-bolts at same level and allowance made for sag of 1 ft. in 20 ft. of span, with eye-bolts at full length.

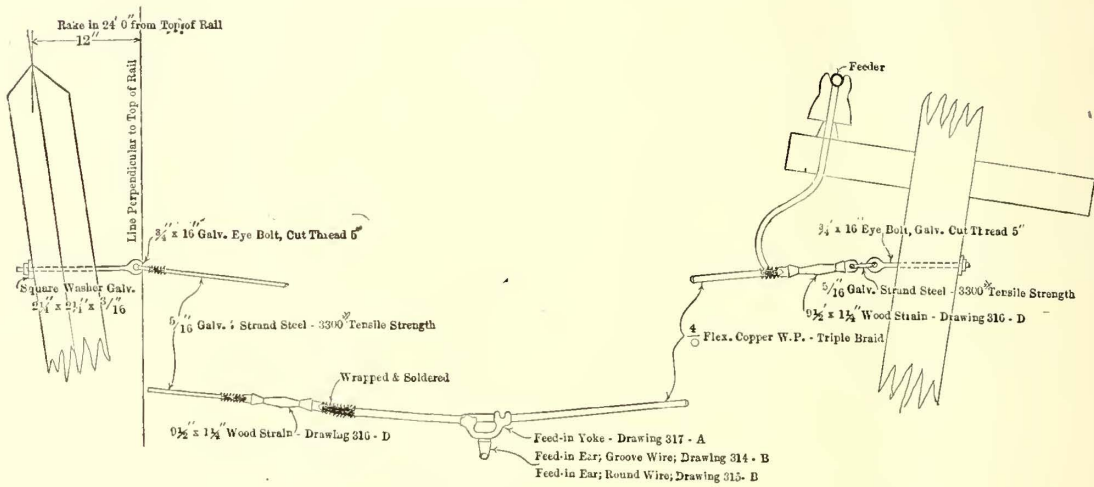
#### TROLLEY WIRES

One No. 0000 B. & S. grooved trolley wire shall be used. Wire to be hard drawn, and shall have 96 per cent of the conductivity of pure copper wire. Trolley wire shall be 18 ft. above top of track rail and shall be installed without kinking or cutting same. Trolley wire to be anchored at P. C. and P. T. of all curves and on an average every 1000 ft. on tangents. On bracket work where extra anchor poles cannot be set the pole supporting anchor ear is to be braced by two head guys, to be led to adjacent poles, these poles in turn to be anchored to adjacent poles, the last attachment being made about 7 ft. above ground where conditions do not permit installation of anchors in ground. The guys and anchors are to be attached to poles by three turn wraps. All head guys and anchors to have  $9\frac{1}{2}$ -in. x  $1\frac{1}{4}$ -in. wood strains cut in 4 ft. from strain plates and poles respectively.

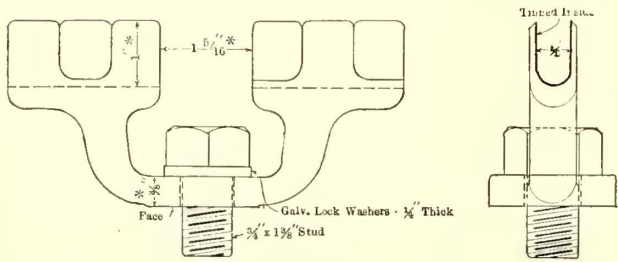
On span work, four head guys and anchors to be installed, using same method as on bracket work. Head guys and anchors to be of  $\frac{5}{16}$ -in. galvanized seven-



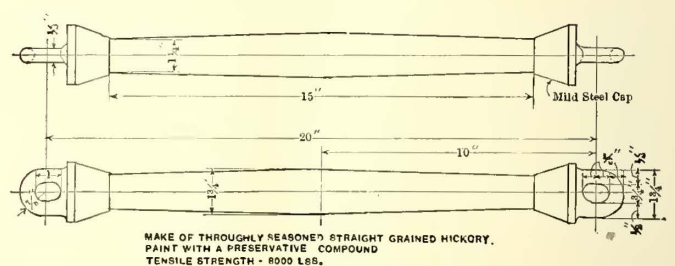
Drawing No. 318-A—Bracket Construction at Feeding-in Points



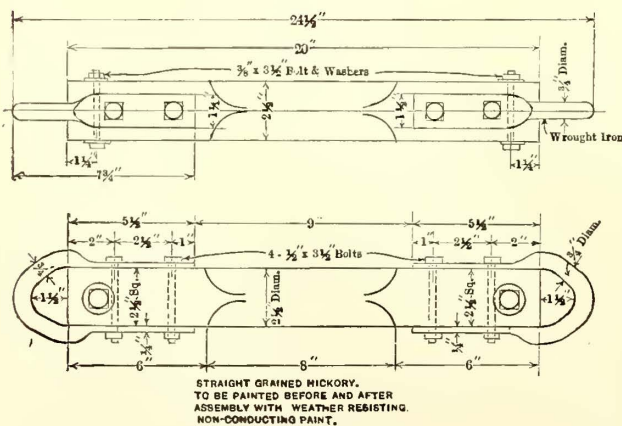
Drawing No. 318-B—Span Construction at Feeding-in Points



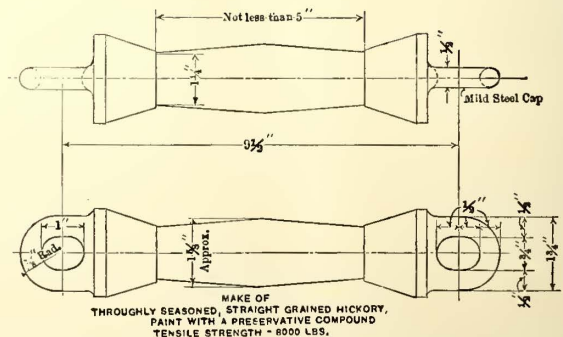
Drawing No. 317-A—Feeding-in Yoke Composition (Dimensions Marked Thus \* Must Not Be Less than Shown)



Drawing No. 324-B—Wood Break Strain Insulator



Drawing No. 320-A—Strain Insulator of Heavy Wood

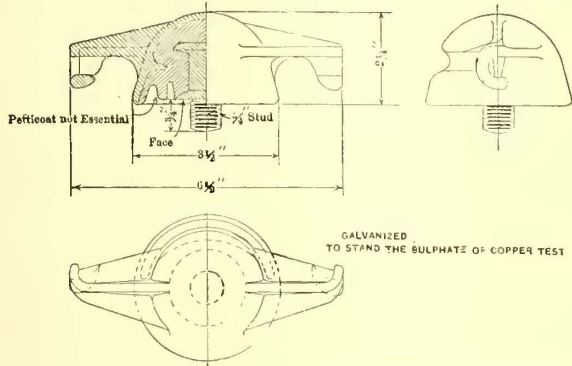


Drawing No. 316-D—Wood Break Strain Insulator for Cable up to and Including 300,000 Circ. Mil.

strand steel cable, tensile strength 3300 lb. Where overhead frogs are installed, trolley wire is to be taken straight through frog and anchored to nearest pole, cutting in a 9½-in. x 1¼-in. wood strain 4 ft. from frog and using 5/16-in. galvanized strand for head guy and anchor. In pulling trolley wire, proper allowance must be made for temperature at time of installation.

**SPLICING SLEEVES, FEED TAPS, HANGERS AND EARS**

Splicing sleeves should be similar to those shown on drawing No. 316-A. When sleeves are installed ends of wire shall be bent back sharply, and after soldering these



**Drawing No. 316-B—Malleable Galvanized Iron Straight Line Hanger**

ends shall be cut off close and filed smooth with body of sleeve.

In making feed taps use No. 0000 B. & S. stranded copper for span with feed-in yoke, as shown on drawings Nos. 317-A and 318-A. (The lips of this yoke are longer than usual.)

On straight line work use round top galvanized hanger with ¾-in stud shown on drawing 316-B. On curve work use double-curve galvanized heavy pull-over with ¾-in. stud made up with two wood strains instead of giant strains, as in drawing No. 315-D, and single-curve galvanized pull-overs with ¾-in. stud, made up with one wood strain, as per drawing No. 315-C.

Use for grooved trolley wire: Straight-line clip ear, galvanized malleable iron, ¾-in. stud, 7 in. long, drawing No. 314-D; curve clip ear, galvanized malleable iron, ¾-in. stud, 14 in. long, drawing No. 314-C; anchor ears, double center, soldered, drawing No. 314-A; strain plate, galvanized, ¾-in. studs, drawing No. 316-C; feed ears, ¾-in. stud, soldered, 15 in. long, drawing No. 314-B; feed yoke, ¾-in. stud for No. 0000 feed tap, drawing No. 317-A.

Use for round trolley wire: Straight-line ear, ¾-in. tap, D. G., high center, 15 in. long, drawing 315-B; curve ears, ¾-in. tap, high center, 15 in. long, drawing 315-B; anchor ears, double center, soldered, drawing No. 315-A; strain plate, galvanized, ¾-in. studs, drawing No. 316-C; feed ears, ¾-in. stud, soldered, 15 in. long, drawing No. 315-B; feed yoke, ¾-in. stud, for No. 0000 feed tap, drawing No. 317-A.

**MISCELLANEOUS DETAILS**

Use heavy section insulators of design specified or approved by the engineer in charge of the work.

Use section switch as per drawing No. 320-B. (Boxes for line cut-out switches as in drawing No. 320-B are made of any well-seasoned wood and are long enough to lock with the handle open or closed.)

Cross arms shall be clear hard pine of sound live stock and close grain, properly seasoned, free from shakes, splits and other defects. There shall be no knots so located as to

interfere with the strength of the arm. They shall be delivered unpainted and given two coats of good metallic paint before installation.

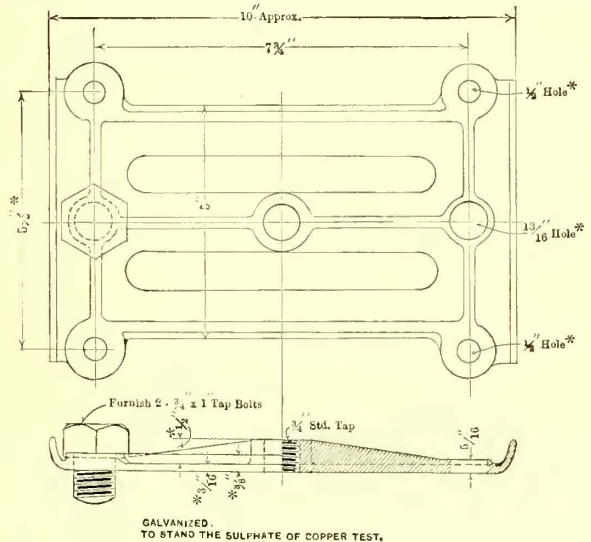
Up to 3 ft. length and with 500,000 circ. mil cable, use ¾-in. x ¾-in. arms. Over 3 ft. length and with 500,000 circ. mil cable and larger sizes, use 4¾-in. x 5¾-in. arms except with feeder lines of unusual weight, where special arms will be designed. Double cross-arms shall be installed at P. C. and P. T. of all curves, at angles, and on such curves and at such other points as may be designated by the inspecting engineer.

Use ¼-in. x 1¼-in. galvanized steel braces with ½-in. x 4-in. lag screws and ¾-in. galvanized carriage bolts with washers. Use ⅝-in. galvanized spacing bolts with double nuts and washers on each end. Use ¾-in. galvanized machine through bolts with thread cut 5 in., with 2¼-in. x 2¼-in. x 3/16-in. galvanized square washers.

Use for pins 9-in. x 1½-in. x 1-in. top young second-growth locust free from imperfections and with straight grain. Shank of pins to be dipped in paint before installation in arm and pins to be fastened in arm with 2-in. wire nail. At points of heavy strain, if so directed by inspecting engineer, use shall be made of 9-in. x 1½-in. drop-forged iron pins.

Use shall be made of glass insulators with plain glass base and grooved top to suit size of cable. Where malleable iron pins are used, use molded mica insulators of proper size.

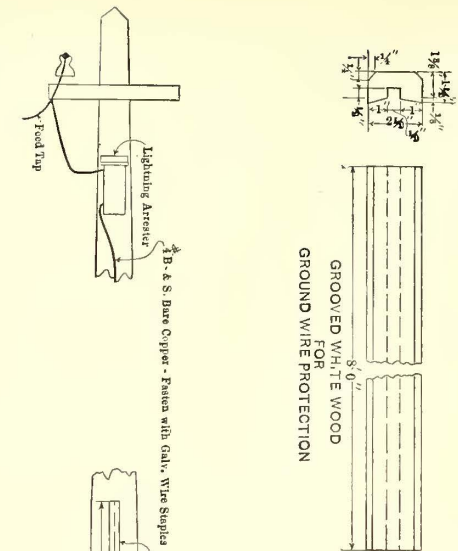
Feeders are to be installed as per feeder diagram which gives length, size, location of feed taps, section insulators and switches. Detail methods of making feed tap connections are shown on attached drawings Nos. 318-A and 318-B, and the feed tap insulator is No. 317-B. For tie wire, use



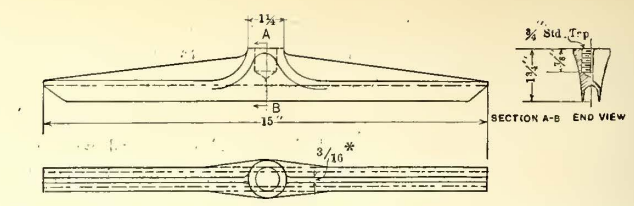
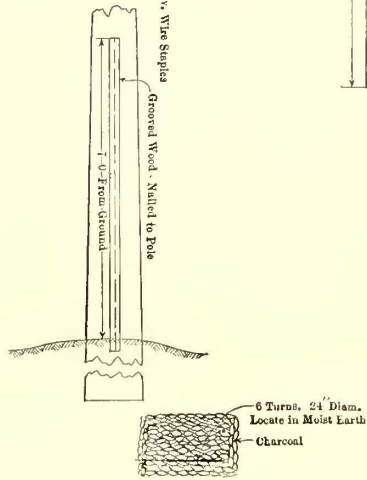
**Drawing No. 316-C—Malleable Iron, Galvanized Strain Plate (Dimensions Marked Thus \* Must Not Be Less than Shown)**

No. 6 galvanized iron wire. For strain insulators, use 9-1½-in. x 1-1¼-in. wood strains up to and including 300,000 circ. mil cable as per drawing No. 316-D; above that size use insulator shown on drawing No. 320-A. (This is to be changed.) No ties are to be made on anchorage poles until they have taken final strain from trolley wire. Joints of feeder to be made of long wrap and with no appreciable increase above size of wire at joint.

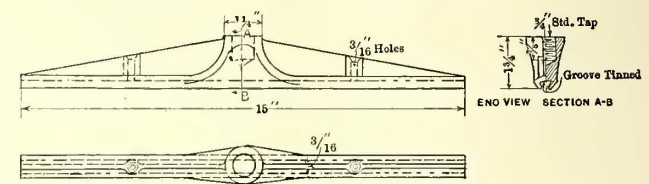
Lightning arresters are to be installed at intervals of 2000 ft. They are to be located on feed tap poles, their line connection being made to or close to feed tap. For



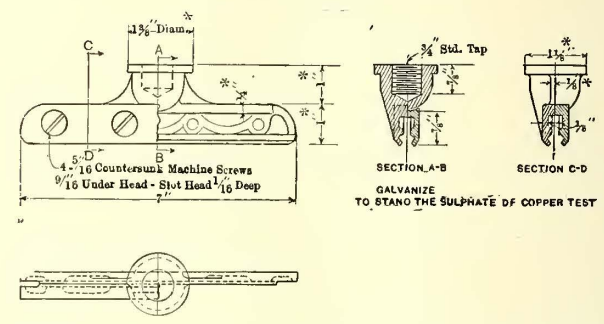
Drawing No. 319-A—Method of Installing Lightning Arrester



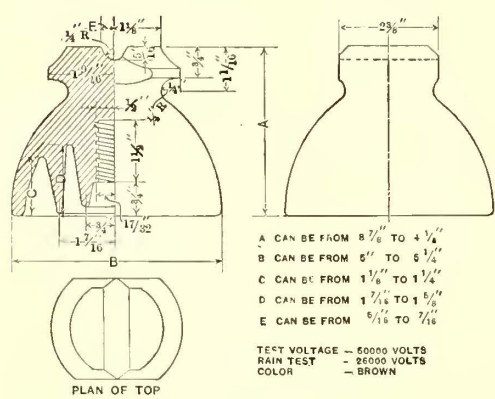
Drawing No. 315-B—Composition Feed-in Ear for Round Wire in Special Cases (Dimensions Marked Thus \* Must Not Be Less than Shown)



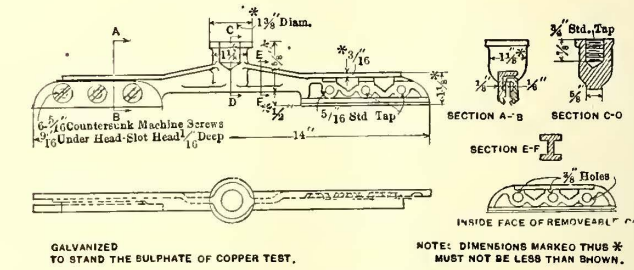
Drawing No. 314-B—Composition Feed-in Ear for Grooved Wire (Dimensions Marked Thus \* Must Not Be Less than Shown)



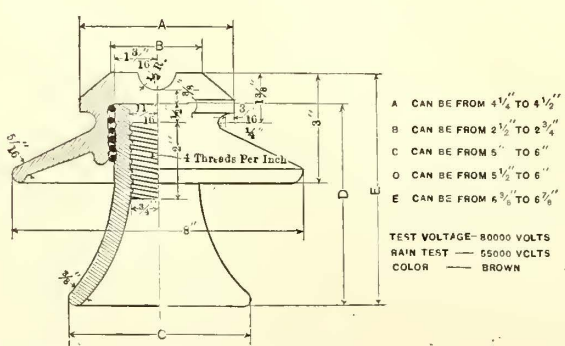
Drawing No. 314-D—Galvanized Malleable Iron Clip Ear for Grooved Wire (Dimensions Marked Thus \* Must Not Be Less than Shown)



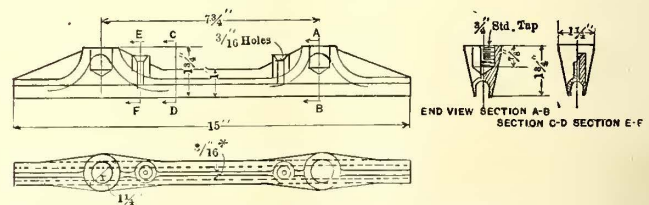
Drawing No. 323-A—Porcelain Insulator for 11,000 Volts



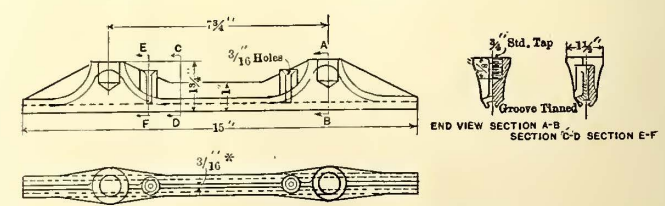
Drawing No. 314-C—Galvanized Malleable Iron Curve Clip Ear for Groove Wire



Drawing No. 323-B—Porcelain Insulator for 22,000 Volts



Drawing No. 315-A—Composition Strain Ear for Round Wire (Dimensions Marked Thus \* Must Not Be Less than Shown)



Drawing No. 314-A—Composition Strain Ear for Groove Wire (Dimensions Marked Thus \* Must Not Be Less than Shown)



ground connection use No. 4 B. & S. copper, stapled to pole with galvanized wire staples. On lower end of ground connection, make a coil of six turns, 2 ft. in diameter, and imbed this coil in moist earth, first surrounding it with charcoal, the body of charcoal to be not less than 2 ft. thick. Ground connection wire is to be protected for a distance of 7 ft. above ground by a strip of grooved wood nailed to pole. (See drawing No. 319-A.)

GENERAL

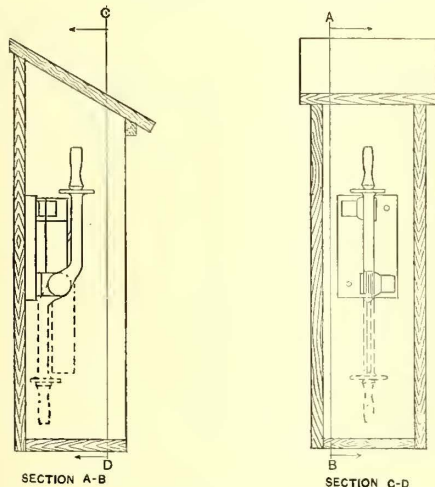
In making soldered joints no acids shall be used. Fittings specified are to be given preference and if their equivalents in kind and quality are used they must be acceptable to the engineer in charge of the work.

The use of ball or giant strains is prohibited. (Note: The company does not believe that compositions are capable of withstanding weathering for any length of time and has also found that they are easily bruised in handling and shipping. (Wood is used wherever possible.)

When wood poles are used and there are no foreign attachments to poles single insulation shall be used between trolley wire and pole.

When iron poles are used or when there are foreign attachments to wood poles, double insulation shall be used between trolley wire and pole.

All through bolts, eyebolts and anchor rods shall be



Drawing No. 320-B—Box for Line Cut-Out Switch

tested for crystallization before installation. This can be done by giving them a sharp blow on rail head or piece of metal of similar weight.

Contractor shall do all necessary tree trimming and cutting for which the company will obtain the necessary permits. When such work is done, the wood must be cut up into suitable lengths, brush disposed of and premises left in neat condition.

HIGH TENSION TRANSMISSION SPECIFICATIONS

In addition to the drawings accompanying the specifications for railway circuit work there are others relating to the installation of transmission lines carrying either 11,000 or 22,000 volts. Drawing No. 319-C shows the construction and limiting dimensions for a combination pole with one transmission circuit except that the central pin shown in drawing No. 325-A is now used instead of the short top cross-arm for a single wire. Drawing No. 319-D shows another combination pole with two transmission circuits. Drawings Nos. 321-A, 321-B, 321-C (note bent angle braces detailed in drawing 324-A) and 321-D illustrate several other high-tension designs. Drawings Nos. 322-A and 322-B illustrate respectively the method of

transposing power lines and the method of guying at transposition points. The liberal specifications governing the porcelain insulators will be noted on the drawings Nos. 323-A and 323-B covering both 11,000 and 22,000 volts. The pins for these potentials are illustrated in drawings Nos. 323-C and 323-D.

ROADWAY SIGNS ON THE FOND DU LAC & OSHKOSH RAILWAY

The Eastern Wisconsin Railway & Light Company, which owns the Fond du Lac & Oshkosh interurban line, has recently installed a complete set of enameled steel signboards to facilitate the safe operation of its high-speed cars. Each railway crossing is designated by a distance sign, reading "Ry-Xing 1000 ft." and a "Stop" sign placed 50 ft. on either side of the intersecting steam track. Road crossings are designated by a sign lettered with a large letter W. These signs are also recognized as whistle posts. At a distance of 1000 ft. from curves, at which



Fond du Lac & Oshkosh—Road Crossing and Curve Warning Signs

speed must be slackened, signs reading "Curve 1000 ft." are placed. These signs have white letters on blue backgrounds.

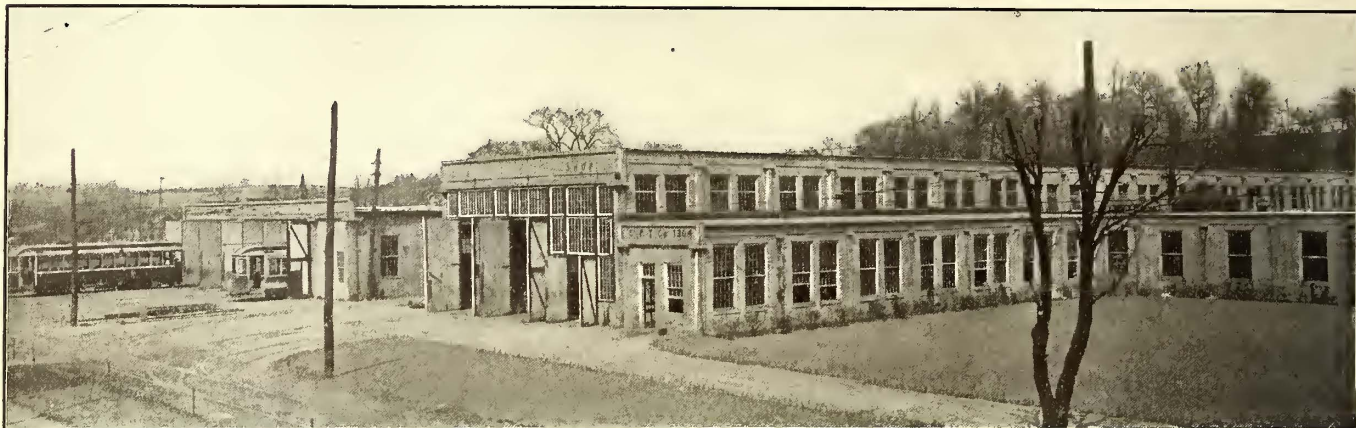
The various signboards are mounted on oak posts of uniform dimensions, painted white, and so located with reference to the track that they are "illuminated" at night by the car headlights. The signboards are made of heavy enameled sheet steel and were furnished ready for installation by the Electric Service Supplies Company. The accompanying engravings illustrate the appearance of some of these signs along the right of way. The new signs are said to be of considerable assistance in safely maintaining schedule time during snowstorms and fogs. It is stated that the Oshkosh-Neenah division of this road will similarly be equipped in the near future. Acknowledgment is made to R. T. Gunn, general manager, Eastern Wisconsin Railway & Light Company, for these views.

C. H. Merz has estimated that if the heat wasted in the manufacture of 8,000,000 tons of coke in one district in England was utilized it would develop 150,000 hp with steam and 258,000 hp with gas engines.

## MECHANICAL AND ELECTRICAL PRACTICES AT HARRISBURG, PA.

In the Sept. 3, 1905, issue of the *STREET RAILWAY JOURNAL* Mason D. Pratt described the general shop and division car house designed by him for the Central Pennsylvania Traction Company at Harrisburg, Pa. This was one of the first railway installations built entirely of rein-

men's room and a 50-ft. x 375-ft. main shop, with wings for a blacksmith's shop, storeroom, winding room and heating plant. The main buildings are 50 ft. apart, and consequently are entirely separate fire risks. Both are supplied with through tracks and an outside loop to secure the utmost freedom in car movement for maintenance and emergency purposes. The spare grounds are neatly sodded to make an attractive background to the light cement finish



Harrisburg Shops—A General View of the Shops and Car Houses, Illustrating in Particular the Upper Side Lights of the Main Shop and the Great Window Area of the Wings or Leantos

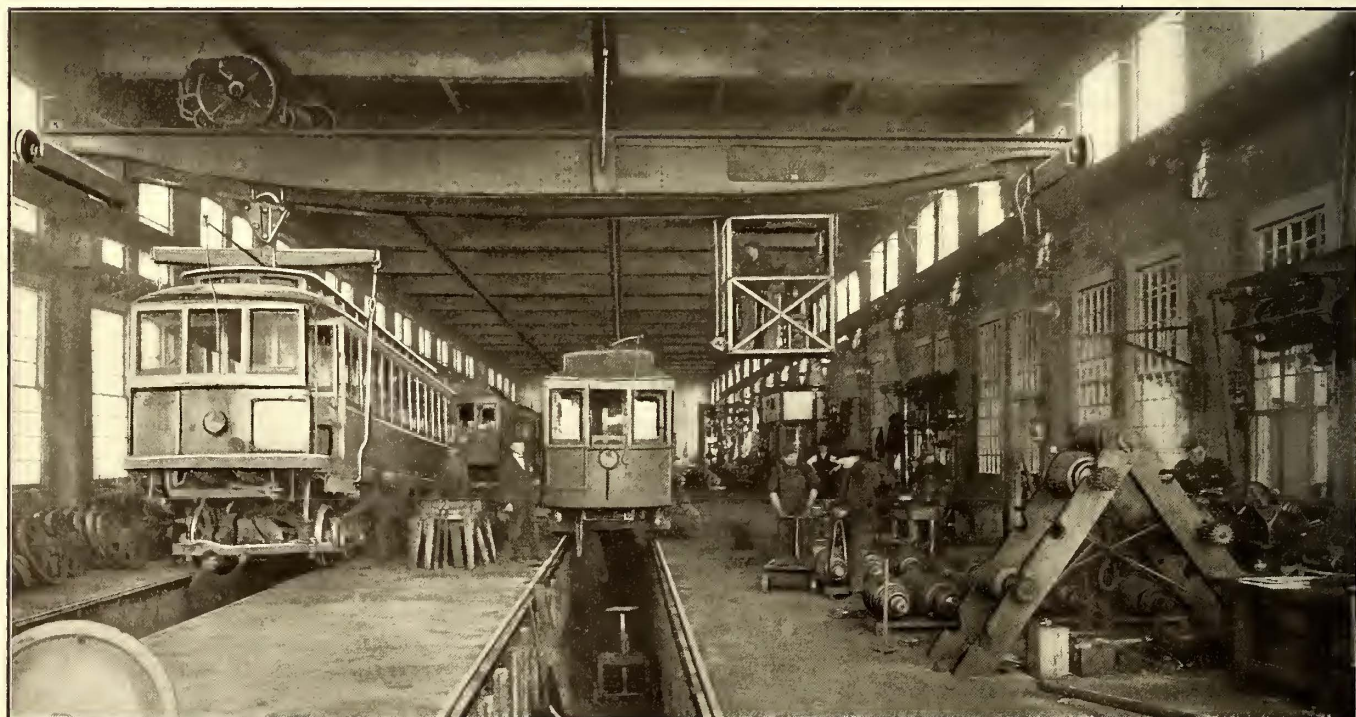
forced concrete and attracted considerable attention by reason of its novel construction and arrangement. At this time the buildings have been in service for over three years, and present many interesting features from the operating standpoint.

### LOCATION

The shops and car house are located on an 8-acre plot near the corner of Cameron and Foster Streets, in the out-

skirts of Harrisburg. Railway litter or other junk is not permitted to spoil the surroundings.

In view of the earlier description of the construction features, the latter may be disposed of briefly. Both buildings have concrete walls, floors, pits and roof, all suitably reinforced where necessary. Their general exterior and interior design is clearly shown in the accompanying illustrations, but special attention may well be directed to the



Harrisburg Shops—General View in the Machine Shop, Showing the Crane and Car Sling, Pit Arrangement, Overhead Motor-Drive of Tools, Etc.

skirts of Harrisburg. Here land was cheaper, and the company was able to provide liberally for the future. The area in present use is 53,000 sq. ft., and is made up of a 75-ft. x 360-ft. car house with a 90-ft. x 75-ft. 6-in. train-

great window and skylight area. The main shop roof has no skylights, but plenty of illumination is obtained through side sash. Arc lamps are installed for night service.

The car house is made up of two three-track bays divided

by a concrete partition, with fire door. These tracks are 5-ft. 2½-in. gage and are spaced 11 ft. centers. The pits are of the intercommunicating type—that is, the devil strips simply are concrete floors carried on the pit posts, which support the running rails. The track entrances and exits are 3-in. wooden doors hung by steel strap hinges which are fitted around iron pipe posts resting on collars bolted to the posts.

In operating the doors as originally installed it was found that the absence of a back latch on the outer doors allowed them to swing too freely when they were opened. This annoyance has been eliminated by door stops of the type shown on page 602. The stop consists of a flat steel strip anchored at the near end and bent to the shape of a half rectangle at the other end. This free end is sprung upward several inches. When a door is opened it must be pushed over the anchorage and along the bar until it approaches the point where the depressed section springs

the paint shop, however, there are three tracks, the third track coming in from the rear or Twelfth Street entrance. The two shop tracks were set 15 ft. centers to give a strip 7½ ft. wide along the northern wall for storing wheels, axles, gears and other heavy parts. This arrangement of the machine repair and storage facilities has been found most advantageous for the manipulation of the crane. As the machine and truck work do not yet require the full length of the building, the woodworking and painting shops are placed directly back of them. The latter shops are isolated by temporary steel frame partitions. The electrical repair department, blacksmith shop and storeroom are placed in wings alongside and at right angles to the shop. These lean-tos are of the same general construction as the rest of the installation.

#### SOME NOVELTIES IN THE OVERHEAD DEPARTMENT

One of the first things to attract attention in a visit to this installation is the overhead catenary construction in



Harrisburg Shops—View of a Bay in the Nearby Car House, Showing the Type of Concrete Construction, Lighting, Pits and Other Features

up and acts as a stop. The door is allowed to swing back by pressing down the strip with the foot. This anchored stop thus avoids marring the concrete wall with iron-work.

A wing was built adjoining the car house for the convenience of the trainmen of this company. It is well furnished, and contains lockers, toilets and other features for the convenience of the men.

The pits and doors of the shop are similar to those in the car house. Both houses are heated through ducts by hot air supplied through a Sturtevant 120-r.p.m., 10-ft. fan driven by a Sprague 20-hp motor. Steam is supplied by a 72-in. x 18-ft. tubular boiler. The heat plant building is made of concrete of the same construction as the car house.

The shop building proper is 50 ft. wide and 375 ft. long. It contains two tracks which were offset toward the north so that a space of 20 ft. was left along the southern side for the arrangement in line of all the machine tools. In

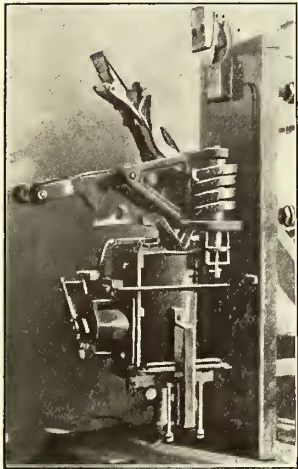
front of the buildings, because elsewhere the company uses the standard d.c. suspension. P. F. Gerhart, chief electrician, reasoned that if the catenary was such a good shock absorber there was no better place to try it out than in the complicated special work in front of a car house. This home-made catenary has demonstrated itself as an unqualified success for holding curves, and might be imitated with profit at other car houses.

Another improvement shown in the illustration of the catenary suspension on page 603 is the use of a cross-piece to prevent jumping trolley wheels from tangling up the wire junctions and smashing the frogs. Each of these stops consists of nothing more than a piece of angle iron which is bolted into an ear on each of the converging wires.

The shop employees have also rigged up from waste material a car alarm outfit, which saves time for the company as well as offering a convenience for the men. Within a short distance from the shops they have installed in

the trolley circuit brass contact makers 4 in. x 4 ft long, bolted to wooden backs. These contact makers are in circuit with a shop gong, the ringing of which warns intending passengers that a car will pass the shop within a few seconds. A similar alarm has been made for the power house.

The company is placing on all of its feeders a modified form of I-T-E circuit-breaker, with resetting magnets.



**Circuit-Breaker with Automatic Cut-In Feature**



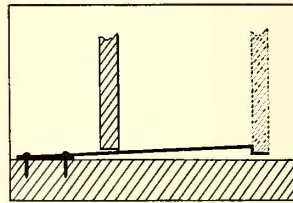
**Swing Platform Tower Wagon for Pole Painting**

These have been installed to reduce transmission losses by satisfactorily tying together the feeders and trolleys which supply separate sections. Before modifying the circuit-breaker in this manner, the company considered other apparatus, such as a switch and fuse, as well as the ordinary circuit-breaker. It was found, however, that while either of the customary means would separate con-

separate sections, operates as follows: Maintains a closed circuit between two sections under normal conditions; opens in case of grounds or shorts on either circuit, stays open until the trouble is removed and service resumed, after which it automatically resets, consumes no current except momentarily when resetting.

A Bristol recording voltmeter installed at a point 2 miles from the power station showed that under like schedule conditions on successive days the use of this breaker reduced voltage variations from 60 volts to 30 volts. So great a reduction necessarily must be of value in trying to get the maximum value of any railroad transmission system. After additional circuit-breakers were installed, switchboard observation showed that the feeders were tending to carry average loads instead of a peak one instant and nothing the next.

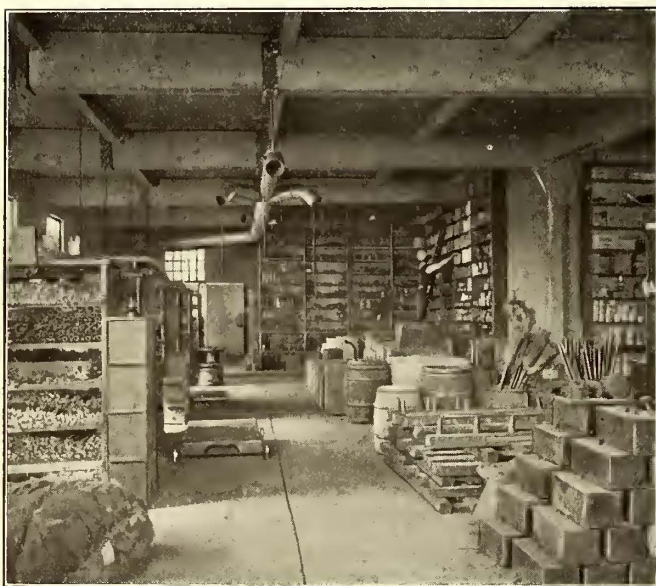
One direct advantage asserted for this breaker is that



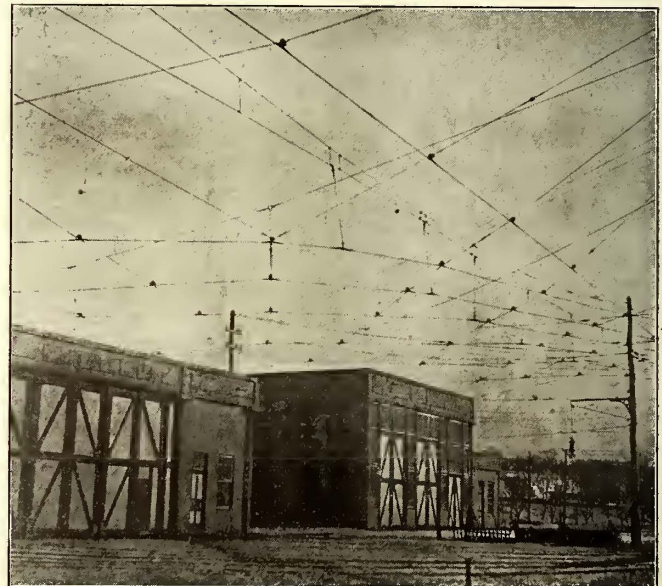
**Car House Door Stop**

it may be set for the lowest possible limit. Where a fuse is employed, it must be of sufficient capacity to carry the maximum peak occurring between the two sections. For the same reason an ordinary breaker must be set at the maximum, as otherwise it would require constant attention to keep it set. Again, the use of heavy fuses or high-limit breakers may in cases of short-circuits injure apparatus in the power house and on certain parts of the line. This feature, which may be attached to any breaker, was invented by D. B. Moist and C. W. Young, Harrisburg, Pa., under the supervision of P. F. Gerhart.

While on the subject of the line department attention



**Harrisburg Shops—A Glimpse of an Orderly, Well-Lighted and Heated Storeroom**



**Harrisburg Shops—Catenary Construction in Front of the Car House and Shops**

necting sections in time of trouble, they were troublesome to maintain.

For the sake of experiment, an I-T-E, 350-750-amp circuit-breaker of the switchboard type was equipped with a resetting solenoid and a pair of small control magnets, switches and contacts. A time-limit was also installed, but is not essential. This modified breaker, when connected across section insulators or between feeders supplying

may be called to the two-platform tower wagon, which is also shown on this page. This wagon is particularly useful for painting trolley poles, as the extension platforms allow two men to work on the wagon, together with one on the sidewalk. Under these conditions three men can paint 100 poles a day.

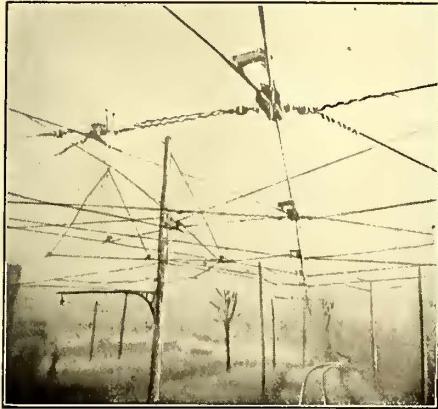
#### PIT LIGHTING

Railway men are so accustomed to the continuous burn-

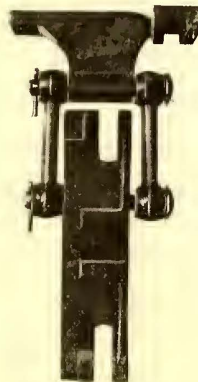
ing of pit lamps that they will find something to ponder over in the pit lighting arrangement of the Harrisburg shops and car house. It has been possible to dispense with this expensive practice largely on account of the fine natural lighting. To be sure, this lighting is not sufficient at all times and for all purposes, but it has demonstrated that the usual forms of pit lighting are needless in a shop of this kind. Instead of having a separate lamp circuit

wheel and pole on the forward crane girder. The crane is especially effective for rapid car hoisting in connection with detachable slings of the type shown on this page. The general view across the shop on page 600 shows how easy it is for the crane to care for inter-tool transportation, and a second view on page 605 illustrates its position in the woodworking shop.

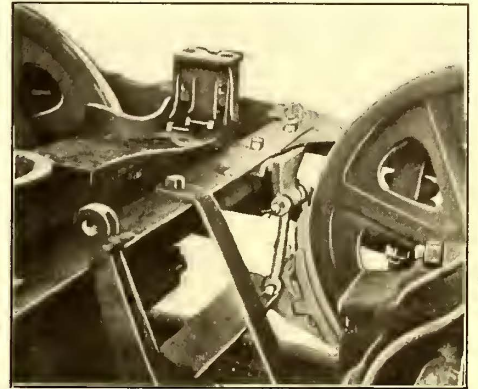
In the pits armatures are handled with Barrett jacks



Harrisburg Shops—Overhead Cross-Bars for Protecting Frogs from Damage



Brake-Hanger Holder



Harrisburg Shops—Brake-Hanger Holder Installed on No. 27-G Truck

for each pit, the current for the occasional pit lighting is obtained from wires under the devil strips. Lamp sockets are placed on these circuits at short distances so that the pitman can plug in at any desired point from the pit on either side. Each man has his own extension lamp, for which he is personally responsible. For extraordinary lighting and pit tests of grounded fields, armatures, etc., three five-lamp sets, each with a 50-ft. extension, are used.

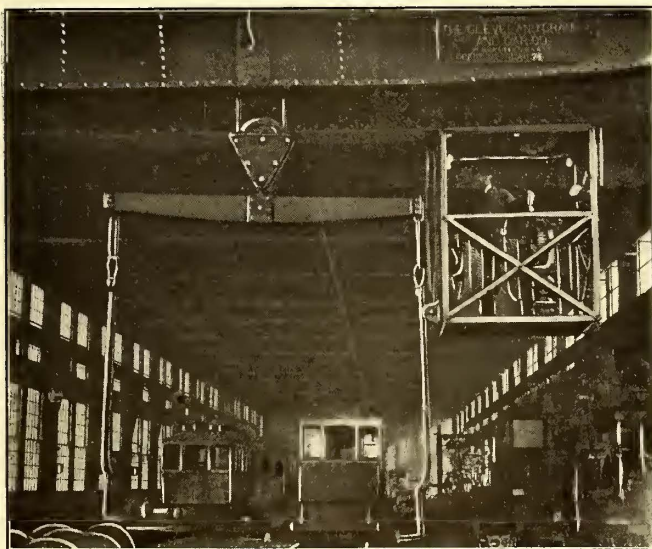
TRANSPORTATION AND HOISTING

Without question, the most valuable tool in the Harrisburg shops is the 7½-ton Cleveland crane, which does

and in the winding room with Franklin portable chain hoists.

MACHINERY EQUIPMENT

The machinery outfit of the Harrisburg shops is extensive enough to handle all maintenance work, and by adapting some of the heavier tools for several purposes their idle time is considerably reduced. The following machines are driven by Robbins & Myers motors, usually mounted directly overhead: Putnam boring mill, 5 hp; Schaefer-Rochester wheel press, 2 hp; Putnam lathe, 2 hp; Bement lathe, 2 hp; Reed armature lathe, 2 hp; Oliver



Harrisburg Shops—Car Sling Used to Raise Cars with the Crane

every kind of work, from lifting a car off its trucks to the transfer of an armature from lathe to storage rack. By comparing the output of this shop with the older one, the company has found that the crane is worth at least five men steadily employed.

This crane has one 10-hp and two 5-hp motors, which take current from the railway power wire through a trolley

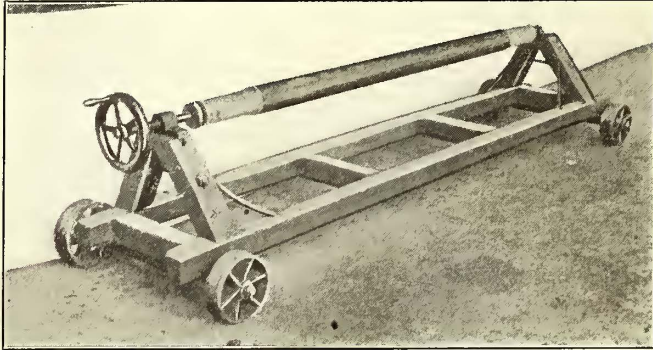


Harrisburg Shops—Every Car Marked "Special" when Destination Sign Is Removed from the Dasher Frame

rip saw, 5 hp; Oliver combination rip and cross-cut saw, 5 hp, and Oliver 20-in. jointer, 5 hp. The last-mentioned tool is to be fitted with a new safety cylinder cutter, which will prevent workmen from getting their fingers cut off by accident.

The other tools, which are belted to a common shaft driven by an old 10-hp Thomson-Houston exciter, com-

prise a Barnes drill press, Wilmarth & Morman drill grinder, emery wheel, Sterling hack saw, Zucker, Leavitt & Loeb buffer, and a gumming machine for the circular saw. The various small tools in the winding room are also belted to one line shaft, which is driven by a 2-hp motor. An old Christensen compressor is used for air-brake tests and to supply air for the cleaning of commutators, armatures, controllers, etc.

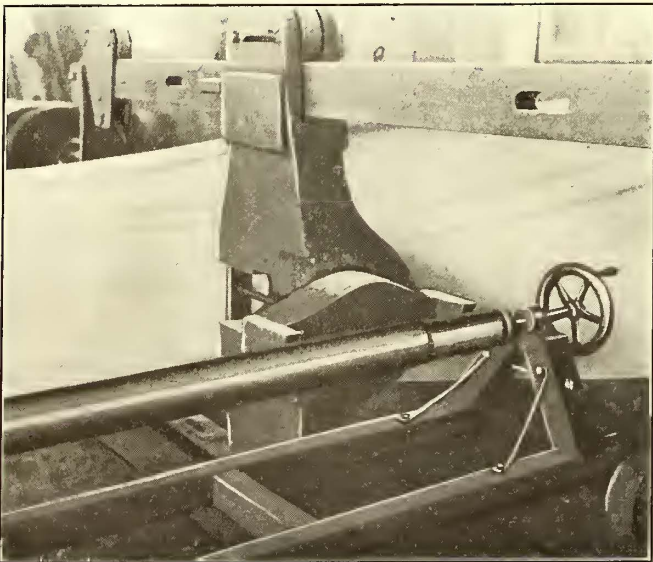


Harrisburg Shops—Truck on Which Bent Axles are Marked and Carried to the Wheel Press

The blacksmith shop contains two Buffalo forges and blowers driven by an 8-hp motor, together with one Buffalo exhaust fan.

#### SOME INTERESTING TOOL APPLICATIONS

The operators of this shop have devised a number of interesting auxiliary uses for the more expensive tools. Thus one of the lathes is also employed as a commutator slotter in the manner illustrated on page 605. The armature is mounted on the lathe so that the commutator is brought opposite the tool post in which a small piece of self-hardening tool steel has been inserted. This cutter is



Harrisburg Shops—Preparing to Straighten an Axle with the Aid of a Wheel Press

ground to the width of the mica and can be regulated to follow it with great accuracy. In this way about 45 minutes are required to slot the commutator of a GE-1000 armature.

The wheel press has been cleverly adapted for straightening bent axles. A bent car axle first is mounted on a special truck which has a regulating wheel to hold the axle firmly in position. The distorted section is then chalked off and the truck and axle placed at right angles

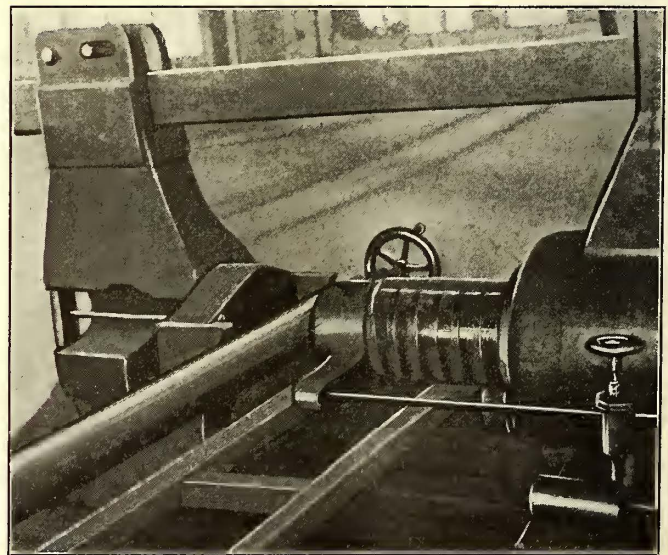
to the wheel press, as shown on this page. The head of the wheel press is furnished with a heavy block, which is recessed to hold the axle in line when the piston operates. The pressure is not exerted directly by the piston face, as might be supposed from the illustration, but through an inserted forging shaped like the frustum of a pyramid. These bearing blocks are made in several sizes, according to the area of distortion. The axle alignment is finally tested by the ease of spinning it around the truck.

A valuable accessory of the boring mill is an expanded borer furnished by the Davis Expanding Borer Tool Company, of Chicago. This device bores holes from  $3\frac{1}{4}$  in. to any size desired. It has been in service on gears and car wheels for five years without any maintenance cost whatever.

#### BRAKE SHOE HANGERS AND BRAKE SHOE PRACTICE

About two years ago the company substituted for the ordinary U-bolt brake-head hanger of the Brill No. 27-G truck an anti-chattering steel hanger made of a forging bolted to the truck transom links carried on two  $\frac{7}{8}$ -in. x 7-in. key bolts with cotter pins  $\frac{1}{4}$  in. x 2 in. The life of this new bracket and hanger is about two years. The company has not experienced any trouble in keeping all parts tight, as they are easily inspected.

The company has followed the unification of brake-shoe practice with much interest, having accepted the recommendations of the standardization committee of the American Street & Interurban Railway Association for wheels of  $2\frac{3}{4}$ -in. tread. As fast as the half-dozen old designs wear out they are replaced by the gray iron, steel-back shoe pattern M-541 made by the American Brake Shoe & Foundry Company. The matter of shoes for pony wheels is not of much importance, as very few maximum traction trucks are operated in Harrisburg. About seven months



Harrisburg Shops—Straightening a Car Axle in the Wheel Press

ago brake-shoe life began to be recorded on a mileage basis.

#### GEAR PRACTICE

Solid gears of Bliss, Catskill and Nuttall manufacture are the Harrisburg standards. They are pressed on at 30 to 40 tons pressure without any keyseat to weaken the axle. The end of the axle is slightly tapered, say  $\frac{1}{64}$  in. in 8 in. length as for the GE-80 motor, to give the gear a good start while using less power. Gears can be pressed on and replaced in one-half the time it would take to in-

stall a split gear. The gears are not permitted to wear out entirely, but when the teeth are within  $\frac{1}{8}$  in. of becoming sharp they are scrapped on the assumption that they would be in bad condition before the next set of cast-iron wheels wore out.

Gears are lubricated with Dixon's wood graphite. They are housed either in Columbia or Lyon sheet steel cases. Pinions are removed with Columbia pinion pullers.

#### BEARINGS AND LUBRICATION

The armature babbitt used in Harrisburg for the last three or four years is a composition containing 83 per cent tin and costs  $23\frac{1}{2}$  cents per pound. In GE-80 motors it has given an average life of 40,000 miles.

The lubricant for bearings of grease cup motors is a non-fluid, vaseline-like material made by the New York & New Jersey Lubricator Company and costs  $5\frac{1}{2}$  to 6 cents per pound. It is successfully used on the Westinghouse No. 3 and GE-800 motors, both in hot and cold weather.

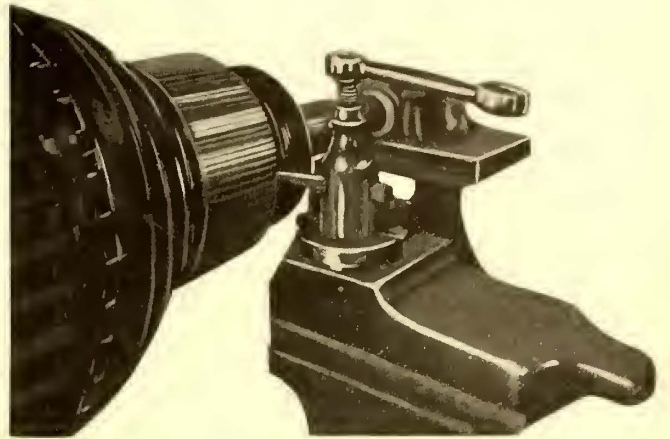
#### IN THE PAINT SHOP

Among the interesting things in the paint shop is an adjustable sawhorse for conveniently painting the sides of cars from roof to panels. The simplicity of this scheme for using but one set of sawhorses for the different heights is apparent from the cut on page 606. The view on page 603 of the car marked "Special" brings up another oddity. Although the Harrisburg cars carry destination posters in a frame on the dasher, people had the disastrous habit of trying to board special cars which had just left the shop

solution of nitric acid and finally applying a coat of lacquer.

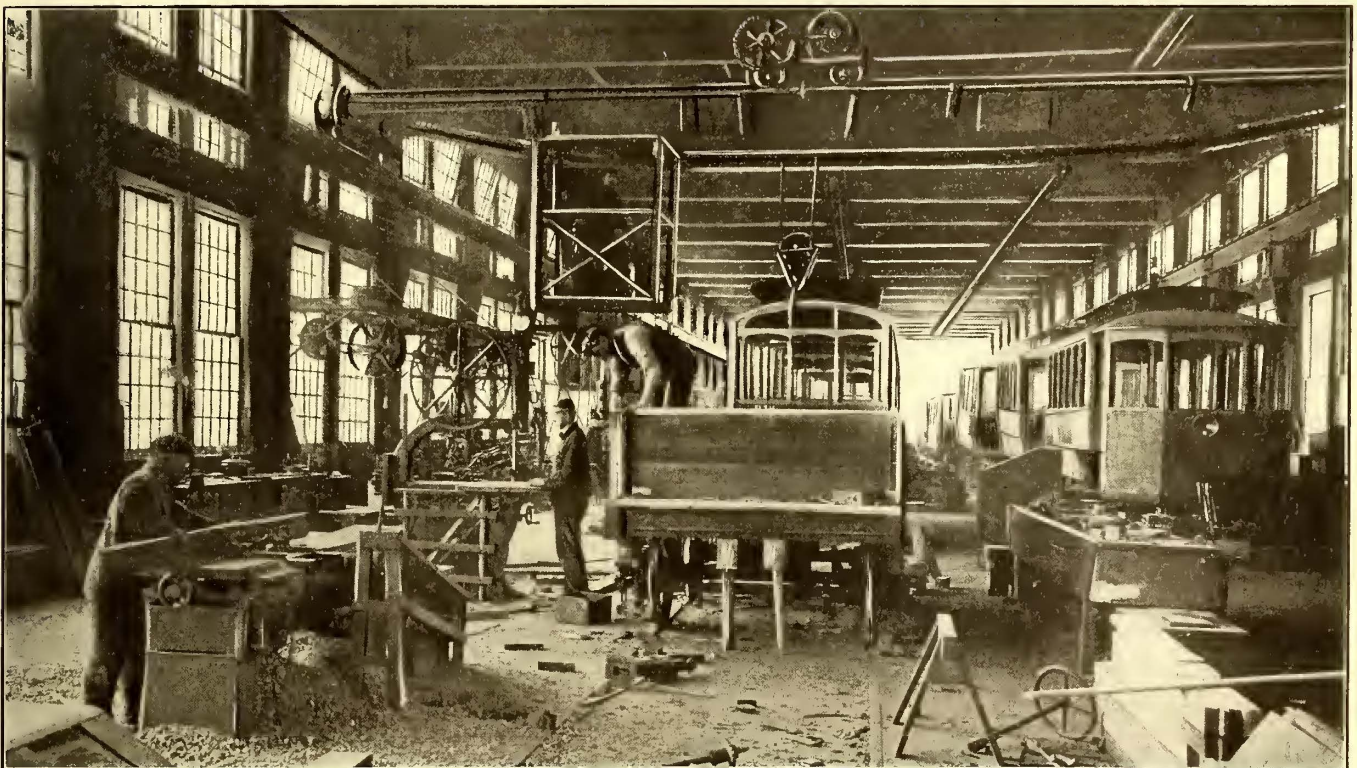
#### CAR PAINTING

The system used by this company for car painting is as follows: When found necessary to repaint a car it is first burned off outside. After being sandpapered, a coat of white lead is applied as a primer. It is then given one coat of surfacer or rough stuff, puttied and glazed. Next it is



Harrisburg Shops—Slotting a Commutator on a Lathe

sandpapered again to get an even surface, and three or four coats of color are applied, according to the requirements. It is then striped, lettered and finished with three coats of body varnish of a standard make. The inside of



Harrisburg Shops—View in the Woodworking Department Back of the Truck Overhauling Department

without any intention of picking up passengers. It occurred to A. F. Rexroth, master mechanic, that if the word "Special" were painted in conspicuous red letters on the yellow dasher the car could be plainly indicated as a non-passenger vehicle just by removing the destination sign over it. The adoption of this simple idea really has eliminated a lot of trouble in this respect.

Brasswork is easily cleaned by first dipping it in lye to remove old varnish, dirt and grease, then dipping it in a

the car is cleaned with varnish remover and washed with benzine to insure a clean surface. It is then sanded and filled with wood filler or shellac until a good foundation is obtained, sanding between the coats. It is then given two or three coats of body varnish. Except on emergency jobs, the first coats used are rubbing varnish. All cars are given one coat of body varnish once each year.

The painting force consists of three painters and two helpers. These men are able to take care of 114 cars in ad-

dition to doing all park and other outside company painting.

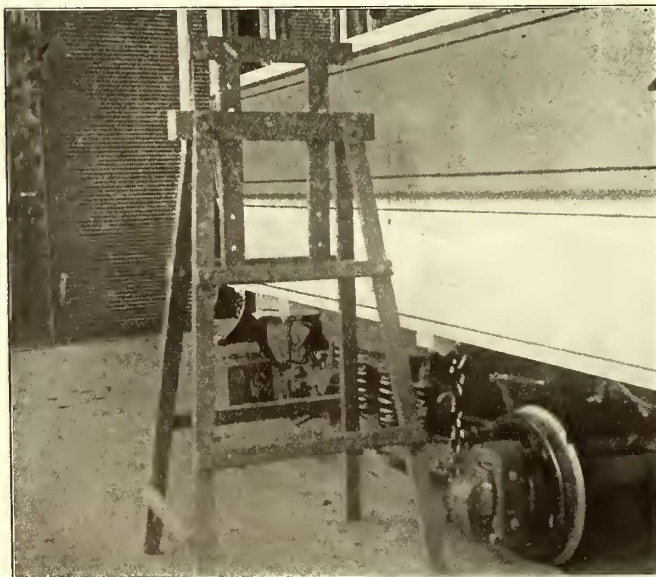
#### WINDING PRACTICE AND ELECTRICAL KINKS

In the winding room a countershaft run by a 2-hp Robbins & Myers motor operates a banding lathe, armature coil taper and field winder. The latter was made from an old belt tightener and worm gears, which arrangement has been found satisfactory because when the machine is stopped the tension is kept tight on the wire. The standard field coils for motors are made of asbestos-covered wire, and while



Harrisburg Shops—The Winding Room

being wound are treated on each layer with a brush-applied composition made of equal parts of powdered asbestos and oxide of iron mixed to a soft paste with armalac. After fields are taken from the form they are put in a roaster for about 24 hours. On being taken out, they are thoroughly coated outside with the same composition and taped with asbestos tape. After all outside insulation and terminal plates are put on they are again roasted for about 12



Harrisburg Shops—Adjustable Horse for Painting Cars

hours. Fields treated in this manner have been in constant service for about four years and are still in good condition.

The winding room contains a set of electric heaters, the coils of which are made available in different voltage combinations for various purposes. In one instance, a shunt off the heater circuit lights some tiny incandescent lamps on the inner side of a tool-box cover whenever the lid is raised to look for something. Another heater shunt connected to

bells is used for coil testing in place of batteries. This method is more reliable than a battery, since the latter is liable to have an open circuit.

#### SHOP PERSONNEL

It would be difficult to point out the actual originators of many of the shop practices at Harrisburg, as the maintenance men have the pleasant custom of working out their new ideas in co-operation. The responsible heads of the maintenance departments, however, are A. F. Rexroth, master mechanic, and P. F. Gerhart, chief electrician in charge of the overhead work, to both of whom acknowledgment is due in helping to gather data for this article.

### CAR CIRCUIT BREAKERS

BY A CAR INSPECTOR

The rate of depreciation of the motors, controller, wiring and other parts of a car equipment depends more closely upon the proper adjustment of the car circuit breakers than upon any other one part of the apparatus on the car. It is the safety-valve upon which the integrity of the other portions of the equipment depends.

The adjustment of the circuit breaker should be checked by the use of a suitable rheostat and ammeter at least once a month, and in doing so the current should be raised gradually when approaching the tripping point, otherwise the true reading will not be obtained. It is the practice in some shops to set the breaker by the use of a calibrated scale or dial. Such a scale is not necessarily correct, and, if it were, the method is not one to be relied upon, as the friction of the tripping mechanism changes on account of rust. Again, the circuit breakers are not always put on a car in the position which the manufacturer intended, and any changes in position alter the force of gravity, hence the calibration of the breaker. To determine the correct setting for a circuit breaker, a car should be put in regular service over the line on which it is intended to run, and, with an ammeter and proper acceleration, the correct current value at which to set the breaker can be determined.

Improperly set circuit breakers are of two classes, namely:

- (1) Those set to blow at too low a current value.
- (2) Those set to blow at too high a current value.

Those in Class 1 make it necessary for the motorman to feed his controller more slowly than if the circuit breaker were set properly. It is also evident that on this car the rheostatic losses will be greater, and there will be less opportunity to coast, and as the current is on for a longer period, braking must be commenced at a higher speed to make the same schedule.

With the platform controller in the hands of an indifferent motorman, the circuit breaker inoperative, the voltage high and the load heavy, the acceleration is apt to be disagreeably quick, and the life of the equipment in general will be decreased. The parts on the car most affected are the commutator, coils, pinion and gear, but on interurban roads a sudden overload at the substation might result in burning the station breakers, flashing and throwing the rotaries out of synchronism. With a slippery rail an automatic safeguard is provided through the spinning of the wheels, through which the counter e. m. f. of the motors is increased, but the current in the motors may be suddenly raised above the normal tripping point of the breaker should the motorman sand the rails. The location of circuit breakers under the car is advantageous in one respect. It reduces the tendency to fast feeding of controllers because the motorman has to stop the car in order to reset the breakers.



**REINFORCING METAL POLES**

When iron poles were originally used for electric railway work it was thought by many that if properly maintained they would last a lifetime. Experience has shown, however, that after about ten years serious corrosion begins to take place, usually at the base of the pole, just above the ground line and extending below the ground for several inches. The extent of this corrosion seems to be largely independent of the manner in which the poles are installed. Usually, the location makes little difference.

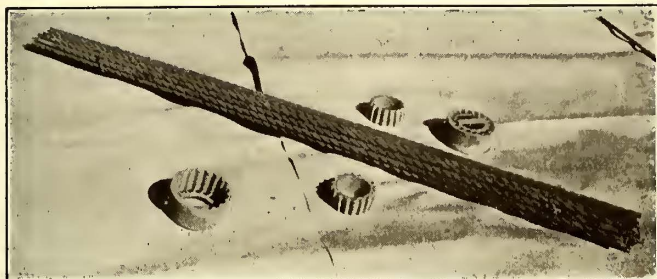


Fig. 1—Twisted Rods and Castings Used in Reinforcing Poles

Poles set in a cosmocrete sidewalk or in country side paths are attacked impartially, but pure wrought-iron poles seem to be much less susceptible to attack than steel. Thus, in Brooklyn a lot of about 50 wrought-iron poles which had been set just 10 years were removed recently, and were found to show no signs of corrosion, although parts of the



Fig. 3—Slipping the Wires Inside the Pole

poles were not covered by concrete near the surface of the ground.

The question of the maintenance of poles which were corroded near the base had to be faced some time ago by the engineering department of the Brooklyn Rapid Transit Company. Several courses were available: (1) To replace

the pole with a new one. (2) To reinforce the pole by removing and shrinking on an iron jacket over the weakened portion. (3) To slip a sleeve, larger than the lower section, over the pole, sink it below the ground the desired distance and fill in the intervening space with sulphur,

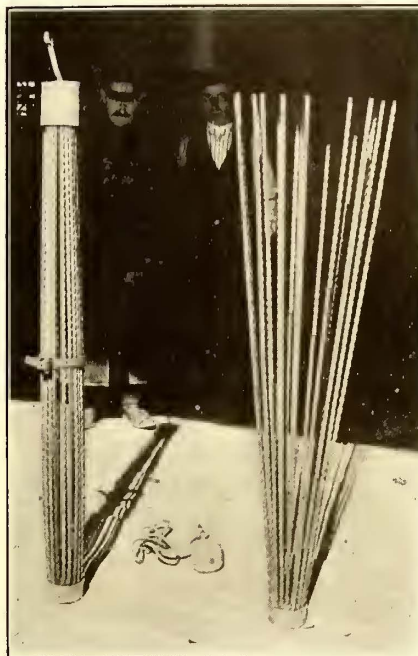


Fig. 2—Rods Used for Reinforcement

cement or other material. (4) To insert a reinforcing system of rods in the trolley pole from the top and filling the pole to the desired height with concrete or cement mortar. In the opinion of the Brooklyn engineers there were serious objections to the first three plans. The cost of the first was large, as it involved not only a new pole, but disturbance to the overhead construction supported by the pole and to the sidewalk. The second plan



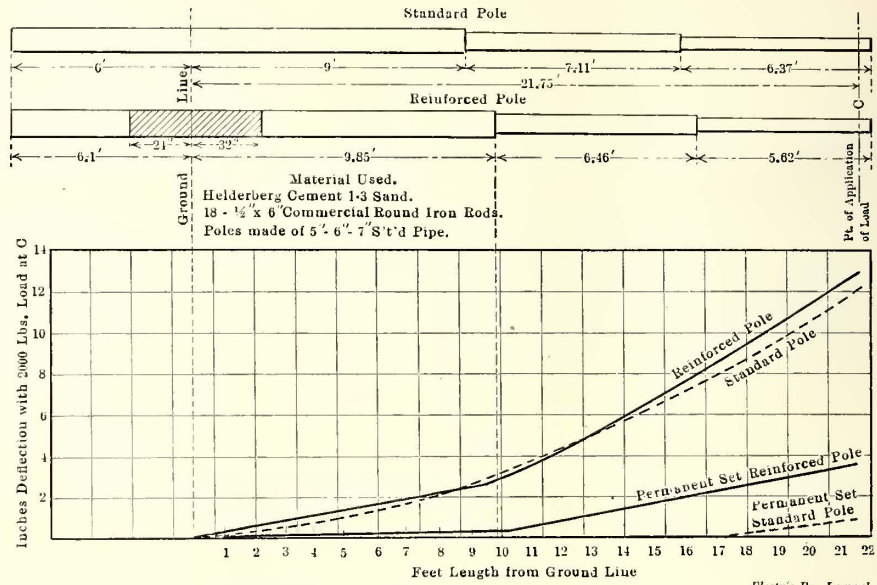
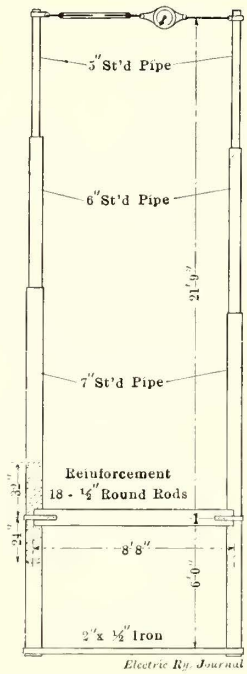
Fig. 4—Pumping Liquid Cement into Pole

presented the same objections as the first. In the third plan all wires as well as the arms and ornamental collars must be stripped from the pole to permit slipping the sleeve over the top. Again, the sidewalk must be destroyed and replaced, and this was considered objectionable because malicious persons frequently destroy the patches and prop-

erty owners are apt to be unreasonable. The method is also costly, since when sidewalks are opened a city inspector has to be engaged at \$4 per day to oversee the work.

The fourth method was adopted in Brooklyn and has

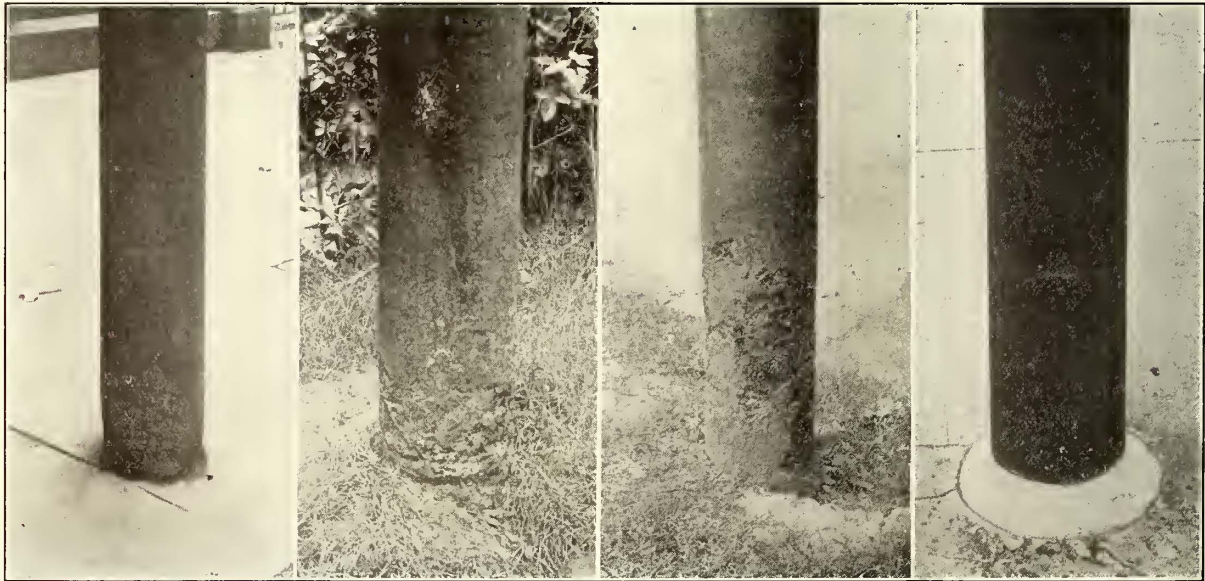
rods when inserted in the top of the pole require a little pressure to force them through the upper section, but after passing into the middle section, fall easily to the bottom. In this position the rods will expand very close to the inner wall of the pole, thus providing the most economical distribution of the metal and still leaving sufficient space between the rod and the inner wall for a coating of cement



Figs. 5 and 6—Tests of Plain and Reinforced Iron Poles

been found simple, cheap and effective. A short description of this method was published in the ELECTRIC RAILWAY JOURNAL for Oct. 10, 1908, page 929, but further particulars will be of interest. Nothing but the pole cap need be disturbed, and this can be done easily by lifting the cap off. Twisted steel rods of any desired number

mortar. A piece of tar paper is then placed around the bottom of the pole, if there is a hole in it, to close the hole. A cement mortar is then forced into the pole so as to cover the rods by a foot or more, and then the replacement of the cap is all that is required to complete the job. The method is shown in Figs. 4 and 5. No wires, arms or other fixtures



Figs. 8, 9 and 10—Bases of Corroded Poles

Fig. 11—Repaired Pole

within limits are formed into a "cage," as it is called, by means of the pair of castings between which the rods are held. These are shown in Figs. 1 and 2. These rods are held in such a manner that some pressure is required to restrain them while they are being inserted in the top of the pole (see Fig. 3). The rods are usually about 5 ft. long and to insure their proper position with respect to the point of weakness, the bottom of the pole is filled with sand so that the cage will rest at the desired point. The

need be removed. No difficulty has been experienced with vibration and poles reinforced under severe conditions have withstood tests indicating that a pole with less than 1/16 in. of metal at the ground line will fail at other points before showing any signs of bending at the reinforcing. In fact, even if all the metal were removed the pole will be still as strong as the new pole and have the additional advantage that at destruction it will only bend and not break and fall into the street.

The amount of reinforcement can be varied by increasing the number and size of the rods and their disposition in the pole. For example, rods may be larger at the "back" of the pole, depending on the concrete to take the compression, but as poles are frequently reset and removed, it is considered in Brooklyn better to reinforce the pole equally and thus enable it to resist stress in any direction.

Fig. 6 gives the results of some tests of poles, new and reinforced at the ground line. The poles were framed up

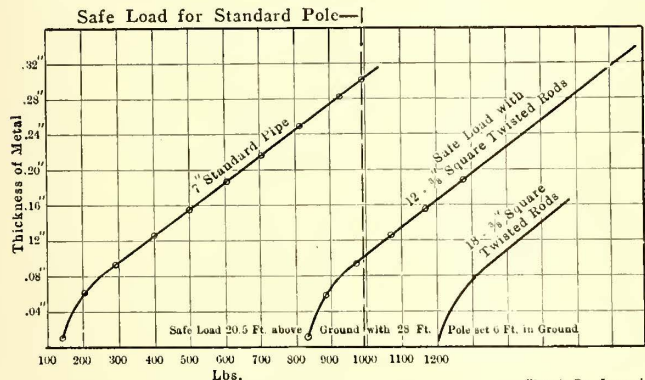


Fig. 7—Tests of Reinforced Iron Poles

as shown in Fig. 5. At their bases the poles were held with an iron link of suitable strength; at the ground line a strut of heavy timber was inserted and fastened loosely to the poles for convenience. At the top a turnbuckle and dynamometer were inserted to supply the load to the poles. This arrangement insured the same stress on both poles and eliminates any inaccuracies in measuring instruments so far as relative results are concerned. It should be noted that the conditions of the test do not reproduce exactly the conditions of the poles in the ground which are generally assumed as cantilevers, but poles as usually set are not fixed rigidly in the earth, as the concrete jacket is not thick enough to be of much value in preventing bending below the ground line.

The load was applied in regular increments up to 2000 lb. (safe load being about 1000 lb.) and deflections noted at 1-ft. intervals above the ground line. It was found that the new pole had a uniform flexure, but that the reinforced pole was very rigid throughout the reinforced section and most bending took place at other points. This test was completed when the reinforced pole failed above the first joint—that is, at the 6-in. and 7-in. sections. When repeated under same conditions the reinforced pole failed in the same point. The permanent set was found to be small in the new pole and to be hardly perceptible in the reinforced portion of the old pole. (See Fig. 6.)

In the study of reinforced steel poles given by C. E. Roehl and H. H. Hilborn, of the engineering department of the Brooklyn Rapid Transit Company, patentees of the system of reinforcement described, tests were also conducted to determine the deflection of beams made up to represent the condition of reinforced poles in which all the metal had disappeared, leaving the concrete and reinforcement only to carry the load. Two sections of 7-in. square Ransome rods and a grout of two parts sand and one part cement, the other with 12 3/8-in. square Ransome rods. After the concrete had set for 30 days the specimens were weakened by cutting away a ring of metal 1/2 in. wide entirely around the pipe at the center. The beams were then tested by placing them on two saddles, 6 ft. apart, and applying the load in the center with regular increments by a testing machine, and the beams were found able safely to

withstand a load of 675 lb. and 1071 lb., respectively. Another series of tests was conducted to determine the safe load which may be applied at 20 1/2 ft. from the ground for various thicknesses of metal available in addition to the reinforcing rods. These results are given in Fig. 7 with the corresponding data for 28-ft. poles composed of 5-in., 6-in. and 7-in. pipe. Figs. 8, 9 and 10 show poles which were corroded at their bases and Fig. 11 a pole reinforced in the manner described by the Brooklyn Rapid Transit Company.

These patents are now controlled by the New York Pole Company.

### ELECTRIC EXPRESS CAR FOR THE NORTH-EASTERN RAILWAY, ENGLAND

Last January the North-Eastern Railway, of England, introduced on its electrified Newcastle division the combined parcel and freight motor car shown in the accompanying illustration. This car has four compartments, consisting of a motorman's cab at each end with separate divisions between for packages and fish, which constitute a large part of the freight.

The car is 55 ft. over all, and is mounted on pressed steel trucks having 36-in. diameter wheels. The wheel base of each truck is 7 ft. and the distance between centers 40 ft. The center and side couplers are located on the end sills to enable the car to be coupled up to either an electrical or a steam-driven train without delay. The buffers are also arranged to conform to the two systems. The braking equipments comprise standard air brakes and hand brakes. Compressed air from the brake system is used for operating a whistle over each motorman's cab.

The electrical equipment consists of four 125-hp British Thomson-Houston railway motors of the GE-66 type as used on all other North-Eastern electric trains but with the latest form of Sprague-Thomson-Houston multiple-unit control. All cables are asbestos covered and are run in solid drawn steel conduits screwed into cast-iron connection boxes wherever junctions are required. A bell mouth is provided where the cables leave the piping and a rubber washer, making a perfectly tight joint, insures the complete sealing of the conduit.



Fish Express Car for Service on Electrified Lines of North-Eastern Railway of England

The car is lighted by six lamps in series. Duplicate signal and route lamps are also installed, arranged on a sliding base, so that in the event of one circuit failing the duplicate set can be immediately brought into use. The weight of the car in complete running order, but exclusive of its load, is almost 38 tons. The car was built by the North-Eastern Railway Company at its carriage works at York and all of the electrical equipment was supplied by the British Thomson-Houston Company, Ltd., of Rugby, England.

**METHODS AND COSTS OF INSPECTION AND REPAIR WORK ON THE SOUTH SIDE ELEVATED RAILROAD**

The South Side Elevated Railroad, of Chicago, in March, 1908, began a careful inquiry into the cause of electrical and mechanical defects on its cars. As a result of co-operation by all departments interested the mileage per case of trouble has been nearly doubled in 14 months. This article describes the scheme of inspection records used and the methods followed in locating and eliminating mechanical and electrical troubles.

The good results of the past 11 months may largely be credited to the thorough inspection practice and plan of specialized inspectors and repair men in particular classes of work. This plan is based on the theory that when one man centers his attention on one class of inspection work

COMPARISON OF ELECTRICAL DEFECTS ON CARS, BY MONTHS.

	Total number of elec. defects			Mileage per case of trouble			Ave for all classes...
	G.E. 57	G.E. 73	West. 121	G.E. 57	G.E. 73	West. 121	
April, '08	648	149	127	673	1200	3910	1202
May, "	731	167	184	629	1118	2745	1064
June, "	386	128	77	1168	1427	6525	1921
July, "	388	126	80	1130	1433	6082	1877
Aug., "	525	133	79	815	1365	6250	1497
Sept., "	520	151	57	826	1220	8450	1504
Oct., "	441	121	88	1025	1640	5700	1774
Nov., "	401	91	100	1070	2154	4948	1893
Dec., "	329	96	117	1495	2200	4460	2278
Jan., '09	293	80	117	1545	2461	4411	2378
Feb., "	310	99	105	1321	1672	4485	2035

the faults which escape him will be a minimum. If this plan were followed to the extreme the shopmen, of course, would lose interest in their daily tasks, and the work might be neglected; so at opportune times deserving men are shifted from one kind of work to another. This maintains interest in the work and offers a convenient means for promotion.

The accompanying table shows a comparison by months from April, 1908, to February, 1909, of the electrical defects on cars and the car-mileage per case of trouble. The statistics are subdivided according to the kinds of motors used. In this connection it should be stated that the GE-57 equipments have been in service about 11 years, the GE-73 equipments for about seven years, and the Westinghouse 121 motors only about two years. The older motors are of smaller capacity than those purchased more recently, and all three types of motors of various horse-power capacities are operated with each other in multiple-unit trains.

The South Side Elevated Railroad was the first road to use multiple-unit control for train operation, and the number of cars equipped with the various kinds of motors, each with two motors per car, are: GE-57, 150 cars; GE-73, 70 cars, and Westinghouse 121, 150 cars. The cars with the GE-57 motors are equipped with the Sprague multiple-unit control as first designed and put in service on the road. The controller is a K-type, actuated by a small pilot motor wound with No. 32 silk-covered wire. Very few changes have been made in control or motors during the 11 years in which they have been in use. The 70 cars equipped with GE-73 motors were purchased about seven years ago, and have the same control system, but improved in some particulars. The 150 cars with Westinghouse 121 motors are comparatively new, and have the Westinghouse elec-

tro-pneumatic multiple-unit control. It is planned to use the latter as much as possible, so that the older equipments will be relieved. As the three kinds of motors with two kinds of control are combined in trains, the gearing on all motors is arranged for a uniform speed of 28 m.p.h.

RECORD SYSTEM

Up to a year ago repairmen were stationed at the ends of the lines so that they might ride defective cars and make light repairs en route. Now the mileage per case of trouble has been so reduced that the repairmen can be used more efficiently by making their headquarters at the shop at Sixty-first Street. Whenever a motorman notifies a dispatcher of trouble on his train the dispatcher enters the report on his train sheet and notifies the shop to send out a repairman to meet this train at the most convenient point. With this report begins a series of car records that is extremely simple, and yet gives all the data

required either for studying the performance of any car or in investigating a reported accident.

The permanent records of all work done on cars and their equipment are made on four cards, all of the same size, 4 in. x 8½ in., but of different colors—white, blue, yellow and salmon. These cards are known as motorman's report of defects, repairman's report of defects, inspection report, and report of repairs made at car shops. After the cards have served their immediate purpose they are permanently filed in a large case in the office

**SOUTH SIDE ELEVATED RAILROAD**

**Motorman's Report of Defect on Car No. \_\_\_\_\_**

Date \_\_\_\_\_ 190\_\_ Time \_\_\_\_\_ A. M. \_\_\_\_\_  
P. M. \_\_\_\_\_

Branch \_\_\_\_\_ Motorman \_\_\_\_\_

Delay: Place \_\_\_\_\_ Minutes \_\_\_\_\_

CAR BODY	CONTACT SHOES
OOORS	
CLASS	
CURTAINS	<b>CONTROL SYSTEM</b>
SEATS	CIRCUIT BREAKER
VENTILATORS	PLATFORM SWITCH
OECK SASH	PILOT MOTOR
BELL	REVERSER
BELL CORD	RELAYS
LIGHT OR LIGHT SWITCHES	LINE FUSE
PLATFORM CATES	SWITCH GROUP
SAFETY SPRINGS	CONTROLLER
ORAW BAR	LIMIT SWITCH
MATS	RESISTANCE
HEATERS	TRAIN LINE CABLE
	OVERHEAD TROLLEY
	STORAGE BATTERY
<b>MOTORS</b>	
ARMATURE	
MOTOR FLASHED	
FIELOS	
MOTOR BEARINGS	<b>AIR BRAKE</b>
FUSE BLOWN	MOTORMAN'S VALVE
BRUSH HOEERS	GOVERNOR
GEARING	COMPRESSOR
	PUMP FUSE BLOWN
	TRAIN LINE PIPE
	RESERVOIR HOSE
<b>TRUCKS</b>	TRAIN LINE HOSE
MOTOR TRUCK	RESERVOIR PIPE
TRAILER TRUCK	AIR CAUCE
FLAT WHEELS	TRIPLE VALVE
HOT BOX	WHISTLE
BRAKES NOISY	

Track Defects \_\_\_\_\_

Signal Failure \_\_\_\_\_

Remarks \_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

South Side Elevated—Motorman's Report of Defect Card

of the superintendent of the car department. This case has 400 compartments, each of a size to hold the cards when lying flat. The compartments are numbered correspondingly with the car numbers, and each day when the cards have been filled out and visid by the foreman and the superintendent of the department, a clerk distributes them by number into their proper compartments in this large case. Thus the system is followed out from day to day without any bookkeeping, and in the compartment for each car may be found at any time the signed reports, describing definitely all the work of inspection and repairing done on that car since this system of records was established.

The various cards are reproduced as actually filled out in regular work during the past month. The method of using them may be of interest.

Each case of trouble found by a motorman is reported on one of these standard size cards as reproduced. The heading of the card used for this purpose is "Motorman's report of defects of car No. \*\*\*\*." In using this report blank the motorman fills in the date and time and branch of the road on which he is operating, signs his name, makes a note of the delay caused and checks from the list of car

account of the blowing of a main fuse, he found that the armature of the No. 1 motor was grounded.

When a car is turned in for inspection, the inspection report used at the shops is fastened to a small board, and is left in the car, so that each man who does any work on the car may sign his name in the space opposite the list of car and equipment parts. After all the blank lines left for

SOUTH SIDE ELEVATED RAILROAD								
DAILY CAR DEFECT REPORT								
Date, March 11, 1909.			7.00 a. m. to 7.00 a. m.			Weather, Clear.		
Car No.	Trouble Found	Repaired by	Time	Place Repaired	Previous Regular Inspection by	REMARKS	Cars In for Regular Inspection	
							O. K.	For Shop
69	In Master Switch	Bowers	A.M. 11:06	On road	Mariga	Changed Master Switch Spring.	O. K.	
65	In Pilot Motor	"	11:42 P.M.	" "	"	Open circuited Pilot Motor.	"	
75	In Train Line Cable	"	5:59	" "	Wood	Cross in jumper between coast and series.	"	

South Side Elevated—General Manager's Daily Report of Car Defects

and equipment parts that part of the car which is out of order. At the bottom of the report he notes the condition of the defect.

Whenever a repairman is called upon to inspect or repair any part of a car he fills out a standard repair report of the

the signatures have been filled, indicating that all the parts of the car have been inspected and taken care of, the card is handed to the shop foreman, who marks up the car "O.K." the car may sign his name in the space opposite the list of superintendent's office, where, after it has been viséd, it is

**SOUTH SIDE ELEVATED RAILROAD.**  
**REPORT OF REPAIRS MADE AT CAR SHOPS.**  
 Date Entering Shop *March 5 1909* Date Leaving Shop *March 5 1909*  
 Car No. *332*

**CAR BODY**  
 WOODWORK *over bushes, vestibule, panels*  
 PAINTING *2 coats paint, lettered*  
 VARNISHING *3 coats varnish*  
 IRONWORK *cleaned & painted*  
 ROOF *painted, coat lead paint*  
 VENTILATORS *cleaned & varnished*  
 HEAD LINING *cleaned, varnished, bolt & pulled*  
 WOODWORK-INSIDE *cleaned*  
 SEATS *cleaned, repaired, varnished*  
 BLINDS OR CURTAINS *cleaned & glazed*  
 GATES *cleaned, painted, coat lead paint*  
 RAILINGS *over bushes*  
 PLATFORMS *repaired & painted*  
 TRUCKS *repaired, cleaned & painted*  
 WHEELS *cleaned*  
 BEARINGS *parts removed & greased*  
 SPRINGS *inspected, examined, painted*  
 TRANSOMS *lightened*  
 BOLSTERS *repaired & painted*  
 DRAW BARS *repaired & painted*  
 AIR BRAKES *repaired & tested*  
 FLOOR *repaired & painted*  
 MATTING *repaired, tested, painted*  
 AIR PIPING *repaired, tested, painted*  
 GLAZING

**ELECTRICAL REPAIRS**  
 REVERSERS *overhauled*  
 CONTROLLERS  
 ARMATURES  
 CABLES

**SOUTH SIDE ELEVATED RAILROAD**  
**INSPECTION REPORT.** Car No. *389*  
 Date *3-15 1909* Last Inspection *3-3 1909*  
*Jackson* Branch.  
 I have inspected and now report the following parts in good condition.

**CAR BODY:** DOORS, WINDOWS, GATES, ORAW BARS, ETC., CAR LIGHTING  
**MOTORS:** ARMATURES GAUGED, BRUSHES AND BRUSH HOLDERS, LEAOS, CABLES, SUSPENSIONS, ETC., OILING  
**TRUCKS:** WHEELS, AXLE, JOURNALS, SIDE BEARINGS, ETC., CONTACT SHOES  
**CONTROL SYSTEM:** PLATFORM SWITCH, CONTROLLER, REVERSER, RELAYS, SWITCH CROUP, LIMIT SWITCH, BATTERIES, ETC.  
**AIR BRAKES:** BRAKES, BRAKE VALVES, PUMPS, GOVERNOR

SIGNATURE: *M. Raueck*  
*G. Lippert*  
*J. Jacobson*  
*J. Mariga*  
*J. Mariga*  
*J. Mariga*  
*M. J. Wilson*  
*Joseph Wood*  
*Thurston*

Car O. K. for Service *Yes*  
 Car Ordered into Shop  
 Remarks: *Fred Smith, Foreman.*

**SOUTH SIDE ELEVATED RAILROAD**  
**Repairman's Report of Defect on Car No. 247**  
 Date *3-15 1909* Time *9:58 A.M.*  
*Jackson* Branch *13 Avenue* Repairman  
 Repaired: On Road In *0* Shop In *0* Yard

**CAR BODY** DOORS, CLASS, CURTAINS, SEATS, VENTILATORS, WINDOWS, BELL, BELL CORD, LIGHT OR LIGHT SWITCHES, PLATFORM GATES, SAFETY SPRINGS, ORAW BAR, MATS, HEATERS  
**MOTORS** ARMATURE, MOTOR FLASHED, FIELDS, MOTOR BEARINGS, FUSE BLOWN, BRUSH HOLDERS, CEARING  
**TRUCKS** MOTOR TRUCK, TRAILER TRUCK, FLAT WHEELS, HOT BOX, BRAKES NOISY

**BRAKES ADJUSTED** CONTACT SHOES  
**CONTROL SYSTEM** CIRCUIT BREAKER, PLATFORM SWITCH, PILOT MOTOR, REVERSER, RELAYS, LINE FUSE, SWITCH CROUP, CONTROLLER, LIMIT SWITCH, RESISTANCE, TRAIN LINE CABLE, OVERHEAD TROLLY, STORAGE BATTERY  
**AIR BRAKE** MOTORMAN'S VALVE, COVERNOR, COMPRESSOR, PUMP FUSE BLOWN, TRAIN LINE PIPE, RESERVOIR HOSE, TRAIN LINE HOSE, RESERVOIR PIPE, AIR CAUCE, TRIPLE VALVE, WHISTLE

No Defect Found  
 Defect Repaired *20*  
 Car Ordered Laid Up *transferred at 9:58 north*  
 Remarks: *Reported main fuse blown - found same and grounded armature #1 motor*

South Side Elevated—Car Inspection and Repair Report Cards

form illustrated and explains his part of the repair work in the suitable space left at the bottom of the card. On the particular blank used for the illustration of the repairman's report it will be noted that car 247, running north on the Jackson Park branch, was turned over at 9:58 a. m. to the shops at Sixty-first Street, because, when the repairman inspected the equipment reported to be defective on

placed in a compartment of the large case with all the other report cards referring to the same car.

The work done in repairing cars at the shop is similarly recorded on a repair report card of the standard size, one of which is reproduced. When filled out this card presents a record of the work done on all parts of the car body, the electrical and the other equipment. On the reverse side of

this card is a tabulation space for the material and labor costs of this repair work. The repair report is signed by the superintendent of the car department and then placed in the large card case with the other cards referring to that particular car. It is said that only about five minutes' work is required each day in sorting all the cards in the case. This process, of course, is purely mechanical, and therefore no errors of transcribing occur.

Each morning a clerk in the office of the superintendent of the car department fills out a daily car defect report, which is forwarded to the general manager. The report for March 11 is reproduced. Even the most trivial defects are reported. A blown fuse is classed as a defect. In the general manager's office a record for comparative purposes is made for classifying by cars and months the different defects to all equipments. It is found that most of the trouble is with the older cars, and so a record also is made of the number of each car on which there occur five or more cases of trouble per month. An inspection of this record shows at a glance which cars need the most attention, and an analysis of the daily car defects when tabu-

The cars are lubricated and cleaned throughout at every inspection. It is necessary to put about 25 cars a day through the inspection shed, which has track accommodations for but 16 cars at one time. The work of inspection is subdivided as follows: When cars are received into the shed in trains one man immediately goes through the entire train and cuts all electrical connections, so that there may be no accidental starting or shocks. All of the controller inspection is done by two men, who clean, renew and oil the pilot motors and controllers. Another man devotes his time to inspection and repairing of reversers. So, also, one man devotes his time to the relays and to general electrical trouble work and there is one repair man each for air governors, air compressors, motor brushes and brush holders, contact shoes and trolley connections, master controllers and light circuits. An oiler with a helper is responsible for the lubrication of all car journals and motor bearings. One man also is responsible for the safe tightening of the bolts and all suspended parts under the cars and for gaging all clearances.

The costs for inspecting the more important parts of the equipment follow:

Name of part	Cost	Cost per 1000 miles
Controller.....	\$0.20	\$0.1228
Reverser.....	.0945	.0580
Governor.....	.0945	.0580
Master switch.....	.0472	.0289
Compressor.....	.1010	.0620
Brakes.....	.2165	.1330

The regular inspection work is supplemented with yard inspection by a man who particularly looks for loose or defective parts underneath the car bodies. The foreman of the shop or his assistant also gives every car a thorough inspection after it has been passed upon by their subordinates.

#### CAR CLEANING

All cars put through the regular inspection are cleaned while they are in the inspection shed. The body paint on five cars per day is gone over with an emulsion cleaner manufactured by the company, the formula for which was obtained from the Philadelphia Rapid Transit Company. It is applied with scrubbing brushes and then wiped off with waste. All the windows of all cars are cleaned with whitening and water at each inspection. The floors are also scrubbed and the interior finish rubbed clean. The cleaning process also includes disinfecting with suitable disinfectants. Compressed air for use in cleaning motors and control apparatus is led into the car body through a long hose provided with a standard coupling so that it may be connected with any nearby car equipped with an operative motor compressor. The unit costs for cleaning cars are as follows: Windows, 40.75 cents; sweeping, 6.01 cents; scrubbing, 20.41 cents; outside cleaning with emulsion, \$2.34 per car.

An average of 25 cars per day are oiled, four of which have their journals repacked. One man looks after all of the oiling and draws each day 23 gal. of oil for use on car journals and the GE-73 and Westinghouse 121 motors. He also draws on an average 5 gal. of light oil per day for oiling GE-57 motors which have wick feed.

#### REMEDYING TROUBLE

About a year ago there was found to be an excessive number of fuses blown out on cars equipped with old GE-57 motors. A study of the equipments indicated that the probable seat of the trouble was at the brushes. As a result

#### SOUTH SIDE ELEVATED RAILROAD

#### DAILY REPORT OF CARS OUT OF SERVICE

Date, March 12, 1909.

CAUSE	CARS	Number
General Repairs.....	20-61-147-157-179-223-334-335 & 336.	9
Light Repairs.....	186.	1
Wheels.....	71 & 190.	2
Trucks.....	52.	1
Motor Trouble.....	48-350 & 386.	3
Control System.....		
Air Brakes.....		
Heaters.....		
Other Causes.....		
	Total.....	16

*George H. Hopkins,*

Superintendent of Car Department and Shops

#### South Side Elevated—General Manager's Report of Cars Out of Service

lated is valuable as a month-to-month comparison of the efficiency of the shop forces and the reliability of the car equipment. The general manager's office also is furnished with a daily report of the cars out of service, which is reproduced.

#### INSPECTION AND REPAIRS

The reduction in defects made during the past year can be accredited largely to thorough inspection and repair work. The shop and inspection facilities of the South Side elevated road are not of the latest design. The buildings now used are the same structures which were built for the maintenance of the small number of cars operated 15 years ago. The motor and truck repair shop has three tracks about 60 ft. long, served by air hoists. The paint shop has sufficient trackage to hold but 12 cars, and that space which could be occupied by two cars must be used for varnishing and other light work. The inspection shed has two tracks, each of which holds eight cars. As an illustration of the crowded condition of these shops, it is stated that estimates showed that if the striping and ornamentation were left off the car bodies it would increase the capacity of the paint shop by two cars per month, and for this reason the cars as now painted are without decorations. Including the shop and inspection department, the superintendent of the car department has on his payroll an average of 200 men at a total cost of \$386 per day.

Regular inspection is made on the basis of 1500 miles.

the dimensions of the brushes used have been changed and the troubles largely reduced. Until this change was made the GE-57 motors were equipped with carbon brushes  $\frac{5}{8}$  in. thick, which just covered two commutator bars from mica to mica. If the brush holder became warped or was set a little out of line the brushes would be in contact with three bars all of the time and flashing would result. The electrical defects from this cause have been prevented very largely by the use of a  $\frac{1}{2}$ -in. Le Carbone type E brush, which is  $\frac{1}{2}$  in. thick and therefore will allow  $\frac{1}{8}$  in. variation from perfect alignment without short-circuiting three commutator bars all the time. The brush tension is about 5 lb. and all main motor commutators are grooved  $\frac{1}{32}$  in. Work has been started also on grooving all of the commutators in the compressor motors.

Sparking at the commutator has been remedied by paying close attention to lining up the commutator bars with the armature slots so that when the brushes are on any particular bar the coil connected with that bar will be at its proper position in the neutral point of the field.

The third-rail collector shoes, of which there are four per car, have a life of about 20,000 miles and require very little attention other than renewal.

Master Car Builders' standards are closely followed with regard to wheels. All motor cars have 34-in. Standard steel-tired wheels with spoke centers. Similar wheels, 31 in. in diameter, are used under the trailers. The motor-car wheels have an average life of about 40,000 miles between turnings and the total life of the wheels averages about 200,000 miles. Wheels are inspected according to the M. C. B. rules and are turned whenever they are hollowed out  $\frac{1}{8}$  in. The tread and flange of the wheel is M. C. B. standard. A composition brake shoe is used, which has a filling made up of 85 per cent cast-iron borings and 15 per cent asphaltum.

## HUNGARIAN ELECTRIC RAILWAYS AT THE END OF 1907

The department of commerce of Hungary has issued the accompanying statistics on the electric railways of that country for 1907. The only change from the preceding year was a decrease of 5 km (3.1 miles) over 1906, due to the purchase of an electric railway which is now used as a portion of the Hungarian State Railways. Freight lines are owned by municipalities:

Railway.	Length of all track		Length of Route. Km.
	Single track. Km.	Double track. Km.	
<i>Vizinal System Divisions</i>			
Budapest-Budafok .....	7.835	.....	8.675
Budapest-Szentlőrinc .....	11.868	7.915	11.506
Miskolcz-Diosgyőr .....	8.277	.....	6.943
Total .....	27.980	7.915	27.124
<i>Other City Railways.</i>			
Budapest street railway lines.....	71.850	67.845	71.850
Budapest municipal line.....	44.856	44.032	44.785
Franz Joseph electric subway (in Budapest).....	3.700	3.700	3.700
Budapest-Ujpest-Rákospalota railway.....	16.488	11.267	17.208
Budapest and suburban railway.....	6.841	3.725	6.770
Fiuman railway.....	4.413	.....	3.982
Miskolcz municipal railway.....	7.300	.....	6.578
Nagyszeben municipal railway.....	2.395	.....	2.395
Nagyvarad municipal railway.....	15.327	1.799	12.497
Pozsony municipal railway.....	8.002	2.516	7.800
Sopron municipal railway.....	4.575	.....	3.830
Szabadka railway.....	10.000	.....	10.000
Szombathely municipal railway.....	3.026	.....	2.810
Temesvar municipal railway.....	10.415	4.865	10.415
Total .....	209.188	139.749	204.620
Grand total.....	237.168	147.664	231.744

Application has been made to the Ministry of Public Works of Austria-Hungary for a concession for the construction and operation of a standard-gage electric railway from Tirano to Bormio. The line will be about 25 miles long.

## PAINTING AND VARNISHING PRACTICE OF THE BOSTON ELEVATED RAILWAY

All painting and varnishing work done on the Boston Elevated Railway Company's system is conducted at the Bartlett Street shops, Roxbury. These shops are connected with the elevated railway structure and with the surface lines passing through the district and all work done there is more or less closely associated with car body repairs. In a general way the machine shop work of the company is carried on at the Albany Street plant, while the woodworking is performed at Bartlett Street. A large forge shop is also located at the latter point.

### ORGANIZATION

The painting department is one branch of the Bartlett Street organization, and as such is under the general supervision of the superintendent of rolling stock and shops. The superintendent of shops is in immediate charge of the work at Bartlett Street and makes his headquarters at this point. Under him are an assistant superintendent and various department heads, among whom is the general foreman painter. At present the latter has jurisdiction over four groups of painters, each section or gang being under a sub-foreman. The working force in each section consists of painters and helpers. One of these gangs is constantly at work painting the company's buildings, such as car houses and power stations, while the others are specialized on rolling stock and in general are located in the painting department of the shops.

### ARRANGEMENT OF WORK

The rolling stock which is owned by the company includes 219 elevated cars, 91 service cars, 12 mail cars, 1504 open cars of from 7 to 12 benches, 1565 closed cars of from 20 ft. to 26 $\frac{1}{2}$  ft. body length and 191 semi-convertible "easy access" cars of about 33 ft. body length. There is also a large number of snow plows, snow sleds, wagons, automobiles and other miscellaneous vehicles. All rolling stock is brought to Bartlett Street for painting and varnishing when such work is necessary. Closed cars usually go to the shop under their own power, but are occasionally hauled, one at a time, by a service car. Open cars are usually stripped of their motors before being taken to the shop and are hauled there two cars at a time by the service car. One motorman and two trolley men are required on such a train. Two service cars are constantly at work transporting open or closed cars to and from Bartlett Street shops.

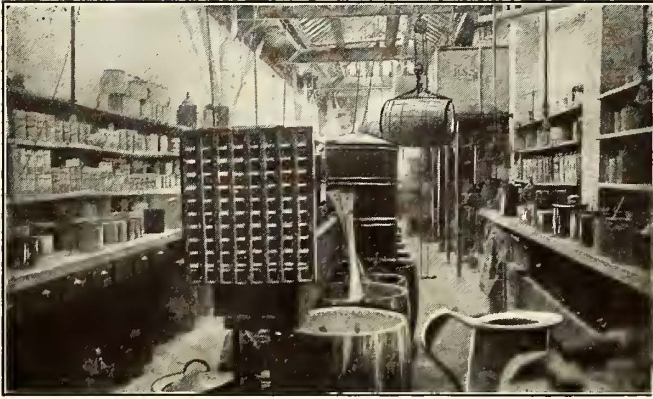
The work on the open cars begins in the painting department about Oct. 1 and continues until early in May. During this time about 150 closed cars are usually put through the shops in addition to the open cars. In May the force takes hold of the closed cars and works steadily on this type of rolling stock throughout the summer months and early fall. The company endeavors to touch up, varnish or paint all of its open cars each year. At present there are about 35 painters at work on open cars, turning out on an average 12 cars per day. The working hours are 56 per week. About 90 per cent of the work of the department is on piece work. The shop is handled on the basis of putting through a certain amount of work in a given time, fixed periods being allowed for each kind of a painting job. The capacity of the shop at any one time is six elevated and 59 surface cars.

The work of the painting department divides itself in general into three classes: Touching up jobs; cutting in

with color, and burning off and painting jobs. The touching up includes cleaning, touching up and revarnishing. Cutting in includes the application of the proper color when a car is transferred to another division of the system. Burning off includes all the steps necessary to practically repaint the whole car. The time schedule for the different classes of work is as follows:

#### BURNING OFF

The car is first entirely dismantled of sashes, doors, ventilators, bells, registers and miscellaneous transportation



**Boston Elevated Paint Shop—Stock Room**

fittings. Burning off is done on the first day with a gas flame and the first coat of priming lead paint is applied. The car is allowed to dry the second day. On the third day the car is puttied smoothly and on the fourth day it is given a knifing coat. This coat is a specially prepared lead and is put on and set partially dry. The surface is then gone over with a broad putty knife and smoothed

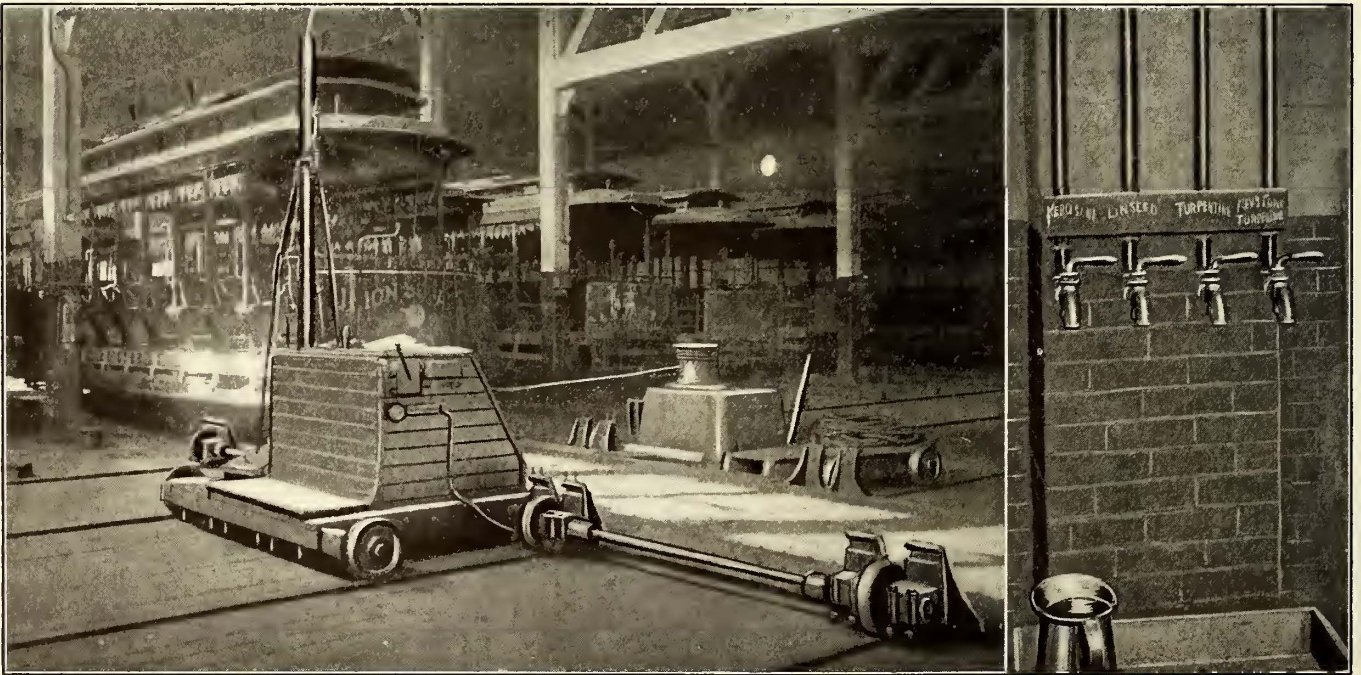
ninth day is devoted to such ornamentation as the car requires. The first coat of body varnish is applied on the tenth day and the second coat on the eleventh, using no rubbing varnish except on doors and sashes. At this time the inside doors and sashes are taken care of, the company's practice being to use no paint on these parts, as they are generally finished in hardwood. The work is mainly varnishing. On the thirteenth and fourteenth days the cars are trimmed and the fittings are installed. On the thirteenth day also the trucks are painted one coat of oil color of a tint approximating that of yellowish mud. On the fifteenth day the car floor is painted and the fenders are blocked off, and as soon as possible within the next few hours the car is taken out of the shops.

#### TOUCHING UP

In the process called "touching up" the car is first stripped and then thoroughly rubbed with pumice stone and water and a mild solution of soap. When it is clean its body color is matched and the colors are touched up. One man in the painting department spends practically all his time in matching colors. After touching up, one or two coats of body varnish are applied and usually a coat of white paint around the car windows. The average time for this kind of a job is approximately from a week to 10 days.

#### CUTTING IN

This is done only when a change in color is made, as in transferring a car from one part of the road to another. The car is sandpapered with fine-grained paper and the color cut in as designated on the instructions. All cars are provided with tags (see p. 616) which state the proposed changes in color for the belts, panels, dashers and other portions of the bodies, with the car number, division number, colors and sign designations when the car comes into



**Boston Elevated Paint Shop—Transfer Table**

**Faucets for Oils**

down to eliminate all brush marks and irregularities. On the sixth day this coat is gone over with fine sandpaper. The workmen then apply a ground coat or a coat of color tint preparatory to the application of a body color. On the seventh day the ground coat is sandpapered and the car is given its first coat of color. On the eighth day a second coat of color is applied and in this coat a sufficient amount of varnish is added to give a very thin gloss. The

shop. The dates of arrival and completion of the work are also stated on this tag, which remains with the car as long as it is in the shop. After the color is cut in, two coats of body varnish are applied. A cutting-in job usually takes five or six days.

#### PAINTING ELEVATED CARS

Elevated cars are sandpapered off and two coats of color applied, after which two coats of varnish are put on. The



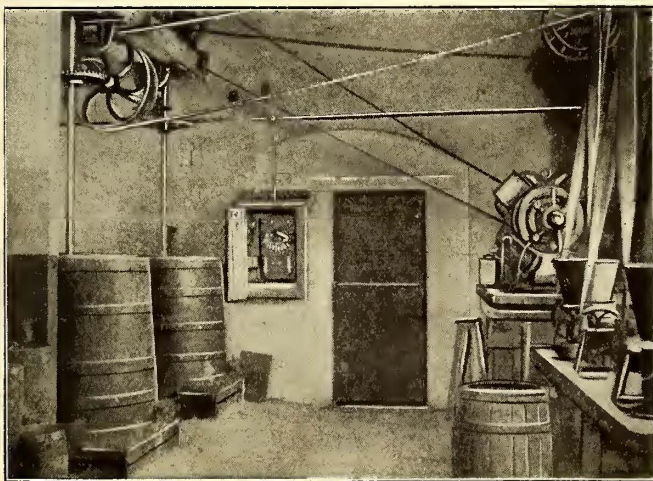
time for this work averages from a week to 10 days. This treatment of the elevated cars is the result of the severe service conditions to which they are exposed. The brake-shoe dust created by the operation of these heavy cars at speeds of from 30 to 40 m.p.h. settles into the surface of the car bodies to an extent that its removal would be very slow and expensive; hence the company does not attempt to remove it before repainting.

#### MIXING COLORS

The company uses stock body colors, among them green, aurora red, blue, vermilion, buff, yellow and brown. With the exception of one or two special colors all those used are put up in Japan. The company mixes its own colors for undercoats, floors, roofs, touching up, etc. Night work is seldom done in this department. As far as possible the work is specialized, each man doing the same class of detail painting repeatedly when a considerable number of cars requiring the same treatment is at hand.

#### STOCK ROOM

The stock room of the painting department is located on the second floor of the shops, at one side of the quarters devoted to the cars and at the end of a transfer table track which traverses the entire surface car painting division. All cars treated in this division are brought up from the street floor by a motor-driven elevator which has a capacity of four cars per hour, including shifting between the elevator and the transverse berth tracks in the painting division. The transfer table and the general arrangement of the painting berths are shown in an accompanying engraving. A short description of the transfer table might be given in this connection. It is a flush table and is fitted with two motors, one for driving the table and one for operating a 15-in. winch, which is used to move cars on and off the table when they are brought into the department without their own power. The wiring of the table is carried in iron conduit and each motor is fused. The table is of steel frame construction with idler and geared wheels on the carriage and is supplied with power from

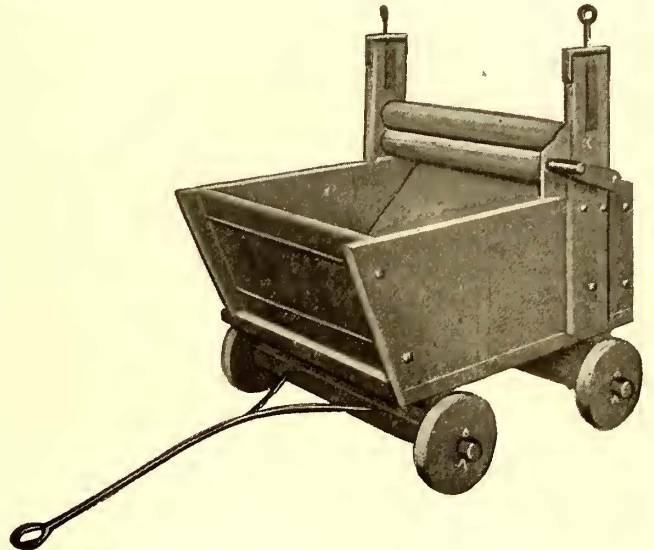


**Boston Elevated Paint Shop—Paint Mixing Room**

an overhead trolley line running across the shop. The table is about 24 ft. long, has a speed of about 2 m.p.h. and can be operated by one man.

The stock room is about 80 ft. x 16 ft. Paint in cans is stored on shelves on each side of the room, which has a skylight giving excellent natural illumination. Brush racks and tanks are located under the shelves and in the central portion of the room and the whole length of the room is served by an overhead traveling hoist installation equipped

with a one-ton and a half-ton hoist of the hand-operated type. By this hoisting apparatus a barrel of kerosene, linseed oil, turpentine or Keystone turpentine can be elevated to a height above the floor of the stock room and the contents can be discharged into one of four tanks carried on a steel framing at the side of the center aisle. Each of these tanks has a capacity of 10 barrels and is connected by a pipe line with a corresponding faucet below. As the faucets are properly labeled, the necessary liquids can be drawn off with the minimum loss of time. The faucets



**Boston Elevated Paint Shop—Canvas Painting Device**

are arranged in groups as shown in one of the views. The brush racks and tanks are provided with steel wires on which brushes can be hung and drained.

In one corner of the stock room is a steam bath where all skin paint is boiled off and redeemed as a brown color for subsequent use by the company. In the center of the stock room near the delivery window is a check rack, shown in the general view. This rack has about 80 pockets of inclined form for the reception of different colored tabs, numbered to show what painters are using the different tools and brushes. An additional rack of this type is also located on the inside wall of the room and on the outside of the room is a duplicate rack where the men keep their tabs when they are not in exchange for tools or brushes. Each pocket has a number corresponding to that assigned to the painter who uses it. Among the supplies and tools for which separate checks are given are color, red paint and flat wall brushes, sash tools, oval varnishers, slickers, chamois, water brushes, scrapers, scraping knives and dusters. At one end of the stock room is an installation of small grinders, group driven by a motor in the next room. These adjoin the reclaiming kettle, which has a capacity of 15 gal.

#### PLANT FOR MIXING PAINT

An interesting installation in the painting department is a plant designed by the company for mixing up very large quantities of paint in connection with the painting of the elevated structures. A batch of 190 gal. of paint can be produced at one time in this plant, which is shown in one of the accompanying views. The plant consists of two mixing tanks 4 ft. in diameter and 4 ft. high, with paddles provided for each tank. The paddles are made out of 2-in. iron pipes and are driven by bevel gearing and counter-shafting from a motor mounted on a platform at one side. The tanks are served by a 1000-lb. hoist, which elevates the materials required in the tanks to a platform shown in

the illustration. Each tank is equipped with outlets for convenient discharge. One tank is used for mixing zinc.

A batch of 150 gal. of paint for the elevated structure is made up according to the following proportions: 1200 lb. lead; 600 lb. zinc mixed with oil in the first tank; 300 lb. stone yellow; 75 lb. lampblack and oil; 6 gal. Japan and 110 gal. of oil. The mixture can be effected properly in an hour after the materials are poured in. At one side of this installation is a group of smaller paint grinders driven

THIS SIDE TO BE FILLED IN WHEN THE CAR COMES INTO THE SHOP.		
Car No.	Division	Date in
Top Belts		
Panels		
Dashers		
Glass—ends		
" —sides		
SIGNS ON CAR WHEN IT CAME IN		
Ends	Sides	
Hoods	Special	

*Electric Ry. Journal*

#### Boston Elevated Paint Shop—Front of Shop Order Tag

by the same motor which operates the mixer. Two men in the stock room are constantly engaged in mixing paint.

#### METHOD OF PAINTING CANVAS

One of the most convenient devices in the painting department is a device for painting the canvas used for motor protection under the car. This device is illustrated in one of the accompanying photographs. It consists of a pine box, 44 in. long, 36 in. wide and 18 in. deep, mounted on wheels, 14 in. in diameter. One end of the box is equipped with two ash rollers 4 in. in diameter and a similar single roller is in the bottom of the box. The box has an iron handle by which it can be transported easily around the shop. In operation the canvas is slipped under the roller in the bottom of the box and is fed through the two upper rollers. Two men then sieze the end of the canvas and walk away with it at an easy speed. Another man keeps the box about two-thirds full of paint and a fourth feeds the canvas from a reel into the box. By this

PROPOSED CHANGES.		
Car No.	Division	Color
Top Belts		
Panels		
Dashers		
Glass—ends		
" —sides		
Remarks		
Date when Car is finished		
RETURN THIS CARD TO OFFICE		

*Electric Ry. Journal*

#### Boston Elevated Paint Shop—Reverse of Shop Order Tag

means four men can paint 300 yd. of canvas in half an hour, which is an enormous improvement over the old methods of hand painting by the brush. The tension of the canvas can be regulated and hence the thickness of the paint application by the use of an adjusting set screw feeding the upper roll upon the lower one.

#### BLANKS

The company has put in force a complete system of blanks and cards for recording the work done in the paint-

ing department on both the piece and flat rate basis. All cards are 3¼ in. x 5½ in. and all time is kept by an International clock installed near the general foreman painter's desk. The workmen on piece-work jobs use a separate card for each job. It shows on one side the painter's shop number. The order number, date issued, number of the piece-work job, a brief description of the work and the time of starting and stopping each job as stamped at the clock are recorded for each day by the painter. On the back of the card the foreman writes the numbers of the cars which the painter is to work upon and keeps a similar list of men's numbers on his desk, corresponding to the car numbers which are undergoing the work in regular tabulated stages. At the end of the week each card is totalled and figured and signed by the foreman for sending to the shop office. The time card inserted by each man in the clock whenever he enters or leaves the shop is arranged to show flat time on one side and piece work on the other. Another card, also of uniform size, is used by men engaged entirely on flat time and another records overtime. Each form of card is of a different color. The main office also has a series of cards to record work done in the shops.

#### ANNUAL MEETING OF THE NEW ENGLAND STREET RAILWAY CLUB

The annual meeting and banquet of the New England Street Railway Club was held at the Hotel Somerset, Boston, March 26. Officers for the ensuing year were elected at the annual meeting which was held in the afternoon. Only one ticket was in the field and the following officers were elected unanimously:

President—W. D. Wright, Providence.

Vice-presidents—C. H. Hile, Boston; Calvert Townley, New Haven; J. Brodie Smith, Manchester, N. H.; F. H. Foote, St. Albans, Vt.; E. A. Newman, Portland, Me.; M. H. Bronsdon, Providence.

Secretary—John J. Lane, Boston.

Treasurer—N. L. Wood, Boston.

Executive committee—Matthew C. Brush, Newtonville; Franklin Woodman, Haverhill; E. P. Shaw, Jr., South Framingham; E. W. Holst, Boston; Lee H. Parker, Boston; Charles N. Wood, Boston; Lewis R. Speare, Boston.

Finance committee—W. D. Wright, Providence; John W. Corning, Boston; George W. Knowlton, Boston.

A portrait and biographical sketch of Mr. Wright, the new president, appear elsewhere in this issue.

The banquet, held in the large dining room of the Somerset in the evening, was attended by more than 400 members and guests of the club and was a very successful affair. D. L. Prendergast, secretary, Boston Elevated Railway Company, acted as toastmaster, and the Fifth Regiment Band supplied music.

Mr. Wright made the opening address and announced that the past year had been one of marked success for the club, which had added 28 to the membership, making a total of 727 members. The account of the treasurer showed the sum of \$3,041.87 in the treasury.

The other speakers at the meeting were Hon. James F. Shaw, president of the American Street & Interurban Railway Association; Hon. James F. Jackson, formerly chairman of the Board of Railroad Commissioners of Massachusetts, and P. F. Sullivan, president, Massachusetts Electric Company.

The topic selected by Mr. Shaw was the "Scope and Purpose of the American Street & Interurban Railway Association." He referred to the important work of a technical character being conducted by the different affiliated

associations and by the committee on municipal ownership and public relations, of which Gen. W. A. Bancroft, president, Boston Elevated Railway, is chairman, in bringing the electric railway companies and the public closer together. On the latter subject he said, in part:

In my judgment a most important plan of creating the proper public opinion is the plan of increasing the membership, both active and associate, and thereby bringing the association and its work more prominently to the attention of the people. The greater our membership and the more enthusiastic our members, the greater good will be accomplished for the electric railways in general. Since Oct. 1 the active membership has increased 35 companies and the associate membership 375, and at the end of this fiscal year we hope to have an increase of 100 active and 1000 associate members. Every member of your club is entitled to associate membership, and I ask each and every one of you to become one of our members.

It is my opinion that no better medium of attracting attention to our work could be had than the associate-membership pin recently adopted by the association, and it is gratifying that so large a number of associate members have already secured and are wearing the emblem of their alliance with, and interest in, the electric traction field. It is felt, however, that if the greatest good is to be accomplished this pin should be worn by every one of our associate members in order that the least possible time be lost in the spreading of a doctrine of fair play to the electric railway interests.

The future of the electric railway business depends in a large measure upon the attitude of the public toward it, and it should be the effort of us all to attempt, each in our own way, to sway that feeling from antagonism to goodwill. We not only want you to become associate members of our association and to wear the pin, but we want you to read the proceedings of our conventions, to familiarize yourselves with our work and to join hands with us in a

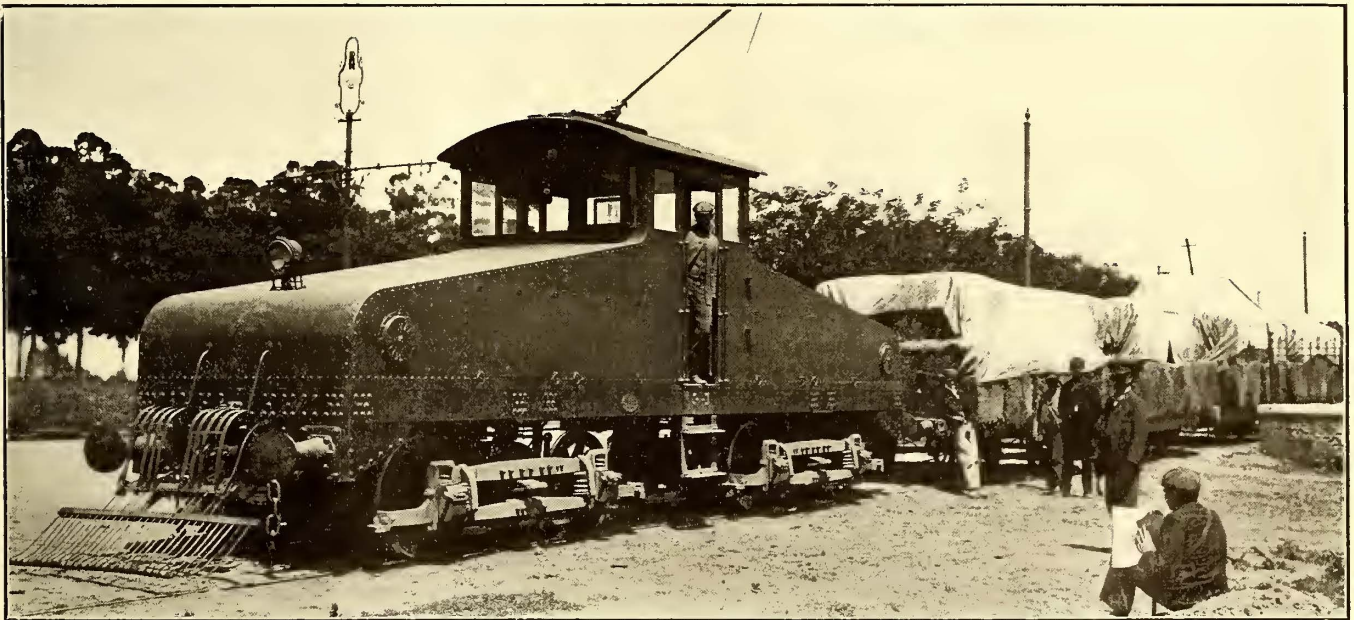
been besieged by his constituents to vote as he did. I have no hesitancy in saying that the members of the Massachusetts Legislature are as fair a body of men as can be found, but the trouble is that the people have been educated to believe that the public-service corporations were dishonest and should be encumbered with drastic restrictions and regulations.

I am of the firm belief that if the work we have in hand has the support of all the people who earn their livelihood through the street railway business, either directly or indirectly, and if they will join with us in our undertaking the public will meet us half-way and let us have a just return on our properties.

### ELECTRIC LOCOMOTIVES FOR SOUTH AMERICA

The accompanying illustration shows one of six standard-gauge electric locomotives recently supplied to the Rural Tramways, La Croze, South America, by Dick, Kerr & Company. The locomotives are of the central cab type and are mounted upon Brill No. 27 E-1 trucks. Each locomotive is equipped with four D.K. 7-B., 500-volt, d.c. motors rated at 50 hp each on the one-hour basis. The total tractive effort of the locomotive at full load is 5720 lb. at the car wheels at a speed of 13.2 m.p.h. and a total current intake of 360 amp. The maximum speed is a little over 20 m.p.h. The diameter of the truck wheels is 34 in. and the gear ratio of the motors is 71:15.

The motors are operated with a type Q-2, Form A controller having five series and three parallel notches. Current is collected by a single trolley. There is no electric brake, but each locomotive is fitted with a Christensen type C-3 straight air brake equipment. The locomotive



Electric Locomotive of the Rural Tramways, La Croze

personal effort to bring about an honest conception of the difficulties under which the electric railway companies operate.

From my experience in the street railway business for the past 17 years and my experience in the Massachusetts Senate for the past three years, perhaps I am in a better position to judge of the temper of the public than some of you who have had only one side of it. Many times we hear the members of the Legislature criticized for the votes on certain questions which appear to be antagonistic to the public-service corporations, but I can recall many instances when such votes were taken where I knew the member was voting against his own convictions, but had

measures 30 ft. over the end sills and 7 ft. over the side sills. The bodies were built at Dick, Kerr & Company's general engineering works at Kilmarnock, the power equipments at their electrical works at Preston. The principal contractors for the Rural Tramways were J. G. White & Company.

The Government Tramways Department of New South Wales reports that over 47,000,000 passengers were carried for the last quarter of 1908 ended Dec. 31. There were 135 miles of line operated, mainly by electric traction.

## QUARTERLY MEETING OF THE NEW YORK STATE STREET RAILWAY ASSOCIATION

The ninth quarterly meeting of the Street Railway Association of the State of New York was held in the assembly hall of the Schenectady Railway Benefit Association, Schenectady, N. Y., on March 24. About 60 were in attendance, and the meeting was presided over by the president of the association, E. S. Fassett, general manager, United Traction Company, Albany, N. Y. The morning session began at 11:30 with the reading of the report of the Committee on Use of Curtains in Car Vestibules, of which W. R. W. Griffin, general superintendent, Rochester Railway Company, was chairman. At the annual meeting at Niagara Falls, last July, Charles R. Barnes, inspector for the Public Service Commission of New York, Second District, brought before the association for discussion three subjects which had been made the basis of complaints to the Public Service Commission. These subjects were "Use of Curtains in Car Vestibules," "Carrying Musical Instruments on Cars," and "Signaling Interurban Cars at Way Stations." They were discussed informally at the Niagara Falls meeting, and committees were appointed by the president of the association to investigate the practice of the railway companies in New York State and to present reports.

### USE OF CURTAINS IN CAR VESTIBULES

The committee sent out a circular of inquiry to all of the member companies. Replies were received from 26 companies, including 5 suburban lines, 13 interurban lines, 5 lines which operated both suburban and interurban routes, and 3 electrified steam railways. The questions included in the circular of inquiry concerned location of tracks, whether on streets, highways or private right of way, schedule speed, use of curtains in the daytime and kind of motormen's cabs. All of the suburban lines replying keep the car curtains open in the daytime, as do also all of the combined suburban and interurban lines which replied. Of the interurban lines, one keeps the curtains closed, 10 keep them open and two which formerly kept them closed have recently opened them. Of the electrified steam roads, one keeps the curtains closed and two keep them open. Various reasons were given for and against keeping the curtains closed. One company believed that the curtains should be drawn day and night, thereby isolating the motorman from all occurrences in the car, so that he will give his whole attention to his work. Another states that it operates with closed curtains on account of the possibility of a panic among the passengers if they can see what to them looks like impending danger. Several of the companies stated that they did not consider closed curtains necessary, and some of the replies added that the ability of the passengers to see ahead was an attraction which stimulated traffic on the electric roads. Another reason given for keeping the curtains open was that passengers in the car often made valuable witnesses in case of accidents, provided they had a clear view ahead and could see all of the occurrences immediately preceding the accident.

The committee, after carefully considering all sides of the question, did not feel that it could make any recommendation for the adoption of a rule covering this point which could be adopted by all companies. Inasmuch as local conditions enter largely into the advisability of operating with open or closed curtains, the committee believed that it was a question to be settled by the management of each company. The report was accepted and the committee discharged.

### CARRYING MUSICAL INSTRUMENTS ON PASSENGER CARS

The committee appointed to consider this subject, of which Albert Eastman (Utica & Mohawk Valley) was chairman, sent out a circular of inquiry, to which 32 replies were received. The replies to the first question in this circular indicated that few companies had so far had occasion to put into effect special rules covering this point. Two companies did not permit passengers to carry musical instruments on their cars, five companies required a release and special permit, while the remainder of the companies which replied carried musical instruments without any special rules, regulations or form of release. The place on the car where large instruments, such as bass drums and bass viols, are permitted to be carried, is shown by the following table, which is a summary of the practice of the companies who replied:

Rear platform.....	8
Smoking compartment.....	2
Body of car.....	8
Front vestibule or front platform.....	9
Baggage compartment.....	4

The form of permit and release used by the Brooklyn Rapid Transit Company; the Fonda, Johnstown & Gloversville Railway; the Schenectady Railway Company, and the United Traction Company, of Albany, were included as appendices to the report of the committee. The report concluded:

So far as general rules and regulations are concerned, the replies indicate that most street railway companies will not permit passengers to board a car with any large musical instrument or other package which will block the aisle or occupy a space required by other passengers. The majority of the companies replying seem to favor a rule prohibiting carrying of large instruments on passenger cars, but believe it would work a hardship in many cases unless some other facilities are provided. Owing to the difference of opinion expressed as to the practicability of enforcing such a rule, the committee does not feel able to recommend any regulation which could be adopted by all companies. This is a matter in which style of car, volume of traffic and other local conditions will have to be taken largely into consideration.

The report was adopted without discussion and the committee discharged.

### SIGNALING INTERURBAN CARS AT WAY STATIONS

The committee sent out inquiries relative to this question to various members of the association, and answers were received from 15 companies.

In answer to the question, "What method, if any, have you adopted to assist passengers on your line in stopping cars at interurban stations after dark?" seven companies replied that they had adopted no method. Four companies answered that they had adopted a mechanical signal to be operated by the passenger. Four companies reported the adoption of bank lights, or clusters, which are kept continually burning at each station. All eight companies stated that their method was satisfactory.

In answer to the question, "Have you experienced any difficulty in maintaining your signals on account of interference or destruction by outside parties?" six companies reported that they had no material trouble or difficulty. One company reported that they had a slight amount of trouble, but not serious. One company said that they had no success with the signals operated by passengers, but that the bank lights were quite satisfactory.

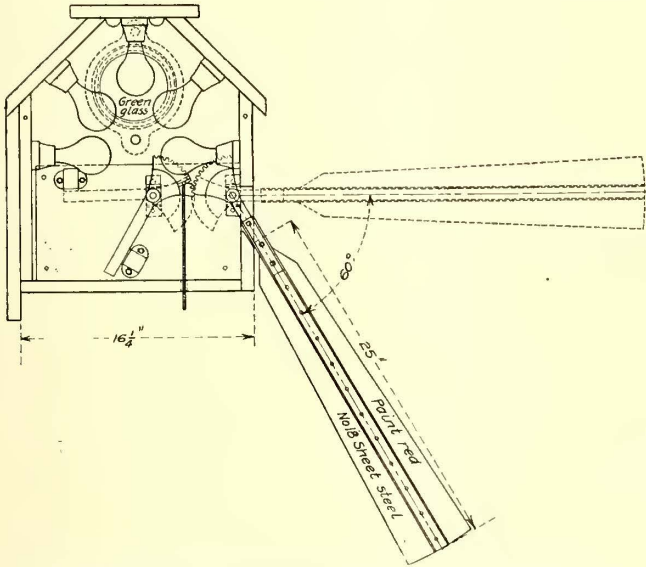
In reply to the question, "What is the approximate cost of installation per station?" the costs named ranged from \$3 to \$7.50 per station for mechanical signals and from \$3.50 to \$15 per station for bank lights.

In reply to the question, "What is the approximate cost of maintenance per station?" one company reported the maintenance of the mechanical signals as \$1.25 per year. On the maintenance of bank lights, one company reports \$1.80 per year, and another company \$18 per year, the

latter taking into consideration the cost of current consumed by the bank light.

In answer to the question, "Do you consider these expenditures a good investment for the railroad?" eight companies who have adopted such signals agreed that it is a good investment. The companies which have not installed a system of signaling believe that such a signal is a good thing, provided the cost of installation and maintenance is not too high. One company reports that it does not need such a signal, as all cars stop at all stations, regardless of whether passengers desire to board or leave car at that point.

The bank lights used by several companies consist of a cluster of five lamps, covered by a disk or box to protect



Stop Signal, with Semaphore Arm, Used by Rochester Railway Company

them from the weather. This cluster is hung over the station platform and connected with the trolley wire, a snap switch being placed on a pole or in the shelter house in such a position as to be convenient for turning on or off the lights. These lights are turned on when it becomes dark and continue to burn until they are turned off by the last car going over the line. With the aid of the light produced by this method the motorman is able to see the passenger signal his car for some distance before he arrives at the station, and in sufficient time to bring his car to a stop at the required point. Since this system has been in operation on the lines of the Schenectady Railway very few complaints have been received on account of cars running by passengers. In using this system it is necessary to depend largely on the patrons of the line for turning on and off the lights, and the principal objection to this system is the cost of current consumed, which makes its cost of operation very high.

Another signal to be used for this purpose consists of a box enclosing five incandescent lamps with a glass disk or lens in each side of the box. This box is attached to a pole at the station so that the light, when the connection is made, shines through the disks in such a way that it is visible to the motorman approaching the station. The signal is lighted by means of a rope extending down the pole to within reach of the platform, this rope being pulled by the passenger when he desires to stop the car. The switch by which these lights are turned on is weighted so that it shuts off automatically. The moment the passenger lets go of the rope, the circuit is disconnected, and very little current is consumed in the operation of this signal. Another signal, used by the Rochester Railway, is very similar to the last mentioned, except that it is equipped with a semaphore arm, and is designed for use both day and night. A drawing of this signal is reproduced in the accompanying engraving.

The committee believes that if any special signal is recommended as standard, the recommendation should be made by the association rather than by a committee.

The report, which was read by George L. Radcliffe (Schenectady Railway), chairman of the committee, was accepted after a brief discussion.

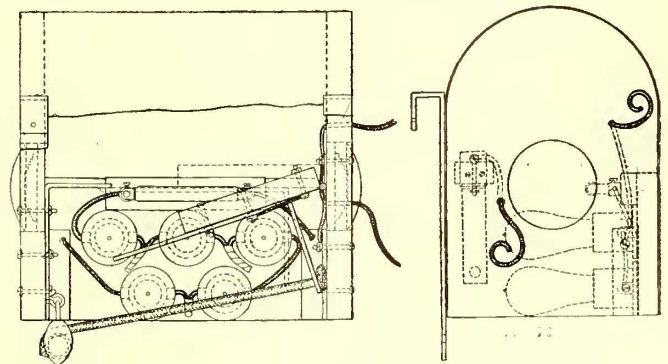
E. F. Peck, Schenectady Railway, said that the use of high power arc headlights was not to be depended upon entirely for distinguishing waiting passengers.

TRANSFERS, USE AND ABUSE

Following the reports of the committees, C. Loomis Allen, vice-president, Syracuse Rapid Transit Company, opened the discussion on this question. He prefaced his remarks by reading a letter received from J. H. Stedman, the originator of the present-day form of transfer slip. Mr. Stedman described the origin and evolution of transfers, and pointed out that the safest way to prevent abuse of the transfer privilege was to enforce the rules regarding time limit. It had not always been the case that the courts had supported the railway companies in refusing to honor transfers on which the time limit had expired, but he believed that the mere punching of a time limit on a transfer acted in a large measure to prevent any excessive abuse of the privilege. He thought that 95 per cent of the passengers who ride on transfers use them honestly. He was strongly in favor of registering transfers collected as well as cash fares and all forms of tickets. In no other way could inspectors check up the work of conductors. In his opinion many companies had lost money by attempting to simplify the form of transfer used and by failing to properly punch the line, date, time, etc. Conductors have time to make change, and in the ordinary course of their work they should have time to carefully punch transfers and to carefully examine all transfers which they take up.

Mr. Allen opened his discussion by quoting from Sections 101 and 104 of the Railroad Law, in which the word "continuous" is used in qualifying the ride to which a passenger is entitled for one fare. In his opinion, the intent of the law was that the trip or ride made by the passenger for one fare should be a continuous ride, and that in no sense was the privilege of a stop-over conceded. Referring to the abuse of transfers, he said in part:

Transfers have been in use since 1884, and pretty generally since 1896. During the operation of the various transfer systems that have been used, passengers who have felt themselves aggrieved, either by being refused transfers, or because the transfers issued to them were not accepted for fare by reason of violation of some regulation which the companies had made, have brought their grievances before the courts. There have been many decisions as to the validity of transfers, and as to the reasonableness of the regulations under which the transfers were issued and accepted in



Stop Signal Used by Hudson Valley Railway

payment of fare. It is fair to say that some of the cases that have been most vital have not involved transfers alone, but evidence other than the regulations in regard to the use of transfers was brought into the case. To-day it is

practically impossible to design a transfer system and make regulations for its enforcement that can be borne out by the court decisions of the past.

The most serious and difficult phase of the transfer problem that we have to contend with to-day is the growing tendency on the part of passengers of a certain class to obtain their passage or pay their fare by offering the conductor, particularly during the rush hours, transfers that are not used in accordance with the statute, viz.: "as a continuous ride." I have seen in various communities prominent persons take from their pockets a half-dozen transfers, examine them carefully, and offer the conductor one of them in payment of fare, and then return the unused transfers to their pockets for future use. Another serious phase of the transfer question is the trading of transfers in public buildings, stores, at newsrooms, cigar stands, boot-black stands, and saloons.

I believe that for any railway company operating in any city outside of New York and Brooklyn (and these two cities are exempted for the reason that there is a lack of information as to the distances passengers are carried on transfers in these two places) the inauguration of the transfer has been a good thing for the railway company, in that it stimulates travel. The increase in the abuse of the transfer privilege by passengers using transfers not within the meaning of the statute, and the trading of them, however, has caused railway men in general to view with alarm the transfer question. I am still of the opinion that a transfer system with reasonable regulations as to the issuance and acceptance is a good thing for the railway company, and the enforcement of reasonable regulations will, to a very large extent, prevent the abuses which are so common and growing to-day. The statute is sufficient in specifying that the transfer is issued for a continuous passage, and it would seem as if it were the duty of the railway companies to educate the public to the fact that transfers are good for a continuous passage, and not good for a "stop over." The abuses in the trading of transfers can be reduced to a minimum by the employment of detectives to secure proper information for the successful prosecution of offenders. It will not be necessary for railway companies to do this in more than one or two instances to break up this trading practice which is so prevalent to-day.

To aid in the discussion of the subject, Mr. Allen propounded the following list of eight questions:

1. Is it reasonable and practical to issue transfers only at time of payment of fare?
2. Is a railway company entitled to say at which transfer point a passenger shall use his transfer, where two lines intersect at more than one point?
3. Is it reasonable and enforceable that transfers must be used by passengers at a stated transfer point, and, if offered at any other place, they can be refused and passenger made to pay his fare?
4. Do you believe in a "specific line transfer"? If so, why?
5. Do you believe in "direction transfer"? If so, why?
6. Do you believe in a combination of the "specific line transfer" and "direction transfer"? If so, why?
7. Do you believe in the "transfer by transfer point," leaving it optional with the passenger to take any line passing that transfer point, excepting, of course, that line from which the transfer was issued?
8. Do you believe in punching the time at which car should arrive at the transfer point, or do you believe in punching the time in which the transfer will be accepted for passage?

The questions were taken up one by one and quite fully discussed by the members present.

#### DISCUSSION OF TRANSFERS

"Is it reasonable and practical to issue transfers only at the time of payment of fare?"

W. J. Cook, Rochester Railway Company, thought that such a rule should be enforced, but he was not sure whether it was practicable under all conditions of operation.

E. F. Peck, Schenectady Railway Company, believed that such a rule worked hardship to passengers who might neg-

lect to ask for a transfer at the time they paid their fare or who changed their minds as to their destination after paying their fare. He believed that a restriction of this kind would discourage traffic. No such rule is in force in Schenectady.

W. H. Collins, Fonda, Johnstown & Gloversville, also thought such a rule would work a hardship. The privilege of asking for transfers after fare had been paid was perhaps abused to some extent, but the greatest abuse of the transfer privilege was the practice of trading transfers.

C. Loomis Allen thought the question of reasonableness depended entirely on local conditions. It is unreasonable for a passenger to ask for a transfer just as the car reaches the junction point and a large number of the passengers are hurrying to get off. On the Utica & Mohawk Valley road no penalty is attached either in issuing transfers or in collecting fares when a passenger changes his mind as to his destination. If a passenger bought a ticket for 30 cents and decided to get off when he had traveled a distance for which the fare was only 15 cents, the passenger was given a rebate receipt, redeemable for the difference. He could see little or no advantage in requiring a passenger to ask for a transfer at the time of paying the fare, so long as the company got the cash fare.

C. Gordon Reel, Kingston Consolidated Railroad, referred to the court decisions as to the reasonableness of the rule put in force in New York City requiring passengers to ask for transfers at the time of paying the fare. He believed the rule was reasonable in New York, where the old plan of peddling transfers through the car at frequent intervals permitted unscrupulous passengers to receive as many as six or eight transfers on a single trip. On his line there was very little transfer traffic, and the rule was to issue transfers at any time on request.

J. W. Hinkley, Jr., Poughkeepsie, said that he had found it necessary to issue transfers only at the time of paying the fare, as two belt lines were operated in Poughkeepsie, and it was easily possible for passengers to get several transfers on one trip. He believed that passengers would not forget to ask for a transfer a second time after it had once been refused them because of neglecting to make the request at the time of paying the fare. On short runs it was necessary, of course, to get the nickels first, but he believed that, under most circumstances, no trouble would be experienced in giving the transfer only at the time of paying the fare.

J. E. Duffy, Syracuse Rapid Transit Railway, pointed out that it was the first duty of the conductor to get all of the cash fares. Where the traffic was very heavy, it might not be practical to require the conductors to issue transfers while they were making the round through a crowded car. The introduction of pay-as-you-enter cars had made such a rule imperative.

F. J. Gerdon, Utica & Mohawk Valley, said that his company made it a rule never to eject a passenger who presented a transfer which for any reason was void. This, perhaps, encouraged abuse of the privilege. He believed that most transfer systems were too complicated and required too much time for the conductors to accurately punch them and carefully examine them.

E. S. Fassett, United Traction Company, of Albany, explained that Albany was one of the last cities in the State to grant transfers. The company had fought the practice, and the transfer system was not inaugurated until after the passage of the so-called Barnes Act in 1905. Before putting a transfer system into effect his company had made

a very careful study of the transfer systems used in nearly all of the important cities in the United States, and the system which was adopted was intended to correct some of the evils encountered in some of the other cities. The public was educated from the beginning to ask for transfers when paying fare. It was not always necessary that the conductor stop and issue the transfer immediately on receiving the cash fare, but it was reasonable to demand that the passenger indicate to the conductor at the time of paying his fare that he desired a transfer. Very little trouble had been experienced in Albany due to the operation of this rule.

"Is a railway company entitled to say at which transfer point a passenger shall use his transfer, where two lines intersect at more than one point?"

Hubbell Robinson, claim attorney, Schenectady Railway Company, expressed the opinion that the railway company has the right to limit the use of a transfer to the line which will take the passenger to his destination by the most direct route. The practice in Schenectady was to designate the particular point at which the transfer would be honored.

E. J. Cook, Rochester, stated that his company did not enforce such a rule, although he believed it was entitled to do so.

J. E. Duffy, Syracuse, said that his company insisted upon passengers transferring at the first intersection. In one case the company had designated a transfer point where it required passengers to walk 500 ft. from one line to the point where cars of another line could be boarded. This rule had been contested, and the case was now in the Court of Appeals. The lower courts had sustained the company.

"Is it reasonable and enforceable that transfers must be used by passengers at a stated transfer point, and, if used at any other place, they can be refused and the passenger made to pay his fare?"

Hubbell Robinson, Schenectady, thought that the court decisions upheld the companies in making such a rule. Several members raised the question whether it was possible to enforce such a rule during the rush hours.

Mr. Fassett suggested that if such a rule be rigidly enforced outside of rush hours, and whenever possible during times of heavy traffic, the public would soon learn to respect the rule.

C. Loomis Allen, Utica, did not believe that such a rule was enforceable in a city of any size. In Syracuse there is a central district in which no fares are collected, and it would be practically impossible to enforce such a rule in that city.

W. R. W. Griffin, Rochester, thought that as long as the transfer was presented within the time limit it made no difference where the passenger boarded the car.

In closing the discussion on this point, Mr. Fassett pointed out that if a passenger boards a car beyond the transfer point it is pretty good evidence of abuse of the transfer privilege. In Albany conductors are upheld in enforcing this rule strictly.

Questions 4 to 7, inclusive, were considered together.

Mr. Callahan, Rochester Railway, favored punching only the junction point at which the transfer would be honored, and permitting the passenger to take any cars of any other line which passed this junction. He thought it made no difference on what line a transfer was collected. It would be necessary, of course, to have the name of the issuing line plainly printed on the transfer so as to prevent return riding.

F. J. Gerdon, Utica, favored a direction transfer.

"Do you believe in punching the time at which the car should arrive at the transfer point, or do you believe in punching the time beyond which the transfer will not be accepted for passage?"

Charles H. Smith, United Traction Company, Albany, favored punching the time of arrival at the junction and placing a time limit of  $\frac{1}{2}$  hr. upon the use of the transfer.

J. E. Duffy, Syracuse, believed that the accuracy of the time limit placed on a transfer hinged primarily on the issuing conductor. He believed that the liability of mistake was equally great in punching the expiring time as in punching the time of arrival at the junction. Some lines run at much longer intervals than others, and if the expiring time is punched conductors must punch the maximum headway on all transfers. They cannot be expected to punch hourly intervals on transfers to one line and five-minute intervals on transfers to another line of heavy traffic. He believed that punching the expiring time opened the door to abuse.

E. S. Fassett pointed out that it was a safer rule to punch the time of arrival, as conductors know almost by instinct the time at which their cars are due to arrive on each trip at the transfer point.

At this stage of the discussion the meeting adjourned to partake of a buffet luncheon served by the Schenectady Railway Company in an adjoining room of the Benefit Association.

#### AFTERNOON SESSION

The discussion of transfers was continued when the meeting reconvened in the afternoon. E. S. Fassett suggested that the most important question relating to the use and abuse of transfers was the strict enforcement of the rules laid down by the companies.

George L. Radcliffe, Schenectady Railway Company, said that inspectors frequently checked the issuing of transfers by conductors while riding on the cars. This was the only method of checking employed in Schenectady.

J. E. Duffy, Syracuse, described the method of checking transfers used by his company. Conductors deposited all transfers collected in an envelope and dropped these envelopes in boxes at the car houses at the end of every round trip. The envelopes are collected from these boxes five or six times a day and are immediately taken to the office, where the number of transfers in the envelopes is checked against the trip sheets. No attempt is made to check the time of collection or the sequence of the serial numbers; he thought the expense of such elaborate checking was more than it was worth.

Mr. Callahan, Rochester, said that his company made a complete check of all transfers issued and collected on a different line each day. Conductors were required to pay for shortages and for transfers collected which were punched for the wrong date. Once each month transfers from all lines in the city are carefully checked to discover any serious abuse.

C. Gordon Reel, Kingston, said that his company issued only a few hundred transfers each day, and these were all carefully checked against each other.

E. S. Fassett, United Traction Company, Albany, explained the very complete method of checking transfers which is used by his company. A duplex form of transfer is used, and the conductors punch both the passenger's check and the duplex check at the same time. At the end of each half-trip conductors enclose the duplex stubs of all transfers issued on that trip in an envelope printed in red, on which are entered the beginning and ending serial

numbers. All transfers and passes collected are enclosed in an envelope printed in black, on which is marked the number of tickets enclosed. The serial numbers of the transfer pads issued to each conductor at the car houses are transmitted to the office every night. In the auditor's office two sets of girls check all transfers issued and all transfers received. The transfers are put back in their proper order, and the time, date and line are all checked. Mistakes of any kind are charged against conductors at the rate of 5 cents for each defective transfer accepted. The cost of this system to the company is about \$5,000 a year; the duplex transfers used cost 8 cents per thousand more than plain transfers. The amount collected in penalties from conductors averages between \$50 and \$60 a month. Between 7,000,000 and 8,000,000 transfers per year are audited in this manner, and the transfer traffic amounts to between 8 per cent and 18 per cent of the total number of passengers carried, depending on the time of the year. It is necessary to occasionally check the girls in the auditor's office, to make sure that they are doing their work carefully and honestly. This is done by having inspectors put out decoy transfers and having these pass through the office in the usual way. A recent test showed the efficiency of the checking system. Fourteen decoy transfers were put out in one day, and all were detected in the auditor's office, with the exception of one, which was punched with the wrong year, but with the correct day and time. He believed that the cost of the system was not excessive, considering the benefits derived. It reduced the abuse by employees to a minimum, and enabled the company to enforce strictly the rules relating to transfers, and thereby reduced to a very large extent the abuse of the transfer privilege.

#### CLAIMS—CO-OPERATION OF OPERATING AND LEGAL DEPARTMENTS

Hubbell Robinson, attorney, Schenectady Railway Company, read a short paper on this subject, which was followed by a general discussion.

F. J. Gerdon, Utica, believed that it was not within the province of the claim department to lecture trainmen or to attempt in any way to interfere in the matter of discipline. The superintendent only should deal with the men, as he is the officer who hires the men and should be the one to administer any discipline. He believed that the interference of men from the claim department who were constantly making suggestions and lecturing an unfortunate trainman who had been in an accident tended to discourage the other men.

Mr. Joyce, claim agent, Rochester Railway, believed that it would be a good thing if the claim department could occasionally instruct the superintendents and thoroughly impress upon them the necessity of teaching the trainmen to avoid accidents and the importance of obtaining names of witnesses when an accident did occur.

J. H. Pardee, J. G. White & Company, spoke of the alarming growth of accident damages paid by street railway companies, which was attracting the attention of all managers to the importance of the prevention of accidents and the work of the claim department. He believed that most trainmen had no realization of the amount paid out for damages or the difficulties under which the claim department works when witnesses to accidents have not been secured by the train crew. He believed that it would be a good plan to take a few men from among the best-known and best-liked of the trainmen and put them to work in the claim department for a long enough time to have them be-

come fully acquainted with all of its routine. These men could then go among the trainmen and impart to them some idea of the importance of preventing accidents. Coming from the ranks, the counsel and advice of these men would be respected far more than lectures delivered by representatives of the claim department, about whom the trainmen knew nothing and cared nothing.

J. E. Duffy, Syracuse, described the work of instruction carried on by Dr. Ryan, of the claim department, of his company. Two years ago the company inaugurated the practice of holding instruction classes which were in charge of Dr. Ryan. The first classes were not successful. The men evinced little interest, and felt that they were being imposed upon by being compelled to attend the classes without pay. A few months ago his company inaugurated the plan of paying employees at their regular rate of wages for attending these instruction classes. The results have been much more satisfactory, as the men seem to take more interest in the talks and to evince some desire to put the suggestions made at these meetings into effect in the course of their daily work. The speaker did not believe that it made any difference who instructed the men or who disciplined them, so long as accidents were reduced.

J. P. Maloney, Albany & Hudson Railroad, described a novel scheme which has been tried on his line for the past 18 months. The company pays its employees by check, and in the envelope each week is enclosed a brief talk on the subject of accidents and their prevention. The men at first complained that they were being insulted by the self-evident truths pointed out in these bulletins, but the plan was kept in force, and as a result the past year has been remarkably free from accidents of any kind.

George L. Radcliffe, Schenectady Railway Company, said that he believed most companies crowded the new men too hard in educating them during their period of apprenticeship. The new man cannot absorb all of the words of counsel and advice which are thrown at him by the claim agent, the superintendent, the shop instructor, and the car instructor on the same day. He believed that the place to educate the men was on the cars by means of competent, instructing trainmen; five minutes instruction on a car, in his opinion, was better than an hour of lecturing.

In closing the discussion, President Fassett suggested that it would be an excellent idea to have the superintendent and the claim agent go over every accident report each day and discuss fully the causes and possible remedies. He emphasized the need of the closest co-operation between the claim department and the operating department in every detail of their work.

Charles R. Barnes, inspector for the Public Service Commission, Second District, who was unable to be present at the morning session, when the committee reports on subjects suggested by him at the Niagara Falls meeting last July were discussed, made a few remarks before the meeting adjourned. He expressed his regret that none of the committees felt it advisable to formulate definite recommendations on the subjects which they considered. He said that the object in presenting these questions to the association for discussion was to get some views from the members which would assist the commission in deciding on recommendations concerning these matters which the commission might make as the result of formal complaints.

After a vote of thanks was passed to the Schenectady Railway Company for its hospitality in entertaining the members of the association at luncheon and in providing a meeting place, the meeting adjourned.



## NEW LEAVITT STREET CAR HOUSE OF CHICAGO RAILWAYS COMPANY

Plans were presented in the *ELECTRIC RAILWAY JOURNAL* for Aug. 29, 1908, of the new car house of the Chicago Railways Company at Twenty-fifth and Leavitt Streets. At the time of publication the car house was in the early stage of construction. Since then it has been put into service, and more complete data and illustrative matter are now available. The new building is of especial interest on account of its thorough construction and because of its arrangements for careful car maintenance.

The plan published in the issue of Aug. 29 showed the car house to contain six storage bays, with an aggregate capacity for housing 137 large double-truck cars; a repair bay with track room for five cars on one side, and a row of utility rooms facing this track. Each of the six bays extends from street to street through the block bounded by Irving Avenue, Twenty-fourth Street, Leavitt Street and Twenty-fifth Street. The over-all ground dimensions of the new car house are 303 ft. x 344 ft. 5½ in.

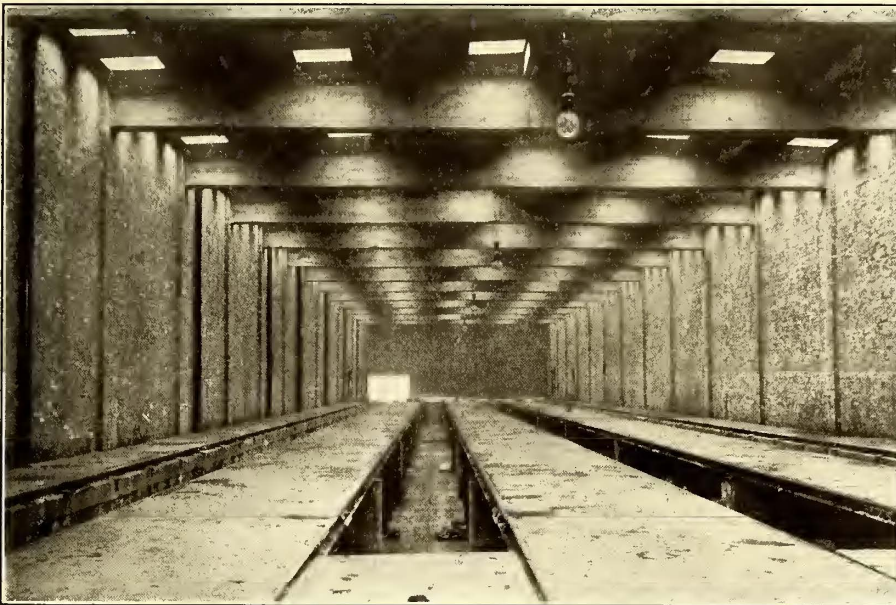
### CONSTRUCTIONAL FEATURES

Each of the storage bays has four through tracks 19½ ft. long, with pits under each track. The 25 through

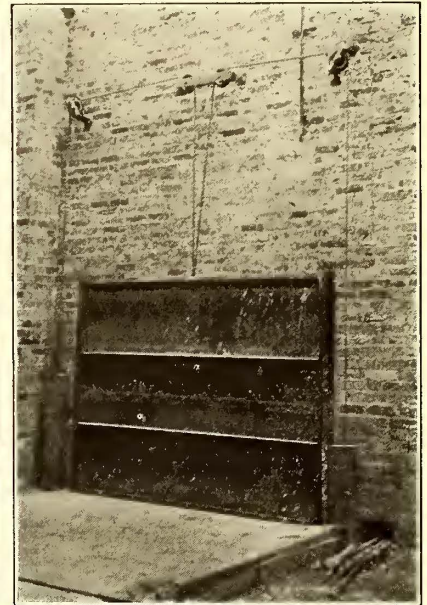
In each bay the sub-floor at the bottom of the pits is continuous under the four tracks, and the space between tracks. This sub-floor is 8 in. thick, not reinforced. The track rails and the floor between pits are supported on concrete piers and cast-iron posts spaced 6 ft. on centers. The T-section track rails are tied to the concrete piers with ¾-in. anchor bolts and to the intervening cast-iron columns with special clamps. The narrowest pits are 3 ft. 11 in. wide in the clear at posts and 5 ft. deep.

The floor between the track rails is made up of a 1:2:4 mixture of concrete, using Portland cement, coarse sand and broken stone to pass a ¾-in. ring. This floor is 6 in. thick, reinforced with ¼-in. twisted steel bars, laid 12 in. on centers both ways. The ends of the transverse bars rest on the bottom flanges of the track rails and the longitudinal bars rest on two 4-in. x 3-in. x 5/16-in. angles connecting the tops of the rail-supporting posts. The stairways at the ends of the pits are of cast iron with 9-in. treads and 9-in. risers. Each track opening at the ends of the car house is fitted with a hand-operated Kinnear rolling steel door, and all openings from bay to bay through the curtain walls are fitted with two automatic sliding fire doors controlled by fusible links.

The roofs of all the bays are of similar design, with



Leavitt Street Car House—Interior of One Storage Bay, Showing Roof Lighting



Automatic Sliding Fire Door in Partition Wall Between Bays

tracks connect at the north and south ends by curves of 37 ft. 6 in. center radius, with parallel ladder tracks leading to the main north and south street tracks on Leavitt Street. A loop track connects the west ends of the ladders so that cars may be passed entirely around the outside of the building. Each bay is 48 ft. 7½ in. wide between wall centers, and is covered by a concrete roof with reinforced concrete girders spaced 17 ft. 9 in., resting on pilasters 2 ft. 5 in. x 1 ft. 9 in. in horizontal section. The concrete roof is reinforced according to the Kahn system. All exterior walls are faced with vitrified paving brick laid in colored mortar. The walls between bays and the partition walls which sectionalize the utility bay are laid with Chicago brick. All foundations and footings below grade are of concrete, composed of one part Portland cement, three parts coarse sand and six parts broken stone to pass a ring from ½ in. to 1½ in. in size. A moderately wet mixture was used.

concrete girders supporting solid reinforced slabs carrying rows of closely spaced skylights. The top finish of the roof slab is ½ in. thick of 1:3 cement and sand, broom-finished. The following specifications were issued by the Board of Supervising Engineers for the roofing to cover the concrete slabs over the entire structure:

*Work Included:* The entire roof of the building is to be covered with roofing as hereinafter specified.

The "General Conditions," on pages 1, 2, 3, 4 and 41, apply to this work, with the exception of "Guarantee" clause. See special guarantee for this work herein contained.

Cover concrete roof slab with a five (5) ply, coal tar pitch, felt and gravel roof. The tarred felt shall be No. 1 wool felt weighing not less than fourteen (14) lb. per 100 sq. ft., single thickness.

The pitch shall be coal tar pitch, brand to be approved by the engineer in charge and there shall be used not less than two hundred (200) lb. per 100 sq. ft. of completed roof.

The gravel shall be of such a grade that no particles shall exceed five-eighths (5/8) of an inch or be less than one quarter (1/4) of an inch in size. It shall be dry and free from dust. In cold weather it must be heated immediately before using. Not less than four hundred (400) lb. of gravel shall be used per 100 sq. ft.

First coat the concrete with hot pitch mopped on uniformly. Over this coating of pitch lay two thicknesses of tarred felt, lapping each sheet seventeen (17) inches over the preceding one and mopping back with pitch, the full width of each lap.

Over felt so laid spread a uniform coating of pitch mopped on. Then

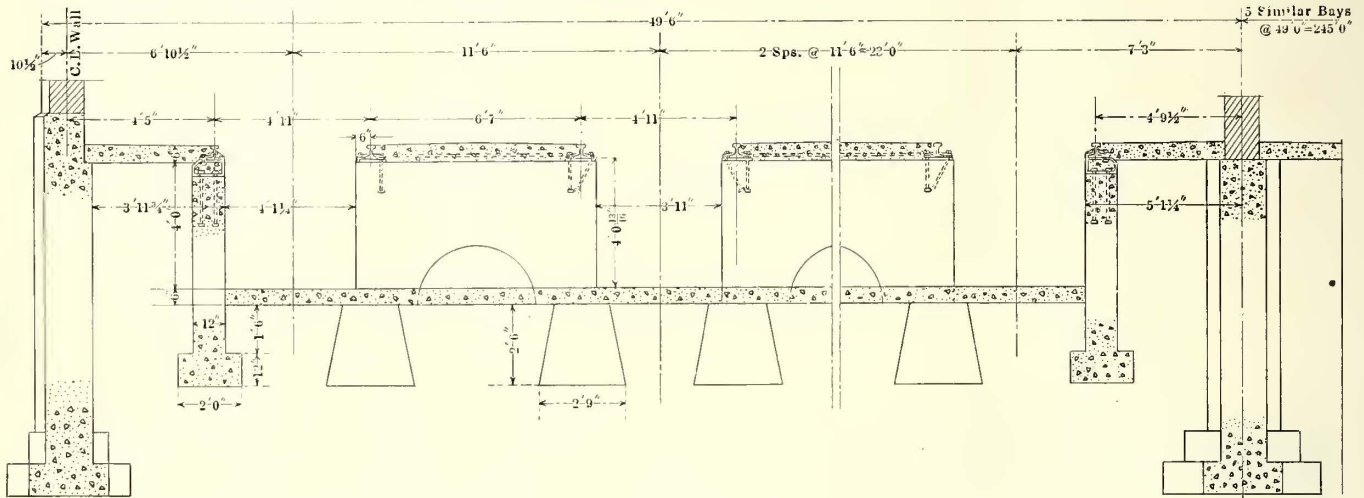
lay three (3) full thicknesses of tarred felt, lapping each sheet twenty-two (22) inches over the preceding one.

When the felt is thus laid, mop back with pitch the full width of twenty-two (22) inches under each lap. Then spread over the entire surface of a roof a uniform coating of pitch into which, while hot, embed slag or gravel. All joinings along wall to be carefully made and connected to 1 1/4-in. x 1 3/4-in. wood strips built in walls.

After three months the contractor shall recoat the entire roof as follows: Sweep up all loose gravel into piles. Coat entire surface of roof with a heavy coat of pitch and gravel of kinds specified above. This recoating shall not be done until the engineer in charge for the Chicago Railways Company has been notified. The inside surface of all parapet fire walls above roof line shall be mopped with one heavy coating of coal tar pitch, using not less than 40 lbs. per 100 sq. ft.

*Guarantee*—Give written guarantee for ten (10) years.

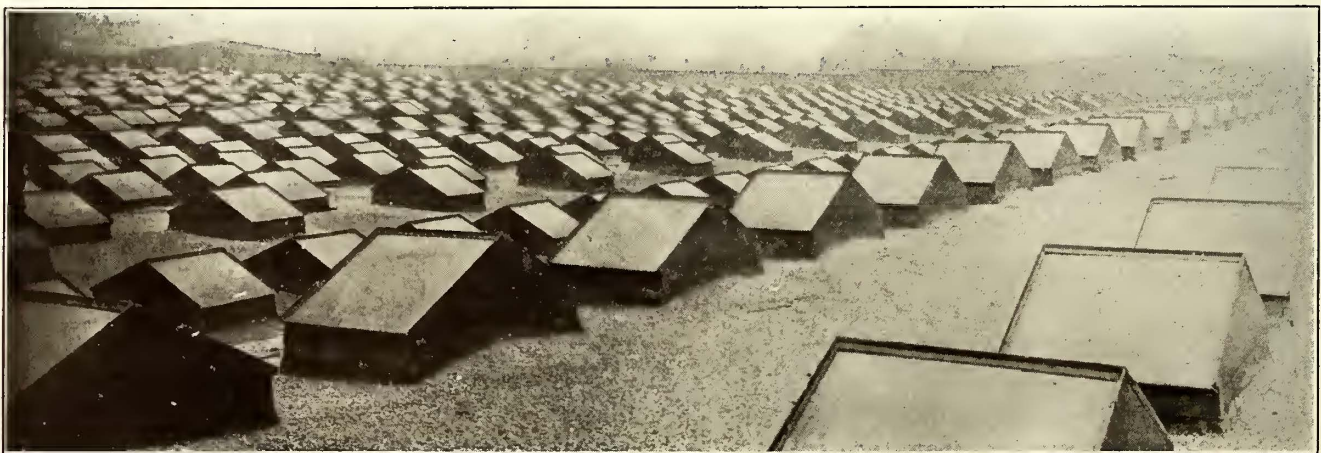
An illustration presents a view of a portion of the roof of the car house, showing the large number of small sky-



Leavitt Street Car House—Cross-Section Through Tracks in Storage Bay

lights which are used. Each skylight is built of No. 24-gage galvanized iron and 1/8-in. factory ribbed glass. The skylights are arranged in rows over the aisles between car tracks. Beneath these skylights at the level of the underside of the roof is a metal guard built of No. 15 gage galvanized wire of 3/4-in. mesh securely fastened to the concrete roof slab. Another illustration shows the appearance of the under side of the skylights with the wire

Beginning at the north end of the car house, the utility section, which is 25 ft. wide, is subdivided as follows: Receivers' and foremen's offices, trainmen's rooms, toilet room, storeroom, repair shop, in which will be placed an equipment of small tools for making light repairs, oil room and heating plant. The heating plant occupies two rooms set off from the rest of the building by full-height brick walls. Hot air for heating is distributed throughout



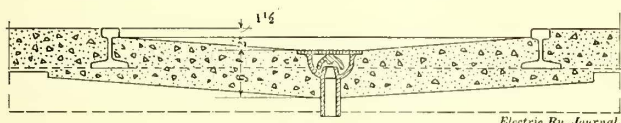
Leavitt Street Car House—View on Roof, Showing Skylights

guards in place. As first designed, the car house was to be lighted by flat skylights of wire glass, but objection to this construction was made by the fire underwriters and the present construction developed. As first designed, the skylights would have formed a barrier through which, it was thought, the firemen could not have worked properly in case of fire. As now built, the ribbed glass may easily be broken for the insertion of a fire nozzle. The wire net beneath each skylight serves to protect workmen from falling glass in case of accidental breakage.

the building by a Sturtevant fan equipment discharging into large concrete ducts under the floors. There are two fire-tube boilers for making steam, so arranged with reference to the nearby track that coal may be unloaded close to the firing doors. The steam at a low pressure is fed through heating coils arranged as baffles in the intakes of two large blower fans. Fresh air is received through two large windows in the outside wall of the building, and fans, steam coils and other blowing equipment are all provided in duplicate with the two sets separated by a sheet-steel

partition. Thus it is possible to regulate the equipments used in heating the car house and also to keep the building warm in event of trouble with one of the heating sets. The fans are belt-connected to 20-hp, 500-volt motors.

The main conduit or tunnel which carries the hot air away from the fans for distribution to the laterals under the pits extends under the repair bay floor, and is 4 ft. x 8 ft. in section. Two cross tunnels, one at either end of the pits, feed galvanized-iron distributing pipes supported under the car house floors. These cross tunnels are 8 ft. x 4 ft. in size where they connect with the main distributing tunnel under the repair bay, and taper to 2½ ft. x 4 ft. in size under the most distant tracks. At each partition wall through which these hot-air ducts pass two balanced sheet-steel fire doors are provided, arranged to be held normally above the level of the car house floor, but so adjusted that in time of fire they may be lowered easily so as positively to close the hot-air duct between the bays on the opposite sides of the door.



Leavitt Street Car House—Section Through Wash Track

The several offices for the transportation and mechanical departments are attractively trimmed in hardwood and have wooden floors. The following specifications were issued by the Board of Supervising Engineers to cover the materials used in painting:

*In General*—Although these specifications are intended to be explicit, and cover all parts to be painted, and varnished, the constructor is directed to refer to detail drawings, also to specifications for carpentry, structural iron, iron stairs and sheet metal, and inform himself fully of the character and extent of work.

Wherever wood work is not perfectly dry or smooth enough notify the engineer in charge before proceeding.

All work must be of the highest grade of its kind and to the complete satisfaction of the engineer in charge.

All iron to be cleaned free from rust before painting. Use wire brushes. The "General Conditions" on pages 1, 2, 3, 4 and 41, hereinbefore mentioned, apply to this work.

*Material*—All paint to be strictly pure white lead, pure linseed oil, pure colors ground in oil and turpentine unless otherwise specified.

Where "Standard Green" is specified, same is to be a special green paint to be approved by the engineer in charge.

Where graphite paint is called for it is to be Dixon's graphite or equal. Asphalt paint to be Western Roofing & Supply Company's black asphaltum or equal.

All colors in oil to be Sherwin-Williams Company's best colors ground in oil or equal.

Use Wheeler's wood filler or equal for all oak finish.

Varnish to be Murphy Varnish Company's best quality or equal.

Whitewash material to be Geo. Fletcher & Company's "Monarch" or other cold wash paint as approved by Board of Underwriters.

All material to be delivered at building in original sealed packages and approved by the engineer in charge, before using.

During the cold weather in London recently trains on the Wimbledon and Putney bridge section of the Metropolitan District Electric Railway were delayed in the early morning owing to the layer of ice which had accumulated on the rails. Curiously enough, none of the other exposed sections of this railway suffered in the same way. If an occurrence of this sort is anticipated it is usual to clear the rails by periodically running a steam locomotive over them fitted with special steel brushes.

On the London "tube" railways, at Dover Street and Earl's Court stations, an elevator-signaling system, electrically connected with the automatic-signaling system, has been adopted experimentally. A bell in the elevator rings on the approach of a train, and the interval before its arrival is just sufficient to enable the elevator to descend and the passengers to reach the platform. Illuminated indicators over the elevators, which are lit up five seconds before they reach the top, have also been fitted in several stations.

## LITTLE THINGS IN CONNECTION WITH OPERATION\*

BY W. A. CARSON, GENERAL MANAGER, EVANSVILLE RAILWAYS COMPANY, EVANSVILLE, IND.

The aim of every practical railway operator is to increase earnings and decrease operating expenses, and with this end in view, he should bear in mind that, saving the dimes, the dollars will take care of themselves. The subject of this paper was given me with the idea of bringing out a few of the "little things" in connection with operation, which are liable to be passed over as unimportant.

### PURCHASES

Almost any railway operator can keep his cars running and carry passengers, but to get economical results all maintenance must be carried on in a systematic manner and the dimes spent must be given as much attention as the dimes collected. Employees are apt to become imbued with the general public opinion that railway companies have unlimited means, and when anything becomes broken or inoperative for any reason, it is much easier to substitute new material than it is to make the necessary repairs even though such repairs could be made at small expense compared with the original cost. Old material should never be scrapped or new material issued without the approval of some competent department head. New material and supplies should be kept in a properly equipped and orderly storeroom and the responsibility of maintaining such storeroom centered in one employee. It should be his duty to carry in stock such materials and supplies as may be specified by the different department heads and such materials and supplies should only be issued on the approval of such department heads. Accurate records should be kept of all materials and supplies taken into the storeroom and nothing should be issued without a properly approved requisition which states to whom and for what purpose the material is issued.

Heavy materials such as rails, ties, etc., stored along the line should also be looked after and checked and record kept by the storekeeper. In this way accurate distribution of maintenance accounts is made possible. When materials are ordered in quantities such as nails, bolts, spikes, etc., for the different departments and delivered to them direct, the whole consignment is generally shipped to the point at which it is needed for immediate use. The quantity left over is usually not taken care of, but permitted to remain at that point in easy access, and it can be expected that such material will be carried away for personal use, which is a direct loss to the company. When another department is in need of the same kind of material, the stock on hand is likely to be overlooked and another order placed.

It has often been said that the maintenance of a car is no better than the shop in which the work is performed. When materials and supplies are piled promiscuously about the shops and car barns and everything is dirty and disorderly, some materials soon become buried, and it is impossible to tell just what there is on hand. When something is needed, it cannot be found, and on the assumption that the stock is exhausted another order is placed. I know of a case where a quantity of several hundred angle bars was stored in a car barn, and to get them out of the way the barn foreman moved them to an obscure part of the barn. As no one had a record of this stock, the next time the track department was in need of angle bars it was not thought of and another order placed. When the bars on this order were received and checked in the stock on hand was discovered and found to be considerably in excess of the amount needed for immediate use. I have also known of cases where material was left at stations and depots on the line and out along the track, which was discovered several months after, and orders for the same kind of material had been placed in the meantime.

Some roads think a card index of all purchases is not necessary and is too much red tape, but with a few minutes' work each day in the office a detailed record can be

\*Paper presented at Cleveland meeting of Central Electric Railway Association, March 25, 1909.

kept of the different materials and supplies purchased, showing the order number, the date the order was placed, the quantity ordered and the price and discount given. In this way differences in prices can be easily found, and a letter can be written asking for an explanation of such differences. In nine cases out of ten a credit memorandum will be forthcoming.

Local wholesale hardware companies and steam fitting supply houses from which the railway companies purchase large quantities of material have quite a schedule of discounts for the different customers, according to the quantity of material ordered. The bill clerk does not always give the best discount to which the customers are entitled, and unless the bills are closely checked, there will be a variety of prices on the same material. From personal experience with a large wholesale hardware company I have received from two to half a dozen credits a month on overcharges of this kind. I have also found this to be the case with a large number of electrical and railway supply houses. A card index record is also a good check on the consumption of the different materials. If requisitions come in more frequently than has been customary, an explanation can be requested, and perhaps some irregularity brought to light.

Employees who check material received should be required to check all shipments carefully and accurately as to weight, quantity, etc. All material and supplies, such as brake shoes, waste, bar iron, etc., which are sold on weight should be checked by weight in addition to quantity. Orders are frequently filled with greater or less quantity than is called for on order, and unless employees are required to check shipments carefully, they will mechanically report the quantity called for on the order or requisition without ever checking the shipment. Shipping clerks of the railway supply houses, under pressure of heavy business, make frequent errors which will be brought to light by a careful check of the railway company.

#### ATTENTION TO DETAILS

Department heads and principal employees should be impressed with the idea that all matters coming under their jurisdiction should have the most prompt attention. An aid to prompt execution is a loose-leaf memorandum book carried in the pocket. Notations can then be made of matters requiring attention, which will serve as reminders until such matters are finally disposed of. Employees are apt to depend too much upon their memories, and every day or so they are confronted with an inquiry as to why certain work has not been done, and the only excuse is that it was forgotten. The head of a large concern once said, "I carry the big things in my head and the details in my pocket." A man burdened with details is not as efficient as he should be, and a pocket supplement to the memory will remedy the difficulty.

#### REPORTS AND COMPLAINTS

Written daily reports should be sent to the general manager by all department heads, giving in detail all the work done by their department during the day and the number of employees engaged on such work. In this way the manager can keep in close touch with the progress of all the work and will know when the work he has requested done has been finished. These reports will also tend to encourage progress of the work that a good showing may be made.

Written and personal requests and complaints of farmers and patrons along the line should be disposed of promptly, and not be allowed to drag along until the patience of the party is worn out and he assumes an unfriendly feeling toward the company.

#### VISITS TO OTHER PROPERTIES

Managers and department heads should make frequent visits to other roads and see how the other fellow handles the various propositions. In this way they can profit by the experience of their neighbors and take advantage of all the good points in their system and apply them to their own. Almost any one can figure out a system of some kind, but to get the most up-to-date methods, experience of the man who has been up against actual conditions is the best.

#### RELATIONS WITH EMPLOYEES

The manager should leave details to assistants and clerks, thereby giving him an opportunity to be out on the line and get acquainted with the employees at work in the various departments and come in close touch with the activities of the company, talking over with the men the various phases of their duties and making them feel that he has a personal interest in them and their work. As long as an employee thinks his efforts are appreciated he will take greater interest, and it will soon become a pleasure for him to come in contact with the manager instead of having that uneasy feeling when the "old man" is around.

The desk should be kept as clear as possible from all papers, one corner of it being reserved for papers covering matters under consideration. Such papers, however, should be gone over every day, so that nothing will be buried and overlooked. All other papers should be filed. The criticism on a disorderly shop, mentioned above, might fittingly apply to a disorderly desk—that the efficiency of business transacted is no better than the condition of the desk it goes over. The latest and most modern office furniture, filing devices and office equipment should be used, so as to get the best results from the efforts put forth.

To maintain discipline among employees, violation of minor rules should never be overlooked as of no importance, as by calling attention to these minor cases infraction of more important rules and regulations will be prevented. Employees should be lectured and warned for violation of minor rules, but for more important violations they should be suspended. The plan of one of the large steam roads to post on the bulletin boards notices of suspension, giving the name of employee suspended, the length of suspension and full details as to the specific cause is an excellent one. Suspensions are not made particularly for punishment to the employees who receive them, but as a lesson and example to all the other employees, and the more publicity given the better effect it will have on the entire organization. It will also soon become a matter of pride for employees to keep their names off the bulletin. The posting of a monthly over and short list of conductors, showing the percentage of correct days, will create enthusiasm and rivalry, and greater care will be exercised in the registering of fares so as to make a good showing.

Men should not be discharged too hastily, as new men taking their places might make more serious mistakes. A man making a mistake and receiving severe discipline will not likely repeat the offense, but his efficiency to the company will be increased.

#### REPORTS ON IRREGULARITIES IN THE SERVICE

It is frequently the case that reports of irregularities of service are made by officials and others interested in the company several days after the occurrence, and it is hard to get enough definite information to place the responsibility. To encourage prompt and accurate reports of irregularities of service, violation of rules, etc., A. A. Anderson, president of our association and general manager, Indianapolis, Columbus & Southern Traction Company, has inaugurated an excellent system of small printed report blanks. These reports have blank spaces for the date, car number, train number, conductor, motorman, time of day, place and remarks, and the signature of the party making the report, and the following printed request: "Please fill out this form, reporting any irregularities of service, violation of rules, misconduct of employees or other matters requiring attention. For the good of the service. After signing, seal and hand to conductor or motorman." Each report is gummed on one end and printed in such a way that when it is folded and sealed it forms a small R.R.B. envelope addressed to Mr. Anderson's office. A supply of these reports was sent out with 1909 annual card passes. (A reproduction is shown.)

#### DUTIES OF EMPLOYEES

Before being turned in new men should receive full instructions about making out accident reports from the men subbing them. They should also be examined and approved by the head of the claim department before be-

ing allowed to begin work. The claim department should be allowed to order suspensions of employees for violation of rules pertaining to that department. Special instructions, covering accident reports, calling physicians, etc., should be printed on the employees' timetable for ready reference, together with the names, addresses and telephone numbers of all company surgeons.

All trainmen and employees whose duties bring them in touch with the public should be required to wear suitable uniforms and be neat in appearance. A few things that add greatly to the appearance of employees in uniform are gold and silver collar ornaments of the company initials, gold and silver braid around the caps and service stripes on the left coat sleeve and a special design of uniform buttons instead of the regular stereotyped motorman and conductor's buttons furnished with uniforms.

At intervals written examinations on the operating rule book should be given all employees whose duties have anything to do with the operation of trains, and all employees making grades of less than 85 per cent should be required to take another examination. Three failures to grade better than 85 per cent should be sufficient cause for dismissal. These examinations should also cover special orders which have been posted from time to time.

Conductors should stand on the ground when loading or unloading at stations, to assist ladies and children and take care of hand baggage, bundles, etc. Conductors should be required to hat-check destination of all passengers, so that people will not be overlooked who endeavor to ride beyond the point to which fare was paid. Conductors should be familiar with the special tickets and rates so as to be able to explain the features to patrons making inquiry. Both conductors and agents should be familiar with the timetables of all connecting steam roads and interurban lines, so as to be able to answer any inquiries regarding such connections.

The leaving time of all trains should be posted on a bulletin in a conspicuous place in all stations. When a car is delayed any considerable length of time for any reason the dispatcher, or some other employee closely connected with him, should notify all agents by telephone about such delays and advise them of the time that car will pass their station.

Good landing platforms should be installed and maintained at all country stops and stations to facilitate the movement of passengers in getting on and off the cars. These platforms should be arranged as near as possible on one side of the track and conductors required to keep only one rear vestibule door open, so that they can give personal attention to discharging and taking on passengers, to avoid accidents.

To enable the motorman to make accurate stops, marker posts should be installed or the ends of ties painted on the right side of track the exact distance each side of the stop, so that when the front of the car is even with the marker the rear vestibule door will be in the middle of the landing platform.

"S" and "X" whistle signs should be painted on poles at least 1000 ft. each side of stations, crossings and curves, insuring the blowing of the whistle by the motorman at the proper time and place, and also acting as a guide for old men on dark nights, heavy rains and dense fogs, as well as assisting new men in learning the road, helping their sense of location, etc.

Conductors, when flagging railroad crossings, should

look back to the rear of the car to see that no passengers are getting on or off before giving the motorman the signal to proceed. The motorman, after receiving a signal from the conductor and before starting up, should look back through the car to see that no one is getting off.

When extra trains back into sidings to clear regular trains, or when regular trains back in for any reason to clear opposing trains, after heading out of the siding and the switch thrown for the main line, the car should be backed over the switch points far enough for the motorman to see that the switch is properly set.

CONDITION OF CARS

Car men are always very ready to criticise the shop for not making car repairs promptly, but if the truth were known the reason would probably be because the attention of the shop had never been called to such defects. To bring these small defects to the attention of the shop promptly, all car men should turn in a car defect report every day, covering each car they have handled during the day, reporting the defects coming to their notice, and in case there were no defects, to mark the report O.K. These reports should be signed and dated by the shop foreman when the work is completed and forwarded to the superintendent for inspection.

All cars should be kept as clean as possible, and if car barns are maintained at one of the terminals, a clean car should be put out every trip. One hour's time is sufficient under ordinary conditions to inspect the equipment of a car, clean the windows and do such other work as may be necessary. Conductors should keep all loose papers and rubbish picked up off the floor of the car when on the road.

ORGANIZATION

To facilitate the systematic transaction of the business of the company and to avoid misunderstandings as to the duty of employees in connection with any particular matter, a written detailed organization plan defining the position and duties of the various department heads and principal employees should be issued and placed in the hands of the men and posted in a conspicuous place. It should specify what employees come under the jurisdiction of the respective departments, and the authority of the various department heads with reference to employees whose duties lap over in two or more departments. Particular mention should be made emphasizing the importance of team work and discouraging personal feeling, disputes and the disposition to shift responsibility.

There are very few roads that do not have friction between the shop and transportation departments, and unless the heads of these two departments work in harmony and keep down the criticising spirit in the men under them, a feeling will soon exist that will be detrimental to the company's interest. When one employee does something to "get back" at another, the company, but neither of the men, is the loser.

To promote a kindly feeling in the organization, it is a good idea to have periodical meetings of executive heads to discuss freely all of the work in the various departments, especially that which laps over from one department to another. Meetings of all employees in every department should be held at intervals and talks given by the management and the various department heads, and an endeavor made to have them bring up for discussion new conditions which come up from time to time; the policy of the company with reference to such matters should then be decided upon and explained. The purpose of these meetings should be the raising of efficiency and removal of complaints by infusing personality, enthusiasm, tact and a knowledge of the company's policies in the whole organization.

Violations of minor rules should be brought up and various cases cited in detail, without mentioning names, with the idea of impressing upon each employee the importance of strict observance of all rules whatsoever. Mention should also be made, without giving names, of the commendable things done by employees. This will not only encourage the particular man, but will stimulate the other employees to do praiseworthy things.

All employees should be inspired with the idea that every one connected with the company, from the general

The use of this envelope to avoid payment of postage on private matter of any kind is punishable under the U. S. postal laws by a fine of \$100.

R. R. B.

A. A. ANDERSON, GEN. MGR.,

Columbus,

Indiana.

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Car No. \_\_\_\_\_ Train No. \_\_\_\_\_  
 Conductor \_\_\_\_\_  
 Motorman \_\_\_\_\_  
 Time of day \_\_\_\_\_  
 Place \_\_\_\_\_  
 REMARKS \_\_\_\_\_  
 Name \_\_\_\_\_  
 Address \_\_\_\_\_

Please fill out this form, reporting any irregularities of service, violations of rules, misconduct of employees, dirty cars or other matters requiring attention for the good of the service.  
 A. A. ANDERSON, Gen. Mgr.

AFTER SIGNING, SEAL AND HAND TO CONDUCTOR OR MOTORMAN

Envelope Used for Transmitting Reports on Irregularities of Service

manager down to the sectionman, should be loyal and work for the common cause, the good of the company, and that those who are constantly finding fault with their duties and superiors are out of place in the organization, and will soon fall overboard. Along this line and to bring out this point more forcibly, the manager of a large interurban line had the following, a clipping from the *Philistine* printed and framed and posted in all of the offices, car barns, power houses and trainmen's rooms:

"A big business is a steamship bound for a port called Success. It takes a large force of men to operate this boat. Eternal vigilance is not only the price of liberty, but it is the price of every other good thing, including steamboating.

"To keep this steamboat moving, the captain requires the assistance of hundreds of people who have a singleness of aim—one purpose—a desire to do the right thing and the best thing in order that the ship shall move steadily, surely and safely on her course.

"Curiously enough, there are men constantly falling overboard. Those folks who fall overboard are always cautioned to keep away from dangerous places, still there are those who delight in taking risks. Those individuals who fall off and cling to floating spars, or are picked up by passing craft, usually declare that they were 'discharged.' They say the captain or the mate or their comrades had it in for them. I am inclined to think that no man was ever 'discharged' from a successful concern—he discharged himself. When a man is told to do a certain thing, and there leaps to his lips, or even his heart, the formula, 'I wasn't hired to do that,' he is standing on a greased plank that inclines toward the sea. When the plank is tilted to a proper angle, he goes to Davy Jones' locker, and nobody tilts the fatal plank but the man himself. And the way this plank is tilted is this: The man takes more interest in passing craft and what is going on on land than in doing his work on board ship. If you are on a greased plank you had better off from it, and quickly, too."

#### LOYALTY

Loyalty is the thing. A large piano manufacturing company, to impress "Loyalty" on its employees, requires every new recruit to commit to memory this preachment of Elbert Hubbard on "Loyalty":

"If you work for a man, in heaven's name work for him. If he pays you wages that supply your bread and butter, work for him, speak well of him, stand by him and stand by the institution he represents. If put to a pinch, an ounce of loyalty is worth a pound of cleverness. If you must vilify, condemn and eternally disparage, why resign your position, and when you are on the outside, damn to your heart's content. But as long as you are a part of the institution do not condemn it. If you do, you are loosening the tendrils that hold you in the institution, and the first high wind that comes along you will be uprooted and blown away, and probably you will never know why."

#### POSTERS AT THE MANILA CARNIVAL

The Manila Electric Railway Company has always taken a prominent part in the annual Manila carnival, which this year was held on Feb. 2. The carnival is an event of interest throughout the island, and many strangers visit Manila to attend the entertainments and witness the other events which take place. One of the contributions by the railway company this year was the distribution and posting of posters throughout the island, advertising the carnival. One of these is reproduced as an addition to the series of advertising posters of other electric railway companies which have been published in recent issues of this journal.



#### THE PRESERVATIVE TREATMENT OF TIMBERS USED BY ELECTRIC TRACTION COMPANIES\*

BY J. M. NELSON, FOREST SERVICE.

The preservation of structural timber from decay has been made the subject of careful study by the Forest Service for many years. It has been recognized all along that the preservative treatment of wood is distinctly a matter of dollars and cents. If it brings about a saving, it will be adopted; if it costs more than it saves, no recommendations from the Forest Service or from any other source will put it into actual practice. The questions with which we are concerned have to do with the supply of cross-ties, poles, and other timbers used by electric traction companies throughout the Middle West; with methods of prolonging their life so as to secure the greatest possible service from a given amount of timber at the least cost, and, finally, with the chance to substitute other and more abundant kinds of wood for the comparatively few species used at present for ties and poles.

It is each year becoming more difficult to secure an adequate supply of tie and pole timbers at reasonable prices, and the replacement of ties and poles, when in a few years they must be removed because of decay, is becoming ever a more and more serious problem. During the past year the supply of ties and poles may have exceeded the demand, but such a condition was purely temporary and due to the enormous curtailment of structural work brought about by the financial stringency throughout the entire country. The Forest Service reports show that in 1907 over 9,500,000 cross-ties were purchased by electric railroads operating in the United States. Nearly 4,500,000 were of white oak, cedar and chestnut, species comparatively expensive and scarce. In this same year the electric companies of the United States purchased over 900,000 poles, nearly 75 per cent of which were cedar and chestnut, both high-priced species of limited supply. Frequently these ties and poles must be transported from distant points at high freight rates.

Within a few years it will be difficult to procure sufficient quantities of these more durable and less plentiful species at any price. It is true that nearby, perhaps adjacent to your property, there may be large quantities of inferior species of timber, such as red and black oak, sycamore, hickory, beech, birch and maple. You can purchase from the pine country of the South shortleaf sap-pine ties at a price delivered less than that which you pay for white oak and chestnut. However, these woods are often classed as inferior species of timber not worth the cutting, and are usually rejected because, in their natural condition, they are neither sufficiently durable to resist decay nor hard enough to resist mechanical wear. One of these defects can be overcome entirely, and the other in part, by a chemical treatment with a wood preservative. If preserved by a suitable treatment, a red-oak tie will outlast a white-oak tie untreated, or a sap-pine pole will prove more durable than a cedar or chestnut pole untreated. Of course, in the case of ties, the element of mechanical wear must be seriously considered. However, this element of destruction is confined for the most part to railroads over which the traffic is heavy. Moreover, it is certain that a large number of ties which are abraded by the rails are previously softened by the decay of wood beneath the railbase and in the vicinity of the spikes.

To grow a white-oak tree large enough to furnish a tie requires from 40 to 50 years, while an equivalent period is necessary to furnish a chestnut pole. The life of a tie or pole as used by electric railway companies is estimated at from 8 to 12 years. In exceptional cases this life is exceeded. At least three times as many ties and poles are being consumed as are annually produced by the forest growth.

Some years ago the Forest Service realized that the decay of timber was a severe drain on the forest resources of this country, and steps were taken to combat this form of timber destruction. Studies in methods of preserving wood from decay by the application of a chemical treatment were inaugurated. Throughout this investigative work the

\*Paper read at the meeting of the Central Electric Railway Association, Cleveland, Ohio, March 25.

financial saving to the consumer has been constantly considered. Efforts have been made to devise treatments at a cost reasonable in proportion to the initial cost of timber, for it is realized that if the added initial expenditure is too great, the timber consumer will not add a new feature to the usual methods of handling timber, regardless of the ultimate final saving. Moreover, it is realized that for an innovation of this character to be a commercial success, it must yield a financial return within a reasonable period; that is, within the term of administration covered by the officials of the timber-consuming company.

At present there are operating in the United States about 60 wood-preserving plants, which furnish an output amounting to 1,250,000,000 ft. (board measure) of timber per year. Four years ago this output was but 500,000,000 ft. This

	Cedar poles		Sap pine poles	
	Cost.	Life.	Cost.	Life.
Untreated.....	\$4.00	15 years	\$2.50	5 years
Treated.....	5.50	25 years	4.00	20 years

	White oak ties		Red and black oak ties.	
	Cost.	Life.	Cost.	Life.
Untreated.....	\$0.75	8 years	\$0.45	5 years
Treated.....	1.05	20 years	0.75	15 years

increase of 300 per cent in this short period argues well for the development of this industry and for its necessity as a money-saver to the commercial world. Throughout the United States, if all the timber were treated which is subject to destruction by decay, at least \$72,000,000 would be saved annually.

It may be well to describe briefly the causes of decay and the principles of its prevention. Decay is due to the activities of low forms of plant life called fungi, which permeate through the wood structure, abstracting their food from the wood cells, and leaving the wood disintegrated and discolored. Spores, which may be described as very primitive substitutes for seed, are borne by the fungi in countless numbers. They can be seen only by the aid of a microscope, and, being carried freely by the wind, are everywhere present, ready to attack any favorable surface of wood on which they happen to alight. Some of the spores of these wood-destroying fungi find a lodging place on cut timber, which is in a receptive condition for their germination and growth. These organisms are the real agents of decay, and the success of a wood preservative is directly proportionate to its ability to render and to keep wood unfit for their germination and growth.

There are four essential conditions for the growth of a fungus: It must have the requisite amounts of food, air, moisture and heat. If any of these is lacking, or is insufficient in amount, the fungus cannot develop, and the wood will be preserved indefinitely from decay. The necessary heat is supplied by all temperate climates, and it is only in rare cases, as under water, or deep under the surface of the ground, that air can be excluded. When freshly cut wood is exposed to the elements in its natural state, the sap contains sufficient quantities of food and air for the development of the fungi. Clearly, the supply of heat and air are beyond control, but the moisture content of the wood may be reduced so low as to prevent the germination or growth of fungi, and the food supply may be poisoned.

All of the efforts to promote wood preservation are based on one or both of these lines of action. Seasoning timber, or reducing its moisture content, is the simplest method of prolonging its life, and it is efficient so long as the amount of moisture in the wood is kept below the requirements of the fungi; but moisture will eventually be reabsorbed from the atmosphere or from the soil, and the old conditions partially or completely restored. A thorough seasoning of the timber is of the first importance for several reasons. It increases its durability, adds greatly to its strength, decreases its weight, and hence the freight charges for transportation. Most important of all, seasoning renders the wood more porous and in better condition for the reception of a preservative fluid such as will be described. Considered by itself, the seasoning of a railroad tie or a pole would more than pay for its cost, which, in most cases, merely represents the interest on the money invested in the timber for the time required by the seasoning process. Sometimes an extra handling is necessitated, but in almost every case the saving in freight will more than pay for

the cost of seasoning, irrespective of all other advantages; but, as has been said, if timber be merely seasoned, moisture will be excluded only temporarily. It will be reabsorbed when the timber is brought in contact with damp soil or air. The only permanent way to prevent the development of wood-destroying fungi is to poison their food supply. This is done by injecting antiseptic substances into the wood and so changing the organic matter from food suitable for fungi into powerful fungicides.

Of the many antiseptics which at one time or another have been proposed for the preservation of timber, two general classes may be made: (1) Antiseptic salts of various substances, such as zinc chloride, corrosive sublimate and copper sulphate; and (2) antiseptic oils, of which creosote, or dead oil of coal tar, is most generally used.

Copper sulphate has fallen into almost total disuse for preservative purposes in this country, and corrosive sublimate is used only to a very slight extent. The most common preservatives in general use are zinc chloride and creosote. Each has its advantages and disadvantages. Both are excellent antiseptics. It may be said, however, that the principal value of zinc chloride may be found in its cheapness and its ease of transportation, for it can be hauled in the form of a solid and dissolved at the treating plant. The principal defect of zinc chloride is its liability to leach out of the timber when exposed to moisture, either in the soil or in the atmosphere. It readily dissolves in water, indeed, it is injected into the timber in the form of an aqueous solution, and so its subsequent leaching out is merely a question of time, and the wood is left once more subject to attack. Its use, therefore, is limited to the more arid regions of the United States. Creosote, on the other hand, is practically insoluble in water, and so, when a high grade of oil is used and injected into the timber, decay will be postponed almost indefinitely. Its principal disadvantages are its higher first cost, as compared with zinc chloride, and its limited supply. But, for the treatment of timber for many structural purposes, there is no other preservative which gives good promise of replacing it. The thing to do, therefore, is so to use it as to insure the greatest returns from the expenditure of a given amount of money. It is along these lines that the principal activities of the Forest Service have been exerted.

Methods of applying a chemical treatment in this country might be divided into two classes, those in which the preser-

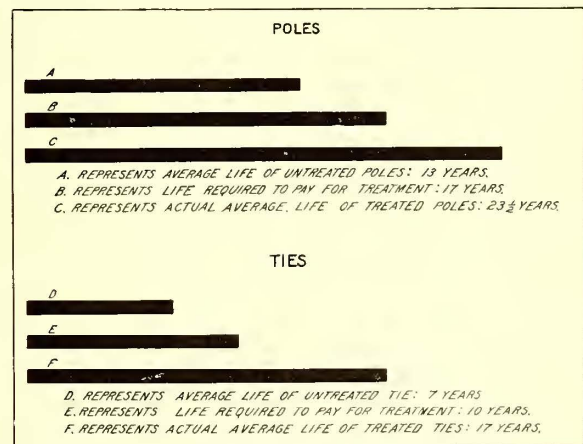
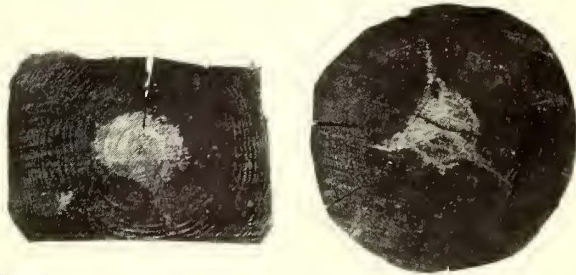


Diagram of Life of Treated and Untreated Poles and Ties

ative is injected by artificial pressure, and those in which the atmospheric pressure is made to force the preservative into the timber. The non-pressure or open-tank process, as it is sometimes called, is much the simpler and less expensive, but not so well suited for the treatment of a variety of species and forms of timber. When timber is to be creosoted under the usual pressure method, or Bethell process, as it is called, it is placed on iron trucks and hauled by cables into large steel cylinders capable of withstanding high pressure. The doors are closed, and the timber is subjected to a bath of live steam for several hours. This is followed by a vacuum, and finally the cylinder is filled with creosote, the force pumps are started, and continued until the desired amount of oil has been forced into the

timber. The surplus oil is then run out, the doors opened, and the treatment is complete. Thus the treatment is divided into three subsidiary processes: First, the steam bath; second, the vacuum, and third, the injection of the preservative under pressure. It remained to be found whether all of these processes were essential to a proper treatment, or whether they could be replaced by simple and cheaper methods. I have not time to trace the steps, or to recount the experiments which were made in this effort. The results were that air-seasoning was found to be more satisfactory in most cases than the bath of live steam, and that the vacuum could often be dispensed with altogether. There remained merely the question of pressure. Allowing the



Section of Loblolly Pine Tie Creosoted by Non-Pressure Process

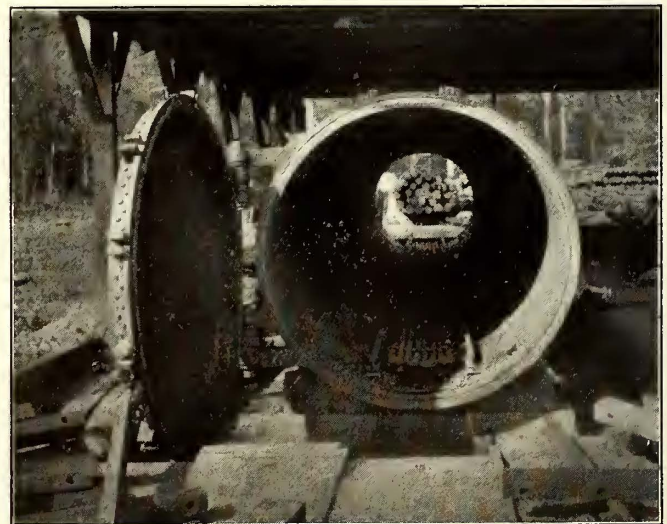
Section of Loblolly Pine Telephone Pole Creosoted by Non-Pressure Process

oil to seep into the wood without pressure of any kind was slow and unsatisfactory; and yet the old artificial pressure required expensive plants and machinery. A happy solution was found by making atmospheric pressure take the place of force pumps. To Dr. Charles A. Seely, of New York, is due the credit for having introduced this principle of treatment into America in 1867. His application of the method has been improved by the Forest Service and adapted to wide conditions. During the process of air-seasoning much of the moisture in the wood cells is evaporated and its place is taken by air. The wood structure becomes more porous and more easily penetrated. Having reached, or closely approached, an air-dry condition, the wood is placed in a bath of hot oil or other preservative. This application of heat causes the air in the wood structure to expand, and much of it is expelled. Some of the moisture remaining in the wood is also evaporated and escapes. After a time the hot liquid is run out of the treating tank and cooler oil admitted; or else the timber is removed from the hot bath and quickly plunged into one of lower temperature; or, by a third method, the heat may be shut off and the timber allowed to remain in the oil as it cools. This quickly causes a contraction of air and a condensation of moisture to take place within the timber; a partial vacuum is consequently created, and the preservative is forced into the timber under atmospheric pressure.

The preservative process best suited for the treatment of poles and ties by electric traction companies depends upon the form and species of timber handled and the proportion of sapwood it contains. A porous wood, such as sap pine or red oak, is more easily impregnated with a preservative than is a dense species, such as white oak or chestnut. A less expensive non-pressure treatment, therefore, is more suitable for the treatment of these porous woods. Moreover, sapwood is more easily treated than heartwood. When the timber to be treated is round, in the form of a pole or post, there is always a well-defined band of porous sapwood encircling and enclosing the interior dense heartwood. The presence of the surrounding sapwood insures a satisfactory and an even penetration of the preservative fluid applied by either method of treatment, inasmuch as the sapwood of almost any species of timber may be penetrated without the application of artificial pressure. However, when the timber to be treated is partly square or rectangular, as a railroad tie, both sapwood and heartwood surfaces may be exposed. As a rule, this dense heartwood can be treated more thoroughly by the application of artificial pressure. When treated, the sapwood surfaces of the tie may be thoroughly impregnated, while the heartwood surfaces are barely penetrated with the preservative liquid. The side of the tie on which the rails

rest and into which the spikes are driven is usually heartwood, and it is here that a preservative treatment is most desired. Moisture collects beneath the base of the rail and around the spikes, forming an excellent opportunity for the development of decay. If such a tie is not treated uniformly on all sides, the money invested in the treatment of the sap portions may be a partial loss. Some species of wood contain a much larger proportion of sapwood than do others. For instance, loblolly pine and cottonwood contain a great deal of sapwood, while white oak and chestnut contain a very small proportion. In consequence, a non-pressure method of application may be suitable for the treatment of the former species and not desirable for the treatment of the latter. Numerous variations in the kind and form of timber should influence the consumer in selecting a method of treatment. It is important to study the specific timber problem before any definite form of treatment is selected and a specific type of plant is constructed.

For the treatment of poles in this locality, a non-pressure form of treatment is usually the best. The poles are usually a durable species, chestnut or cedar, which decay for the most part at the ground line, where air and moisture conditions favor the development of fungi and subsequent decay. It is not economical, of course, to apply a preservative to the top of a pole which, without treatment, is sufficiently durable to give satisfactory service. The butt of the pole, or that part of its length extending from its butt end to about 1 ft. above the ground line, it is of primary importance to protect. For a partial treatment such as this, the necessary apparatus is an open iron tank about 8 ft. deep, fitted with steam coils arranged along the bottom or sides, together with a tank for the storage of the preservative, and a boiler for generating steam. If the amount of timber warrants the additional expense, the treatment can be hastened and cheapened by adding an underground receiving tank for holding the heated oil used in the first bath, a pump to convey the liquid from the receiving to the storage tank, and a steam hoist for convenient loading and unloading. By the pressure-cylinder method it is necessary to treat the entire pole instead of 5 ft. or 6 ft. at the butt, and to inject just as much preservative in the naturally durable top as in the danger zone near the ground line. The saving in the preservative brought about by the treat-



Treating Cylinder of Non-Pressure Plant at Winnfield, La.

ment of 5 ft. or 6 ft. of the whole length, instead of 30 ft., is readily apparent.

An open-tank plant for the butt treatment of 150 poles daily can be constructed for about \$2,000, while a non-pressure plant equipped with a closed cylindrical treating tank for the treatment of the entire length of these poles would cost about \$10,000.

For the treatment of ties, a closed cylindrical treating tank is preferable, although a non-pressure method of application may be adopted. A non-pressure plant for the treatment of 350 seasoned ties per day of 12 hr. can be completely installed for about \$5,000 to \$7,000.

During the past year the Forest Service supervised the



design and installation of three non-pressure plants for the treatment of seasoned loblolly pine. Both ties and poles of this species have been successfully treated at a minimum expense. In addition, round timbers of long-leaf pine, pitch pine and red oak have been satisfactorily impregnated. The above timbers are either species most easily treated or in a form most suitable for treatment, factors which decidedly favor the employment of a non-pressure process.

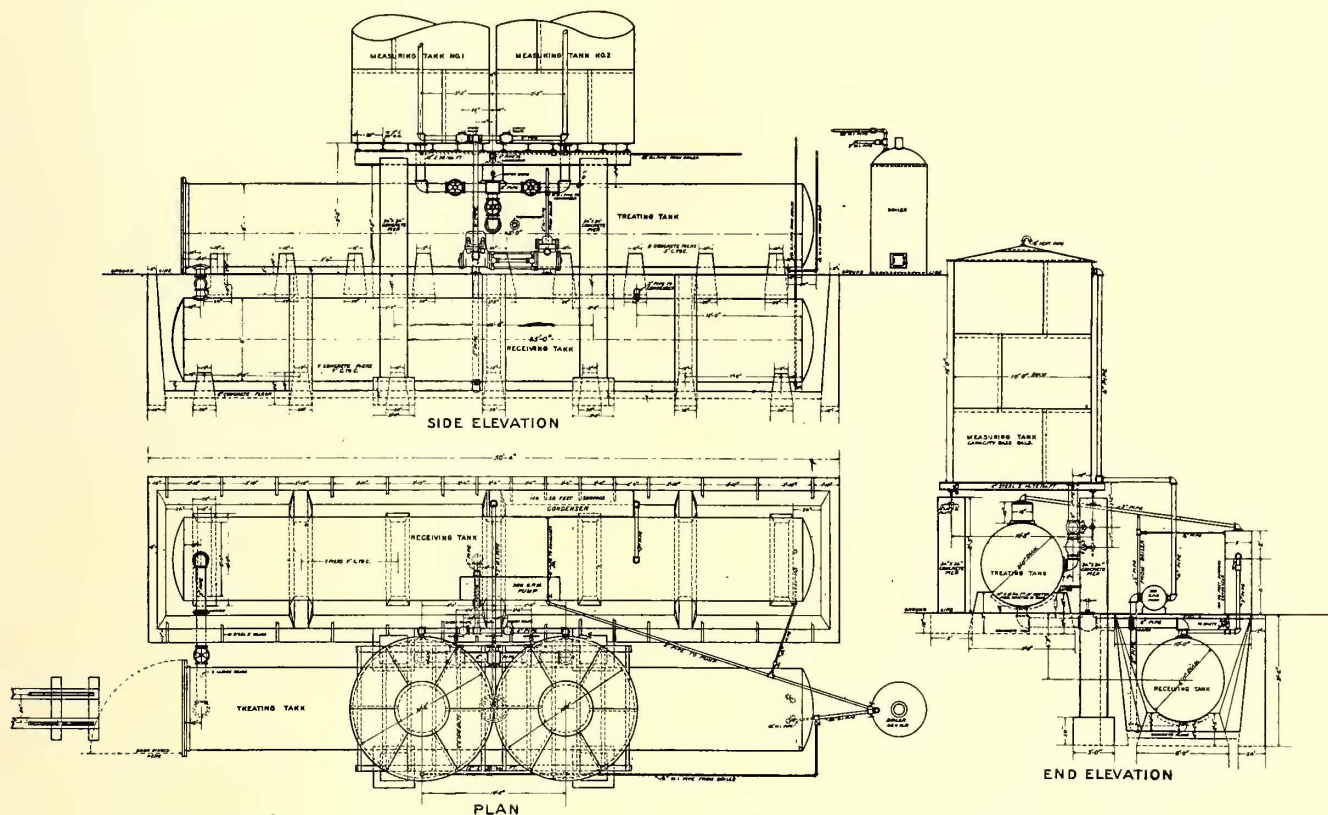
There is perhaps a field for a type of plant combining the better features of both the pressure and non-pressure designs. That is a plant of relatively light and inexpensive construction, but of sufficient strength to stand a low pressure. In operating such a plant a limited amount of artificial pressure, about 70 lb., can be applied to assist the atmospheric pressure in forcing the preservative into the wood. Under such conditions the fundamentals of a distinct non-pressure treatment, namely, the successive hot and cold baths, would be practised, but the absorption obtained by a sudden change in temperature would be assisted by artificial pressure.

Of course, if an electric traction company wished to treat large numbers of railroad ties of hard, dense species,

is, for 25 cents or 30 cents, a preservative treatment may be applied, which will render the red-oak or sap-pine tie twice as durable as the white-oak or longleaf-pine tie untreated. Although the white oak and longleaf pine can be treated with profit, larger returns can be realized from the use of a plentiful and cheap species, made serviceable by protection from decay. The labor cost for placing and replacing ties should be considered in connection with the value of the timber; perhaps 8 cents to place a tie in the track and 15 cents to replace it with a new tie.

The life of a red-oak tie untreated is not more than five years, and in the track it is worth at least 55 cents or 60 cents. At an added cost of 50 per cent for treatment, its life will be increased 200 per cent, and the maintenance charges for renewing ties will be correspondingly reduced. In some instances, where softwood ties are used, it may be necessary to protect them from mechanical wear by the use of tie-plates. However, where the traffic is relatively light, in comparison with steam railroads, as is the case with many electric traction systems, the use of tie-plates need not be seriously considered in connection with the treated tie.

Satisfactory tie-plates cost 25 cents per tie; however, if



Wood-Preserving Plant Designed by the Forest Service for the Indianapolis, Columbus & Southern

a plant of the pressure type is most suitable. A pressure plant of sufficient capacity to treat 500,000 ties annually would probably cost about \$75,000.

The Forest Service does not favor any particular preservative process, nor any specific type of plant, but recommends to the timber consumer the most economic method for preserving the particular timbers which he handles. Recently the impression has been created that the non-pressure processes are designed to replace the older and more firmly established pressure processes for all timbers and for all conditions. Nothing could be less correct. The open-tank or non-pressure process is distinctly a process for the consumer of certain species and special forms of timber, and is nothing more than a natural development of the old pressure system, made necessary by the need for a simple and less expensive method for the small user or for the cheaper classes of timber.

The financial saving to be derived from the treatment of ties and poles will now be considered briefly. A red-oak tie or a sap-pine tie can probably be purchased for 50 cents, while a white oak, chestnut or heart longleaf-pine tie may cost 75 cents or 80 cents. For this difference in price, that

a softwood tie is both treated and plated, its cost is not increased more than 100 per cent, and its life will be increased at least 200 per cent. Such a tie will cost probably \$1 in the track. In the near future the certain rise in price of high-class timbers will make the price of a white oak tie hardly less than this amount. Moreover, within a few years the supply of white oak will be almost exhausted, regardless of price. The railroads must then concern themselves with species of timber which they can obtain in sufficient quantities at reasonable prices. The available tie timbers will certainly be those possessing less durable qualities. If used with economy they must be preserved from decay, and possibly from mechanical wear. A sudden transition from the use of hard, durable woods to those which decay rapidly will be impractical. A gradual substitution of the inferior grades of timber preserved from decay by a chemical treatment is entirely feasible and economical.

The future supply of poles is also of concern to electric railway companies. Assuming that a standard 30-ft. pole of cedar or chestnut costs \$4 or \$5, with the added cost of labor it may be worth \$7 in position. Its average life,

untreated, is but 10 to 12 years. It may be treated with creosote at the butt (where decay is more prevalent) for \$1. Treated, it will last 20 or 25 years—that is, at an added initial expenditure of 15 per cent the pole may be increased in life 100 per cent, with a corresponding saving in expense for timber and labor.

For railroads favorably situated in respect to the Southern pine regions, and where freight rates are consistent with economy, the use of shortleaf (sap) pine for ties and poles is urgently recommended. This species of timber is comparatively cheap and plentiful. It seasons rapidly, and by drying it before shipment a saving in freight of 30 per cent may be effected. It can be easily and thoroughly impregnated with a wood preservative, and when so treated will render far more efficient service than a chestnut or cedar pole or tie untreated. It is fairly soft wood, and under heavy traffic should be protected from rail abrasions. It furnishes an ideal pole, straight and strong, but decays rapidly, and must be protected by a preservative treatment. It is preferable to treat the entire length of a sap-pine pole at a cost of \$1.50. In regions of growth a sap-pine tie may be purchased for 20 cents or 25 cents, and a 30-ft. pine pole for not more than \$1.50. Even with the added cost of freight charges for transportation to the point of consumption, it frequently pays the consumer to use this species of timber on account of its comparatively abundant supply.

There are several other forms of timber which electric traction companies can profitably treat. Pine cross-arms may be preserved almost indefinitely by a treatment with creosote, as well as wooden conduit for carrying wires underground. The joists and foundation timbers of car barns, freight houses and passenger stations frequently decay, while car sills are worthy of consideration. The thousands of posts used to fence the right of way, as well as signal posts and bridge timbers, should certainly be treated where possible, as should all forms of piling.

A less efficient but cheaper treatment can be secured by painting the surface of poles with at least two coats of hot creosote, or some similar preservative. If care is taken to thoroughly fill the innumerable small checks and other defects on the surface of the wood, a thin antiseptic zone may be created around the timber at the ground line, which, as long as it remains intact, will successfully prevent the entrance of wood-destroying fungi. It is especially important in this method that the timber be thoroughly air dry before treatment, otherwise the evaporation of water from the interior of the stick will cause checks to open up and so expose the unprotected wood to fungus attack. Even if this precaution is taken, however, a slight abrasion, such as might easily occur in the hauling or setting, or even after the pole has been placed in permanent position, will permit the entrance of the fungi and the destruction of the pole. Principally for these reasons this process cannot be recommended where a more thorough treatment is possible. It can often be used to good advantage, however, where the amount of timber to be treated is too small to justify the erection of even a small treating plant.

The treatment of railroad ties by painting the surface of the wood should not be considered. Ever so small amount of wear beneath the rails would expose untreated wood to decay. A tie, more than any other form of timber, must be penetrated by the preservative fluid to a reasonable depth if the treatment is to have any permanent value.

Wood preservation is not a merely visionary plan for conserving the forest wealth of the country. This it does, unquestionably, and if it were to be adopted universally—that is, if all the timber were treated which should be treated and which can be treated with a financial profit to the user—the estimated saving to the national forest resources would be approximately 5,000,000,000 ft., board measure, or about 10 per cent of the total number cut. But, in addition, wood preservation is distinctly practical. A theory of wood preservation, a new process, a new preservative or type of plant cannot survive, and should not survive, unless it will bring a financial profit to the user. It is the settled policy of the Forest Service, in its work in wood preservation, to carry on its more purely investigative work in the laboratory or at the more favorable field plants, and then to put the results to a practical test under such conditions as exist in ordinary commercial

practice. The object of its investigations is, of course, to encourage the wider adoption of preservative methods, and it is realized that this can best be done by simplifying and cheapening the processes already in use, as well as by devising new ones, and in increasing their efficiency. Where it is believed that the results of its work will be of wide application the service often assists individual companies in deciding whether or not a timber-treating policy is practicable for their own conditions, and if it is, in selecting the most suitable preservative and process, and in designing the most efficient plant; and, finally, in supervising its preliminary operation until the details of the process have been adapted to the particular conditions of the co-operating company and until the local force is competent to continue the work independently.

The Forest Service will be glad to assist the electric railways in every possible way in the solution of their timber problems, and to place at their disposal whatever information and experience it has acquired.

### CLEVELAND MEETING OF THE CENTRAL ELECTRIC RAILWAY ASSOCIATION

A most successful meeting of the Central Electric Railway Association was held at Cleveland on March 25. A. A. Anderson, the newly elected president of the association, presided. The attendance was especially large and also was representative of the extensive interurban territory covered by this association. Members attended from cities as widely separated as Connellsville, Pa.; Jackson, Mich.; Michigan City and Evansville, Ind.; Louisville and Lexington, Ky.; Cincinnati, Ohio, and Wheeling, W. Va. In all 96 railway men, 25 visitors and 18 supply men registered. Special and private convention cars from Ft. Wayne and Anderson, Ind.; Louisville, Ky., and Dayton, Ohio, were a source of considerable comment by Cleveland newspapers and observers. The cars were exhibited during the day in the Cleveland public square. The "Dixie Flyer" of the Indianapolis & Louisville Traction Company made the longest trip. The scheduled running time of the car for the 508-mile trip from Louisville, Ky., to Cleveland, Ohio, was 18 hours. The car brought to the convention 57 railway men and guests. The private car "Martha" of the Indiana Union Traction Company made the run from Anderson, Ind., to Cleveland, 355 miles, in 11 hours and carried 20 guests. The private car "Lawton" of the Ft. Wayne & Wabash Valley Traction Company ran from Ft. Wayne, Ind., to Cleveland, 267 miles, in 9 hours and 30 minutes, carrying 25 in its party and a special car of the Dayton & Troy Electric Railway carried a party of 25 from Dayton to Cleveland in 10 hours and 15 minutes. All cars were routed to Cleveland by way of Toledo and thence by the Lake Shore Electric Railway to Norwalk and by the Lake Shore or the Cleveland, Southwestern & Columbus to Cleveland. Returning, some of the cars went by way of Mansfield and Columbus, Ohio, over the lines of the Cleveland, Southwestern & Columbus and the Columbus, Delaware & Marion. While en route home the special parties were entertained at the Mansfield works of the Ohio Brass Company.

President Anderson in his opening address urged the member companies to give attention to the following three subjects: (1) Standardization of equipment; (2) readjustment of rates for handling United States mail, and (3) encouragement of long-distance travel. The long special trips made to the Cleveland convention were held as examples of what might be done by the proper provision of more extended limited service between the populous terminals of the high-speed interurban lines. Likewise through freight traffic should be solicited for long runs.

Patient, persistent and concerted work would serve greatly to improve the long-distance business.

President Anderson expressed his sincere thanks to the association for electing him president at the Indianapolis meeting. The next meeting was announced for June 3 at Ft. Wayne, Ind. President Anderson extended an invitation of the G. C. Kuhlman Car Company offering the members and guests of the association an opportunity to visit its plant at Collingwood, near Cleveland, and inspect the following cars now in process of construction: Aurora, Engin & Chicago, five; Rochester Railway, four; Rochester, Syracuse & Eastern, two; Chicago, Lake Shore & South Bend, ten. Through the courtesy of the Municipal Traction Company a special car was provided for this trip.

After the reading of the minutes of the last meeting by A. L. Neereamer, secretary, a paper on "Little Things in Connection with Operation" was presented by W. A. Carson, general manager, Evansville Railway Company, Evansville, Ind. This paper will be found on page 625 in this issue.

#### DISCUSSION ON OPERATING METHODS

The discussion of Mr. Carson's paper largely related to methods of discipline. President Anderson, in inviting discussion, called attention to a possible inconsistency in discipline methods brought about in the suspension of men for non-observance of rules. When a motorman or conductor is penalized by suspension his case is immediately brought to the attention of his comrades, who know that he is being punished and make every effort to learn the reason therefor, but on the contrary, when an employee is commended his name is not given public mention. Mr. Carson said that he would recommend the posting of names only when a man had been disciplined by suspension.

C. D. Emmons, general manager, Ft. Wayne & Wabash Valley, briefly described the merit and demerit system used on his road. A detailed description of this discipline system was presented in the *ELECTRIC RAILWAY JOURNAL* for May 30, 1908, page 904. Basing his opinion on experience with both the merit system and suspension system of discipline, Mr. Emmons did not favor suspension. It took away from a man his means of obtaining a livelihood and support for his family. Weekly meetings of the discipline committee on the Ft. Wayne & Wabash Valley serve to sustain the interest in the merit system and the make-up of this committee gave the men every assurance that its decisions would be impartial. Before disciplining a man the committee gave him one week in which to present his side of the case and then if he was to be disciplined the public notice presented on the bulletin board was impersonal as follows: "A motorman has been given 50 demerits for \* \* \* ." After the publication of such an impersonal notice the trainmen were curious to learn who had been penalized and the moral effect of the giving of demerits was good. The public would report infractions of rules more freely when it was known that the penalization of a man for infraction of rules would not mean the loss of his wages and hardship for his family. For these reasons Mr. Emmons did not favor suspension.

Frank Hardy, superintendent, Ft. Wayne & Wabash Valley, described more in detail the merit and demerit system on that road. He believed that this method of disciplining men encouraged them to follow more closely the details of operation. Rivalry for a prize of \$25 given each six months by the company, the awarding of which is based on discipline records, sustained the interest in the system. The merit board of the company comprises the general

manager, superintendent of transportation and a division superintendent. One hundred demerits are sufficient to cause dismissal. At meetings of this board the superintendent is not permitted to make the first suggestion of the number of merits or demerits which he believes should be given the man whose case is being discussed. The name of the employee whose case is before the board is not divulged until after the board has passed its judgment on the case. After dismissal according to the merit system a man may be re-employed on the approval of the board, but not reinstated.

Charles L. Henry, president, Indianapolis & Cincinnati Traction Company, said that he agreed with Mr. Emmons in opposing the principle of suspension. Mr. Henry did not think that a discharged employee should be re-employed unless he had been discharged with the specific statement that he might be re-employed. Mr. Henry did not approve of re-employing a man elsewhere on the road when he had been discharged by the transportation department.

Mr. Carson, author of the paper under discussion, said that in his early experience on an Indiana road he had found the merit system to fail and so it had been abolished on that road. It since had been shown that suspension methods gave better discipline.

T. R. Cummins, engineer of maintenance of way and traffic manager, Chicago, Lake Shore & South Bend, briefly described the modified Brown system of book suspension used on that road. When a man is penalized a notice similar to the following is posted: "A motorman has been given five days for running through a switch." After the posting of this notice the other men show unusual interest in finding out who has been given the suspension. It should be remembered that a man so suspended is not relieved from work, but his suspension appears on his individual record kept in the general manager's office, to which no other trainman may have access. A total of three months' book suspension brings discharge. Book suspensions may be removed by good behavior.

C. C. Reynolds, general manager, Terre Haute, Indianapolis & Eastern, did not agree with those who favored the merit and demerit methods of discipline. Mr. Reynolds said that he preferred reprimanding, suspending or dismissing men according to the nature of their disobedience. The infliction of discipline in any one of these cases should, however, be tempered with kindness. Mr. Reynolds had had six or seven years' experience on a steam road using the merit system and this experience had shown him many of its defects.

J. W. Brown, superintendent, West Penn Railways, asked for a discussion on how much the wishes of the claim department should influence a decision regarding the dismissal of an employee for disobedience. Mr. Brown himself believed that the claim and transportation departments should be fully divorced in such a situation.

President Anderson asked E. C. Carpenter, claim adjuster, Indiana Union Traction Company, whether in his judgment a trainman whose acts had brought about an accident should be discharged or allowed to remain in service until after the case had been tried. Mr. Carpenter did not recommend the retention of employees in such instances and thought that suspension or dismissal in the case of clear liability was more proper. However, before discharging the employee a clear statement should be obtained from him so worded that it would be accepted by the court. Discharged employees' testimony was thought

in such a situation to have more weight with a jury than if the same testimony were to be given by an employee retained for trial purposes only. Notwithstanding this fact, however, no definite rule should be followed with regard to retaining or discharging employees having to do with accidents which resulted in clear liability cases.

F. D. Carpenter, general manager, Western Ohio Railway, agreed with the previous speaker that each case should be judged on its merits, but if it was determined that an employee had clearly been to blame for a serious accident he should be dismissed without regard to the effect that it might have on the adjustment of claims.

Mr. Carpenter called attention to the fact that the increasing intelligence of men in the transportation department required that the companies continually improve their methods of supervision and discipline. When a man was discharged the necessity for his dismissal should be impressed upon him firmly. The reasons for discharge should be stated clearly and the company's representative, whether it be the superintendent of transportation or the general manager, should handle the case in a fair, but not weak manner. Mr. Carpenter urged that attention be given toward making the men feel that discipline was absolutely necessary for the protection of the public and was not inflicted for any other reason. If the records of a man justified it Mr. Carpenter after dismissing him would gladly assist him to a position on another road.

Mr. Broomhall, attorney, Dayton & Troy Electric Railway, was invited to present the ideas of the legal department regarding the dismissal of employees after accidents. Mr. Broomhall said that there should be first a searching investigation to find out the exact truth regarding the circumstances attendant upon the accident. As a part of this investigation the employees at fault should be examined carefully; then the action of the company should be based upon the facts. With the situation thus clearly outlined the general manager should be called upon to decide whether or not the good of the service demanded the dismissal of the employee.

C. N. Wilcoxon, general manager, Cleveland, Southwestern & Columbus, had had experience with the several discipline systems discussed and was satisfied with none of them. He was opposed to suspension and discharge if he could learn of any other way to obtain equally good results and to protect his patrons and employees. It was not a pleasant duty to discharge a man or to suspend him and thus work a hardship on his family, but the management should do what was necessary to protect the public and the property. The latter duty was the more important. From his observation of successful men Mr. Wilcoxon was led to believe that the best way was to use reasonableness in reprimanding employees, kindness in judging all cases and then discharge men if absolutely necessary. Discipline on any road would be weakened if the men felt that after discharge they might be taken back.

Mr. Wilcoxon did not favor an organization in which any one man had absolute authority. It was his policy to let the men know that if the decisions of the superintendents were thought unfair an appeal might be made to the general manager, and from his decision an appeal in turn might be taken to the president. He did not think that this plan would handicap the work of the superintendent who hired and discharged men only on the approval of the general manager.

C. L. Henry, recognizing that it was very difficult to know and understand human nature and that careless acts

might be made by men with previously clear records, thought that department heads should always meet the employees half-way and give them opportunity to state their views. Mr. Henry approved the plan of keeping accurate records of employees' service to assist in passing judgment, so that decisions might be based not alone on immediate acts, but also on past records. Attention was called to the fact that superintendents usually have a great deal of sympathy for the men and are inclined to temper their statement of the circumstances to the general manager if possibly the men are to be discharged.

#### PRESERVATIVE TREATMENT OF TIMBERS

J. N. Nelson, Jr., forestry division, United States Department of Agriculture, Washington, D. C., presented a carefully prepared description of methods proper for preserving timber used by railway companies. This paper will be found on page 628 in this issue.

When questioned regarding the treatment of cypress timber Mr. Nelson said that cypress was naturally so durable that treatment was not recommended. It was far more profitable to treat cheaper woods.

The investigations of the forestry department had not shown any change in the durability of woods when transferred from one locality to another. Brush treatment, which cost 30 cents or 40 cents per pole and added but two years' life to chestnut, was not recommended because the labor cost was higher than for tank treatment. The tank treatment also would increase the usefulness of the wood for a longer period. Mr. Nelson stated that creosoted wood if properly drained will not be more inflammable than ordinary seasoned timber. There are now 20 or 30 commercial plants for preserving timber and all of them are busy most of the time.

W. G. Irwin, vice-president, Indianapolis, Columbus & Southern, stated that his company would have in operation in 30 days a plant for the treatment of the timber used in the maintenance and construction work on its road and that he would be glad to have members of the association visit the plant so that they might see it in operation.

#### ASSOCIATION AFFAIRS

S. D. Hutchins, Westinghouse Traction Brake Company, chairman of the Supply Men's Auxiliary Association, explained the regulations with regard to membership, attendance at meetings and the display of the association badge. The use of the badge was regulated by the organization agreement between the Supply Men's Association and the Central Electric Railway Association.

H. A. Nicholl called attention to the value of associate membership in the American Street & Interurban Railway Association. Mr. Nicholl's remarks were endorsed by E. M. Williams, of the Sherwin-Williams Company, a member of the executive committee of the American Street & Interurban Railway Manufacturers' Association.

#### LOOSE-LEAF FILING SYSTEM

R. N. Hemming, assistant superintendent, Ohio & Southern Traction Company, presented a discussion on his proposed method for the loose-leaf filing of information contained in current periodicals and catalogs. An abstract of Mr. Hemming's paper appeared in the ELECTRIC RAILWAY JOURNAL for March 27, page 553.

On motion the chair appointed the following committee to consider recommendations made by Mr. Hemming: S. R. Dunbar, C. E. Morgan, L. E. Gould, S. D. Hutchins, H. T. Kenfield. Mr. Hutchins was appointed chairman.

### SHOPS AND EQUIPMENT MAINTENANCE OF THE ILLINOIS TRACTION SYSTEM

The main shop of the Illinois Traction System for repairing all interurban cars is located 2 miles east of Decatur, near the junction of the Danville-St. Louis line and the Decatur belt line, which connects with the north and south lines between Decatur, Bloomington and Peoria. Inspection and light repair work is carried on in the car

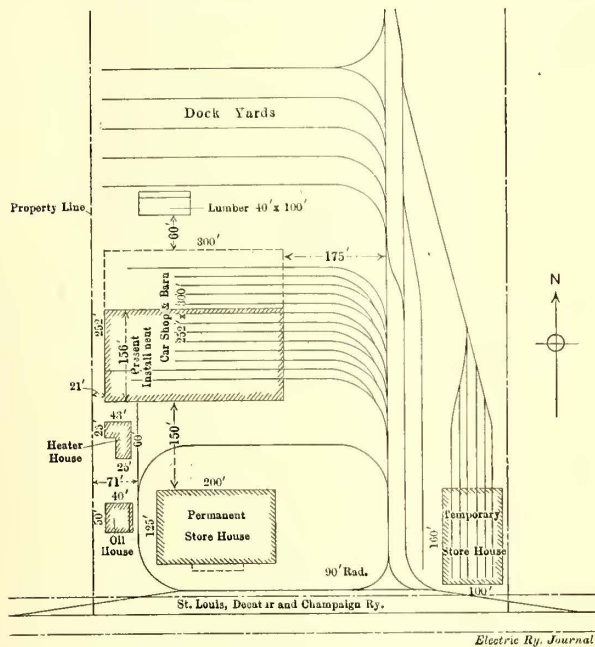
to provide steam for heat distribution by direct radiation. The steam feed pipes are carried in concrete troughs covered with concrete slabs. These pipe boxes are of permanent construction, and are buried in the dirt beneath the shop floor level, but can be easily opened whenever repairs are necessary.

A complete equipment of machine tools for handling heavy interurban work is installed along the south side of the shop. The tools and the adjacent pits are served by a 15-ton Shephard crane electrically operated. A stirrup with stiff but adjustable side pieces has been built for use in connection with lifting car bodies with the crane. Among the tools already installed in this shop are the following: 200-ton Niles wheel press, Niles wheel lathe, Bradley hammer with independent motor drive, and a pipe machine with 3½-in. to 12-in. range and independent motor drive. The car painting work, pending the erection of an additional shop building with a capacity for 40 cars, is carried on in a floor space 120 ft. x 45 ft., partitioned off by corrugated iron walls.

Current for the operation of the shops and also for the power used in the shops of the Curtis Motor Truck Company, located nearby, is received at a substation room in one corner of the shop. This power is taken from the transmission line at 33,000 volts and transformed to 440 volts, three-phase, and also to 125 volts, single-phase.

At the front corner of the shop is an office section three stories high. The first floor is used as a shop stock, tool room and shop foreman's office. On the second floor are two large, well-lighted offices for the superintendent of motive power and equipment and his clerks. The third floor has a space 25 ft. x 29 ft. arranged as a drafting room. To facilitate the work of designing and making large, full-sized detail drawings a drafting table 5 ft. 6 in. wide by 28 ft. long has been built in this room. The table has a cork-pine top 2 in. thick and so fastened that when its upper surface becomes mutilated with tack holes it can be redressed.

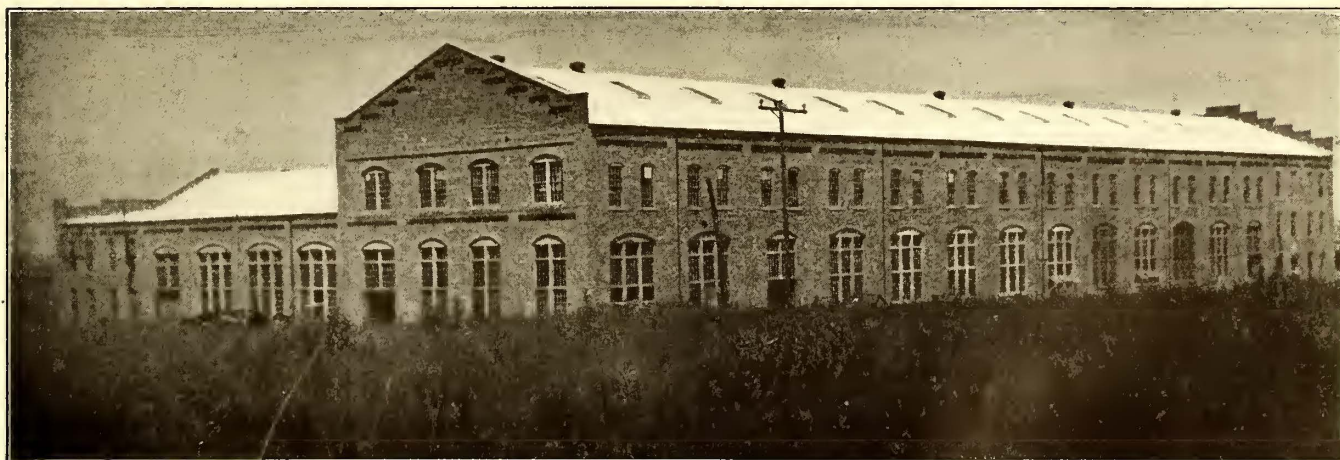
The draftsmen in this department have just completed the first few of a series of "standard" boards for the use of the shop foremen. A view on page 638 illustrates three



Illinois Traction Shops—Plan of Buildings

houses and small shops at the various division headquarters, but the major part of the heavy work is handled at the Decatur shops. These shops have just been put into service and, with a contemplated addition, they will afford excellent facilities for construction and maintenance work.

A plan of the shop property is presented in the accompanying engraving, showing the general arrangement of the smaller buildings with reference to the large car shop.



Illinois Traction System Shops—View of Main Building from Rear

A detailed plan of the main shop, showing the arrangement of pit tracks and the shop subdivisions, is presented on the following page. The main shop building is a fire-proof structure of brick, with concrete floors and a steel-supported roof. It is 300 ft. long by 156 ft. wide. Adjacent to the shop building is the heating plant, with boilers

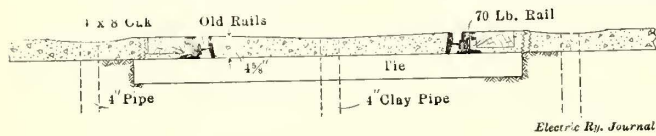
of these boards, each of which shows the finished dimensions of a standard axle. It is proposed to make similar boards for all the standardized parts of a car that may be manufactured in this shop. The boards are of thin well-seasoned wood on which a full-sized detail of the standard part is drawn with black paint and clearly lettered. When,

for example, an axle is to be turned the machinist obtains the board presenting the dimensions of the standard axle and hangs it directly in front of him back of his lathe. Then he can follow his work, not only in the usual way by reference to the dimensions, but also by actual comparison of the proportions.

STANDARDIZATION WORK

Some of the maintenance and construction work scheduled for this shop during the coming year is as follows: Changing equipment on 20 cars from a.c. to d.c.; standardizing the ends of 10 passenger cars, 6 motor express cars and 11 trail express cars (this standardization work includes removing drop platforms and extending the sills to the bumpers); superintending the construction of and installing the equipment on several new passenger cars to be purchased and two new private cars; installing M. C. B. type couplers on all rolling stock; standardizing brakeshoes, grab handles and small fittings.

New rolling-stock equipment now being built includes



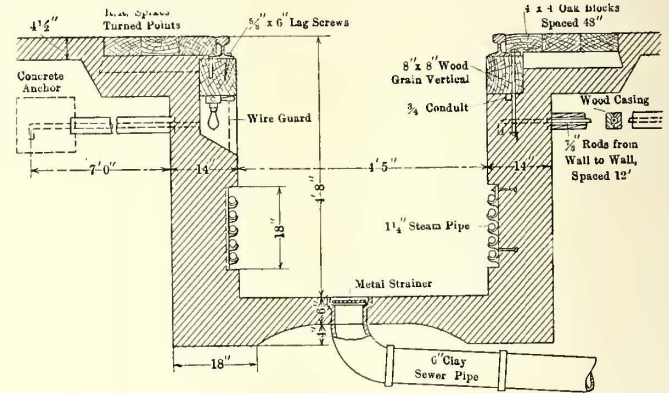
Illinois Traction Shops—Section Through Wash Track

three locomotives, two trailer sleeping cars, one special party car, office car for the general manager, one electric shovel and 25 box cars. Some of the details of construction of the new and the rebuilt cars are of particular interest as showing the standard types and parts adopted.

UNDERFRAME CONSTRUCTION

The body bolster (see page 637) has been designed to be removable from the bottom of the car without interference

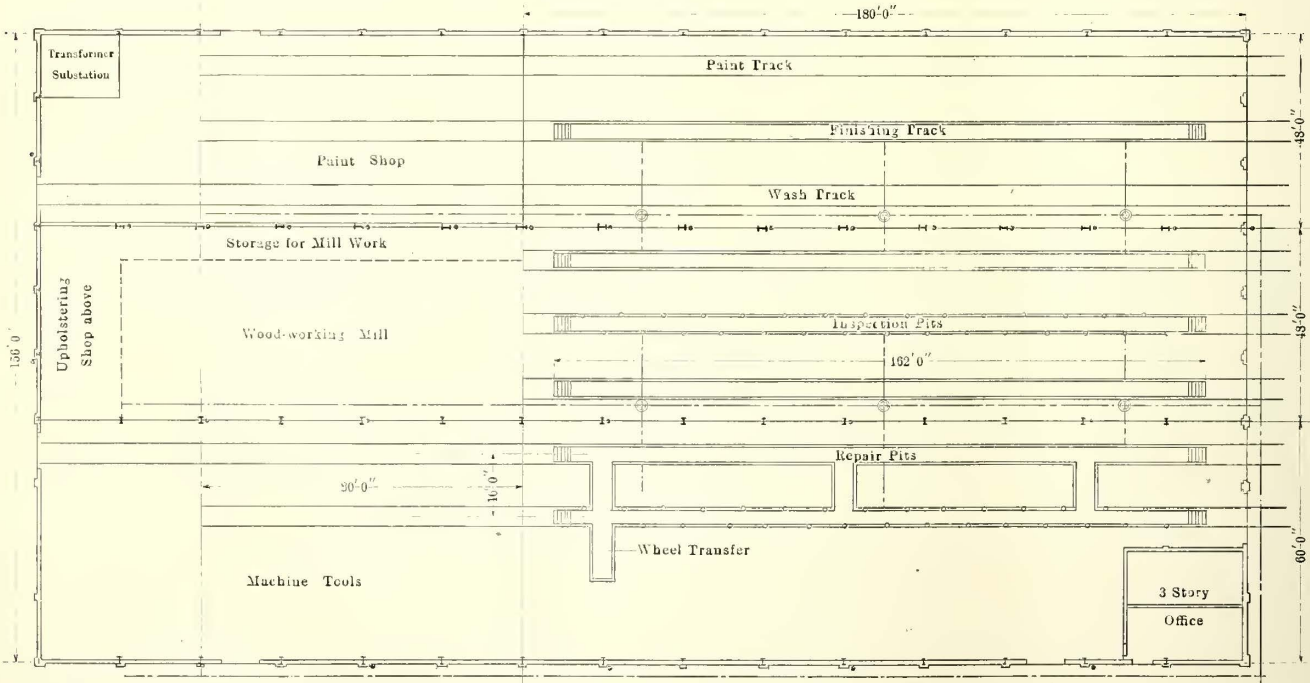
bearing plates are cast integral with the bolster and are fitted with removable wearing surfaces. The bolster has I-beam-section lateral braces at each center and intermediate sill. These braces are a part of the bolster casting and extend lengthwise of the car to prevent any distortion in the position of the bolster that might be caused by rapid



Illinois Traction Shops—Section Through Pit Track

acceleration or braking. The bolster carries the side truss rods inside of the outside sills and their point of support is raised as high as permissible to obtain the maximum stiffness. The tie rods are anchored by bolting through the composite side sill beyond the bolster toward the end of the car. This arrangement places the rods high enough to clear the wheels on sharp curves and permits the use of 18-in. struts at the needle beams, affording a total depth to the trusses of 24 in.

The underframe of the standard car has 5-in. 14.75-lb. needle beams superimposed with a 1-in. piece of wood on which the sills rest. This wooden piece, which may be cut



Illinois Traction System Shops—Floor Plan of Main Building

with the framing or the flooring. This bolster, which is used on all of the 53-ft. passenger cars, is a steel casting with the truss-rod struts cast integral with the bolster to support the truss rods without lateral strain on the bolster casting. The ends of the bolster are tied on the upper side with a 1-in. x 12-in. machine-fitted wrought-iron plate. The

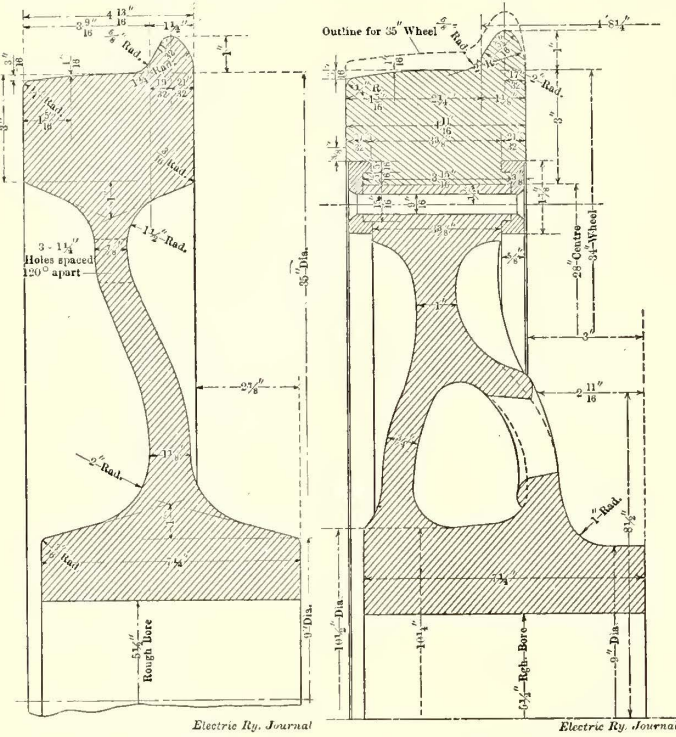
easily, is used to permit of installing new pipes or conduit throughout the length of the car without cutting the steel members or bending the pipe. The center sills are spaced with malleable-iron box-shaped castings, affording a continuous pipeway from end to end of the car for conduit and air-brake pipes. At each cross framing are two



of the sills together, but also are supported on the extended bottom flange of the I-beam sills.

STANDARD WHEELS

Illustrations are presented showing the sections of the standard Midvale rolled steel and steel-tired wheels, which are being installed under all large passenger cars. The



Standard Solid Steel Wheel

Standard Steel-Tired Wheel

wheels are 34 in. and 35 in. in diameter with flanges 1 in. high and 1 3/32 in. wide. The tread proper is 3 9/16 in. wide. This width of tread is used so that the cars will be accepted by connecting roads requiring M.C.B. standards. All wheels are made with hubs 7 1/4 in. long extended on one side so that they may be fitted to motor equipments requiring either 48 in. or 50 in. of space between hub faces.

STANDARD COUPLERS

The coupler which is installed on all standardized cars has been developed by J. M. Bosenbury, superintendent of motive power and equipment. It has the standard M. C. B. contour with the addition of a projection on one side and a receiving lug on the other side. When coupled these projections and mates engage to hold the couplers rigidly in line. Also a knuckle has been introduced which, while having the M. C. B. contour on a horizontal plane, is extended vertically so that it is about 15 in. high, thus providing against parting of the couplers when two cars pass sharp breaks in grade. The couplers are attached to the cars with cast-steel radial bars riding on malleable carriers hung from securely bolted strap-iron supports. The results obtained with this type of coupler are said to have been excellent. Some of the equipments on this road are 68 ft. long over all and when cars of this length are coupled together they can be operated around curves of 35-ft. or 40-ft. radius.

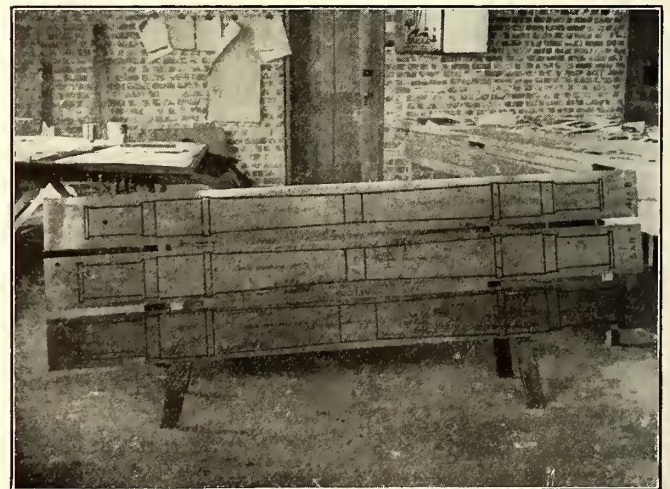
NEW AND REBUILT CARS

A floor plan is presented of one of two 68-ft. combination cars which are now being rebuilt at the Danville, Ill., plant of The J. G. Brill Company. Formerly these were chair cars used for limited service, but they are now being rebuilt and refitted into three-compartment cars to accom-

modate freight and express at the front end, smokers at the center and general passengers at the rear. This floor plan shows the standard arrangement of the motorman's cab at the left-hand forward end of the body. It will be noted that considerable seating capacity is afforded by drop seats in the express compartment. The smoking compartment has 12 double seats and the main compartment has 18. The toilet room is placed at the rear of the main compartment with the heater on the opposite side. Steps are provided on both sides of the rear platform and while running are covered by Edwards trap doors. These cars will be equipped with four GE-205 motors and will be used in fast limited service.

The Danville plant also is building two 52-ft. 6-in. sleeping cars with interior arrangement as shown. These cars will be used as trailers because it has been found that with the two motor-equipped sleeping cars now in service the noise of the electrical equipment disturbs the passengers. The new sleepers will be built for operation in either direction and will be equipped with standard couplers so that they may be handled during the night by any train making the required schedule. The interior equipment of the cars will have 10 standard sections made by the National Sleeping Car Company and complete toilet facilities at both ends with large lockers for storage of linen. The cars will be heated by hot water.

A floor plan of a special party car, also being built at the Danville plant, is presented. This is a combination parlor, observation, dining and sleeping car suitable for private or public use. The car will not be equipped with motors, but will be arranged with end doors so that it may be coupled to a private car to be built for the general manager's use. The special party car will have a large observation platform with an ornamental brass railing and a 4-ft. 6-in. observation window at the rear. The rear compartment within the body will carry eight easy chairs and is arranged so that an extension folding table may be used for serving meals. In the center of the car are two standard sleeping-car sections of the National Sleeping Car Company's type and two seats arranged to pull out to form beds. Immediately forward of the standard sleeping-car sections will



Illinois Traction Shops—Standard Axle Boards

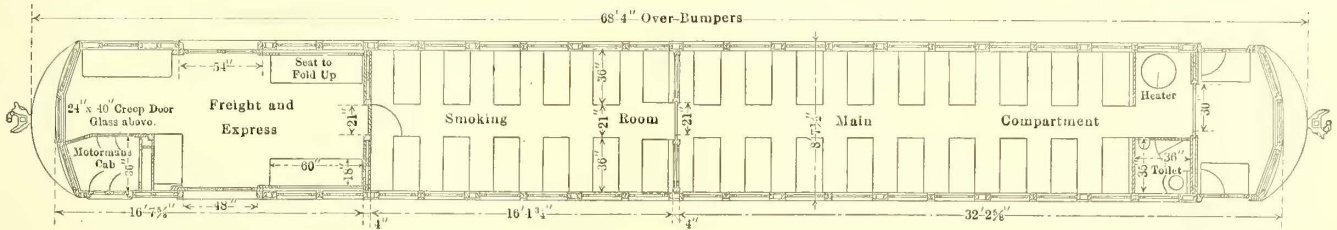
be a toilet room on one side and a davenport bed with a locker below on the other side. The end compartment will be the kitchen, which is also provided with a sleeping-car section for the use of the cook and the porter. The car is to be 52 ft. 6 in. long over all. The sleeping accommodations will provide for nine people.



Plans are now nearly completed for the construction of a private office car for the use of the general manager. This car, which is shown in the accompanying plan, will be 59 ft. 10 in. long over couplers and will be provided with office, sleeping and dining facilities, etc. The car will be 9 ft. 3 in. wide over the sheathing, 57 ft. 6 in. long over bumpers, 9 ft. 5 in. high from sills to trolley board, and will be equipped with four motors carried on trucks spaced 34 ft. between center pins. The design of the body is similar to the company's standard passenger cars. It has seven Pullman windows on each side, one single window on the cab side in front and an exit door at the forward right-

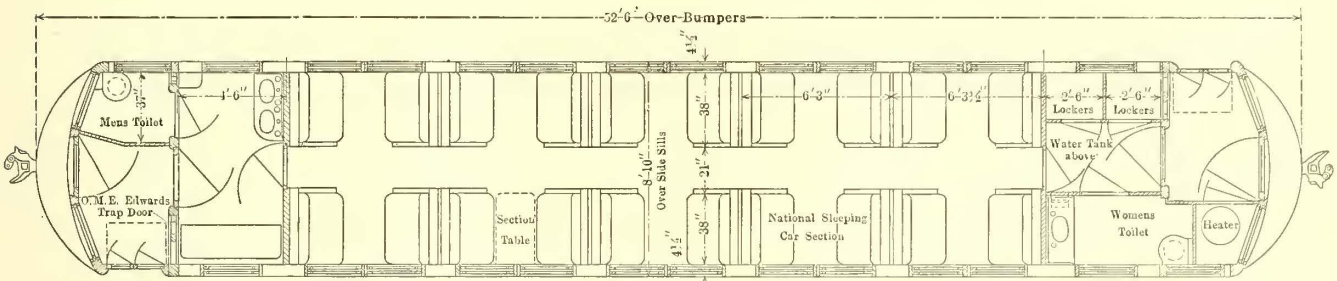
may be pulled out at night to form a berth. At the rear of the office compartment will be two National sleeping-car sections in close compartments, one of which will be provided with a Duner hopper and a folding washstand with hot and cold water. Next, in the rear, will be the toilet room and adjacent to that will be the kitchen provided with complete dining-car facilities. The rear compartment will have six easy chairs, a large dining table and a long cross seat which may be made up into a berth at night. The rear observation window, 57 in. wide, will be arranged to swing open for ventilation in the summer.

The interior of the car body will be finished in African



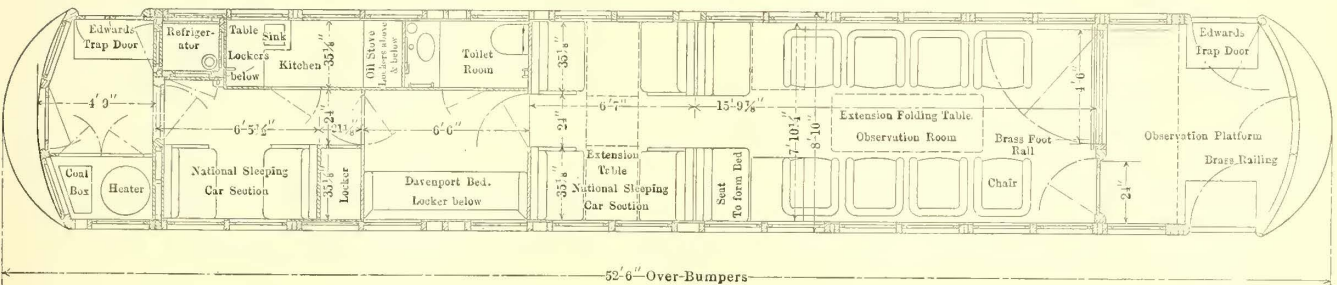
Floor Plan of Long Interurban Car for Fast Limited Service

Electric Ry. Journal



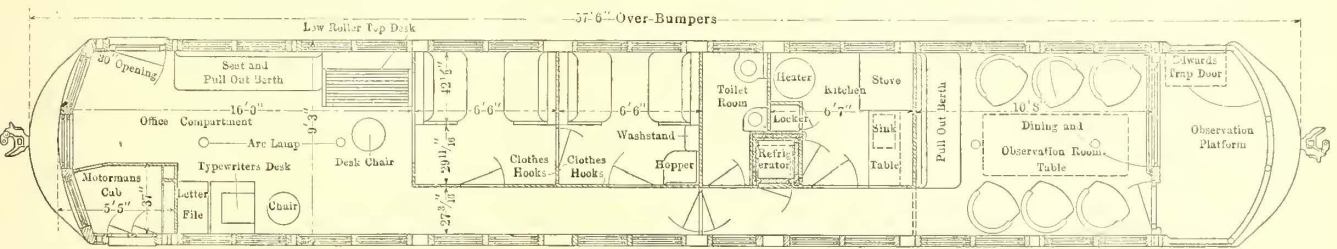
Floor Plan of Trailer Sleeping Car

Electric Ry. Journal



Floor Plan of Special Party Car

Electric Ry. Journal



Floor Plan of General Manager's Office Car

Electric Ry. Journal

hand corner. The front end will have three windows and the rear end will be arranged as an observation platform 5 ft. 6 in. long with an ornamental brass railing and a wide window in the body end. The car body will have a sub-floor provided with a 1 3/4-in. space in which a packing of wool felt will be placed to deaden the noise and withhold the heat of the car. Above this packing will be the regular double top floor.

The interior of the car will be subdivided into an office compartment at the forward end with a roll-top desk, a typewriter desk and a letter file, and a long seat built so that it

mahogany and all the furniture will be of solid mahogany. The upholstery will be done in Spanish leather. All the fittings in the toilet rooms and in the kitchen will be of metal and the toilet rooms will be flashed up on the sides so that a ring shower bath may be used. This car will have a complete motor equipment with multiple-unit control and automatic air brakes. The air-brake pressure will be cut down by a reducing valve for use in forcing the water to the various toilet and kitchen outlets. The car will be heated with Peter Smith hot-water heaters placed in the kitchen.

## HEARING ON MILWAUKEE FARE CASE BY WISCONSIN RAILROAD COMMISSION

During the hearing of the Milwaukee fare case by the Railroad Commission of Wisconsin at Milwaukee recently, one of the principal witnesses was Prof. M. E. Cooley, dean of the department of engineering, University of Michigan. Professor Cooley was on the stand during the sessions from March 5 to 10. Part of the testimony given by this witness was published in the report of the hearing which appeared in the *ELECTRIC RAILWAY JOURNAL* on March 13. An abstract of additional testimony by Professor Cooley follows:

### PLANNING AN APPRAISAL

Professor Cooley said that in laying out the work for an appraisement the first step was the selection of experienced men as heads of departments for the different branches of the work. Each of these chief assistants was provided with assistants to take part in the details of the work and to secure the data from the records of the companies where available and also from the structures themselves by actual examination or inspection. In addition to this force of men, in making the Michigan railroad appraisal it was thought desirable to have the advice and counsel of a body of engineers who were not engaged in the appraisal itself. These latter engineers constituted what was called a board of review. The decision of this board on important questions was taken as indicating the direction which should be followed in the work. One of the main questions was, What would be the cost of securing a right of way? The conclusion reached, substantially the same as that formed in Wisconsin, was that the value of the right of way was about two and a half times that of the property adjacent to the roadway, and in cities something less.

The witness had examined the report of the valuation of the Milwaukee property by the Railroad Commission staff and assumed that the appraisal embraced practically everything that appeared in greater detail on the blank used in the Michigan valuations. The appraisal of the Wisconsin staff had been made in such a way that Professor Cooley was not disposed to criticize it in general at all. With the exception of a single item or two in the valuation, he had not questioned the items. He had found, however, a very material difference in the various percentages of allowance that had been used by the valuation staff as compared with those which he had used in making appraisals. The one conspicuous item in the appraisal was that of track and track structures, valued at \$9,000 or \$10,000 per mile. That seemed to be so extremely low that Professor Cooley went into it somewhat in detail, so far as he could without making an actual appraisal, mainly by the investigation of data submitted to him and also of those familiar with the track structure in Milwaukee. In the judgment of the witness this value was only about two-thirds as large as it should be; it ought to be not less than \$15,000 per mile, which corresponded more closely with values that had been found elsewhere by him. Professor Cooley had assumed outright that a mistake had been made in the computation of this figure. He understood from the testimony that contractors' profits had been figured in each of the items in the appraisal, but he took exception to the rates of percentages and to the general percentages added in the appraisal. A table, reproduced herewith, was submitted by the witness, showing the reproduction cost of the physical property of the company, railway only, as determined by

the valuation staff of the commission, with percentages added by the witness.

No working capital was included in the report of the valuation staff. Professor Cooley said that the object of the appraisal, as he understood it, was to discover how much money was invested to cover construction of the plant. To bring the property to an operating basis a working capital would be necessary. Until the working capital was taken into consideration there was nothing but an inert property. Capital had to be advanced and other steps taken to convert the static property into a dynamic condition.

### APPRAISAL FOR RATE-MAKING A NEW REQUIREMENT

In most cases in the past where appraisals had been made there had been a desire for a general knowledge rather than for some specific knowledge of what the ap-

#### MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY ONLY— REPRODUCTION COST OF PHYSICAL PROPERTY AS DETERMINED BY VALUATION STAFF WITH PROF. M. E. COOLEY'S PERCENTAGES.

1. Land, including 10 per cent cost of acquiring.....	\$597,845	
2. Track and track structures.....	\$1,236,949	
Add 50 per cent too low.....	618,475	
Add 5 per cent contingencies.....	92,771	
3. Cars and car equipments.....	2,007,876	
4. Electrical distribution system.....	1,063,818	
Add 5 per cent contingencies.....	53,191	
5. Power plant equipment.....	1,060,615	
Add 5 per cent contingencies.....	53,031	
6. Buildings and miscellaneous structures.....	878,807	
Add 5 per cent contingencies.....	43,940	
7. Office furniture and appliances.....	23,443	
Add 5 per cent contingencies.....	1,172	
8. Tools, implements and machinery.....	285,564	
Add 5 per cent contingencies.....	14,278	
9. Horses, wagons and miscellaneous.....	32,419	
Add 5 per cent contingencies.....	1,620	
	\$7,409,315	\$656,499
Add 5 per cent general contingencies.....	370,466	
	\$7,779,781	
Add. 4 per cent engineering.....	311,191	
	\$8,090,972	
Add ½ per cent insurance during construction.....	40,455	
	\$8,131,427	
Add (1) land, including 10 per cent cost of acquiring.....	597,845	
Add (7) office furniture and appliances.....	24,615	
Add (9) horses, wagons and miscellaneous.....	34,039	
	\$8,787,926	
Add 2½ per cent organization and legal expenses..	219,698	
	\$9,007,624	
Add 6 per cent interest during construction.....	540,457	
Total of construction and equipment.....	\$9,548,081	
Add stores and supplies.....	57,630	
*Add working capital.....	263,270	
Total, including stores and supplies and working capital .....	\$9,868,981	
Add 10 per cent cost of procuring a going value..	986,898	
	\$10,855,879	
Bonds placed at 90.....	12,048,750	
*Working capital includes average monthly payroll for 1906..	\$82,184.06	
And average monthly vouchers (audited) for 1906.....	181,088.25	
	\$263,272.31	

praisal might afford. An appraisal for the determination of rates was comparatively a new requirement. In such an appraisal all legitimate expenditures that had appeared or were likely to appear should be shown. With that in mind Professor Cooley would include other items which were undoubtedly present in this property and undoubtedly present in every other property, but which were not usually included in an appraisal.

The first of these items would be the cost to make the property a going concern. The witness presented a diagram to illustrate this cost. To the cost of making the plant the diagram showed, in effect, the addition of the expense of getting the business required to make it operative on a paying basis. No interest on the deficit thus assumed was calculated in the diagram.

It would require a considerable expenditure of money

to carry the condition of an operating property very much above 77 per cent of its reproduction value new. It would be rather easy to maintain a property up to, say, 75 per cent, but when it was brought up to 85 per cent, the cost of everything increased in much greater proportion than the value of the return. The question would become an economic one as to where it would be best to stop in order to get the best return for the money invested. Professor Cooley, in his computation, added together the amounts of the deficits during the years 1892 to 1895, inclusive, which appeared to be \$1,556,752. Nothing was figured for loss of interest on the investment during that period, or any allowance for a sinking fund.

The expense of procuring a going cost was taken by the witness at 10 per cent of the cost preceding it. The final result of the computation by Professor Cooley of the reproduction cost of the property was based on the inventory of 1906 and did not refer to anything which might have disappeared in previous years, of which an inventory would make no record.

George P. Miller, of counsel for the company, asked Professor Cooley what he would do with the cost of a horse-railway system if he were valuing the going cost of an electric road after a change from horse power to electricity. The witness said he supposed he would do what was done in Chicago with the valuation of the old cable roads. The cable lines of the Chicago Union Traction Company were valued as if they were to be allowed the going value to-day, although they were to be converted into electric roads to-morrow and the cable stopped immediately. The Chicago ordinances required the valuation of the cable roads as going concerns, notwithstanding they were wiped out of existence immediately after the valuation was made.

In the absence of information to the contrary Professor Cooley would consider it necessary to include in a valuation the proper cost of acquiring subsidiary properties, when they were converted to electricity, even though they were scrapped the day they were acquired. The development of the art was progressing in 1890 at such a rate as to make it absolutely necessary to pass from one form of transportation to another, and these changes were demanded at that time by the public.

ALLOWANCES ABOVE INVENTORY VALUES

In the valuation of the Wisconsin staff the total percentage added to the values fixed in the inventory was 12 per cent. The aggregate allowances recommended by Professor Cooley was 22.2 per cent on the principal. The percentages were figured cumulatively. As a result of his own experience, the witness was satisfied that the percentage of allowances should be at least 20 per cent, and he thought perhaps 25 would be more nearly correct, considering the contractors' profits as having been included in the items.

Discussing depreciation due to accident, Professor Cooley said that an engine or a boiler might be wrecked and with it other machinery. Destruction of bridges or cars or other absolute destruction of property might result. The public demand was largely responsible for depreciation due to inadequacy. In speaking of depreciation due to obsolescence the witness said that owing to the rapid disappearance of coal beds, the price of fuel must advance, and this, before many years, would force the adoption of the producer-gas engine. Water powers were being developed, but to utilize them required the scrapping of large parts of machinery at present in use.

The expense of changes in alignment of roads might be brought into the appraisal as part of the inventory. Edwin S. Mack, of counsel for the company, suggested that if the city of Milwaukee repaved a street the company would have to conform, in relaying its tracks, to the repaving requirements, thus shortening the life of the existing track. The witness thought that might be designated as a class of depreciation of which care must be taken. Many of the steam railroads had corrected their alignment to the extent of abandoning miles of old grades and cuts and property and so far as the inventory was concerned, the appraisal would show less than a few years before the alignment was corrected and yet all the money expended in correcting the alignment should be carried somewhere in the accounts. A similar condition would occur if a street railway company improved its system by simplifying its

MILWAUKEE ELECTRIC RAILWAY & LIGHT COMPANY, RAILWAY ONLY, DEPRECIATION BASED ON REPRODUCTION COST OF PHYSICAL PROPERTIES, PROF. M. E. COOLEY'S PERCENTAGES.

Item or group.	*Reproduction cost.	Per cent.	Used by Prof. M. E. Cooley.	Per cent.	Given by heads of departments.
1 Paving .....	\$823,871	10	\$8,238,710	10	\$8,238,710
2 Track and track structures.	2,158,429	8	17,267,432	8	17,267,432
3 Cars, including equipment.	2,335,777	8	18,686,216	6.75	14,766,495
4 Electrical distribution system .....	1,299,425	8	10,395,400	6	7,796,550
5 Power plant equipment..	1,295,513	8	10,364,104	6.7	8,679,937
6 **Buildings and miscellaneous structures.....	{ 809,947	4	3,239,788	3	2,429,841
	{ 256,386	2	512,772	3	769,156
7 Office furniture and appliances .....	26,092	8	208,736	5	130,460
8 Tools, implements and machinery .....	348,808	8	2,790,464	7.5	2,616,060
9 Horses, wagons and miscellaneous .....	36,081	10	360,810	10	36,081
	\$9,390,329		\$72,064,432		\$62,730,724
			-7.67 per cent.		-6.68 per cent.

\* Embraces all percentages down to and including interest, as shown on table headed reproduction cost, as determined by valuation staff with Cooley's percentages.

\*\* Separated into two amounts, one for power plants, the other for ordinary purposes.

Gross earnings, 1906.....	\$2,973,443
Depreciation due to wear and tear and exposure to the elements .....	627,307 per year
	21.09 per cent gross earnings.
Depreciation due to wear and tear and exposure to the elements, including an allowance for obsolescence...	720,642
	24.23 per cent gross earnings, or say 20 per cent and 25 per cent gross earnings.
From books:	Per cent.
Operating ratio, ordinary.....	48.96
Taxes .....	6.00
Operating ratio, including taxes.....	54.96
Depreciation computed.....	21.09
Operating ratio, including taxes and computed depreciation .....	76.05
Or say .....	75 and 80
From books depreciation taken at.....	10
Operating ratio, including taxes and depreciation.....	64.96

method of transportation, creating a shorter route to give the public a better service.

EXPENDITURES REQUIRED

A table submitted by the witness showing what, in his opinion, it would be necessary to expend if the property in Milwaukee is to be maintained indefinitely in its present state of efficiency, is reproduced herewith. As a basis of this computation, the figures of the valuation staff of the commission were used, but there was added to each of the elements the percentage which he had described and used in making his valuation of the property. The witness took a set of factors reached by himself and another set given by the heads of departments and worked them up, as a matter of fact, with factors used by others. The money represented in the nine items considered aggregated \$9,390,329. Each of the items was then multiplied by its factor and the products summed up. The sum total of the products as given by the heads of departments was \$62,730,724. Dividing this figure by the \$9,390,329 gave as a result 6.68

per cent. This percentage of the \$9,390,329 was required to take care of depreciation according to the factors furnished by the heads of departments. Figuring on the percentage stated \$627,307.24 would be required annually to cover depreciation, of the property based on the estimates of the heads of the departments and on the valuation made by the engineering staff of the railroad commission with the various percentages which Professor Cooley had indicated should be made. The witness did not understand that the heads of departments considered that this sum would do any more than simply take care of the property.

If the property was to remain unchanged in characteristics this sum must be expended annually to keep it up to an efficiency of approximately 80 per cent of the cost value; the sum did not include an allowance for depreciation due to obsolescence, public demands or inadequacy.

An explanation was made by the witness of the reasons why the percentages given by him, as shown in the table, were larger in some cases than those recommended by the heads of departments. Professor Cooley was afraid that his figures did not include all of the elements of depreciation, but they were about as far as he dared to go just now; he thought that in a few years he would go very decidedly further, but he could justify the figures presented from his knowledge of to-day.

Explaining further the figures, as applying to the earnings of 1906, the speaker said they meant that in that year, according to the factors given by the heads of departments, the depreciation was \$627,307, requiring 21.09 per cent of the gross earnings. According to the figures used by the witness, 24.23 per cent of the gross earnings would be required or, say, between 20 per cent and 25 per cent of gross earnings, including some allowance for obsolescence. The ratio of the ordinary operating expenses to gross earnings in 1906, according to the books, was 48.96 per cent and the allowance for taxes for the year was 6 per cent, making a total of 54.96 per cent. The company also set apart 10 per cent of the gross earnings as a depreciation fund, making a total of 64.96 per cent. If to the percentage of operating expenses, plus taxes, the rates of depreciation, as stated by Professor Cooley, should be added, they would bring the total up to 76.05 per cent in one case and 79.19 in the other, making an aggregate for 1906 of from 75 per cent to 80 per cent of the gross earnings to take care of the property and operate it. Professor Cooley thought that was conservative. It was his belief that a larger percentage rather than a lesser one would be shown to be necessary in the next 5 or 10 years.

#### RESULTS IN CHICAGO

The witness gave the percentages of gross earnings expended for operating expenses, including such depreciation provision as was set aside by the Chicago City Railway during a long period of years. He said that the Chicago Union Traction Company expended less than the Chicago City Railway. The lines comprised in the Chicago Union Traction System would have to expend nearly twice as much or at least 50 per cent more than the Chicago City Railway to raise the property to the conditions demanded to-day. If, with an expenditure of 75 per cent to 80 per cent of gross earnings in the Chicago City Railway, it required for rehabilitation \$8,000,000 in 1907, what could be expected of the Milwaukee properties, where 10 per cent or 15 per cent less was spent. The money to keep up the property had to be taken out of the earnings or new capital had to be used.

In discussing the requirement of the Chicago ordinance

that funds aggregating 14 per cent of the gross earnings shall be set apart for maintenance, repairs, renewals and depreciation, Professor Cooley said that the Chicago City Railway used 78.08 per cent of gross earnings in 1906 for operating expenses, including everything. The reproduction cost as determined by the appraisal in 1906 was \$21,604,759. The gross earnings for that year were \$7,871,126.63. Fourteen per cent of this amount was \$1,101,958 and this figure, divided by the reproduction cost, gave 5.1 per cent.

In the case of the Chicago Union Traction Company, the percentage of gross earnings required for operating expenses in 1906 was 68.49. The reproduction cost in 1906 as determined by the appraisal was \$29,131,616. The gross earnings for that year were \$10,008,320, 14 per cent of which was \$1,401,165. This, divided by the reproduction cost, gave 4.81 per cent. In the case of the Milwaukee Electric Railway & Light Company, for the railway property only the percentage of operating expenses, including taxes and depreciation as allowed for 1906, was 64.96. The reproduction cost of the properties in 1906, as taken by Professor Cooley in his calculation, was \$9,400,000. These figures included paving and also some non-productive properties. The gross earnings in 1906 were \$2,973,443, 14 per cent of which was \$416,282. This sum, divided by the reproduction cost, was 4.83 per cent. If the Chicago City Railway expended 5.1 per cent of its reproduction cost and the Chicago Union Traction Company 4.81 per cent and in neither case the property was "maintained anywhere near the proper working condition," then it must follow, it seemed to the speaker, that these percentages were altogether too small to maintain the properties in a working condition.

#### DEPRECIATION FROM WEAR

Considering the subject of depreciation further, it was stated by the witness that the wear and tear of property was directly proportional to its use. Exposure to the elements was one cause of depreciation and to that cause there would be added the effect of wear and tear. A property that was used constantly and hard naturally wore out faster than one that was not so used.

To stop a car subjected all parts of the car to a strain. This strain was repeated such an enormous number of times that the result eventually was that the car became relatively weak and its life was shortened. The wheels of cars and also the brake shoes were worn out more rapidly by frequent brake application, and therefore the expense of maintaining the brake shoes and the wheels was increased. The rails themselves were worn more rapidly owing to the fact that more car-miles were traveled, and all these effects were reflected back into the power houses owing to the fact that increased consumption of power was required for frequent stops and starts. That meant increased work for the engines, dynamos, generators, boilers and, of course, greater wear. The wear on the trolley wire was directly proportional to the number of miles traveled by cars. The entire plant might be said to depreciate more rapidly owing to increased traffic.

Some idea could be had of the probable effect of the wear due to increased traffic in the city of Milwaukee when it was considered that since 1897 the car-miles per mile of track had practically doubled. In 1897 the car-miles per mile of track were 56,385, as compared with 98,681 in 1906. This statement did not attempt to take into consideration the substitution of larger cars. The general effect of the development of any street railway property during the past

15 years had been to increase the wear and tear and depreciation very materially. That was the experience everywhere.

While 8 per cent or 10 per cent, or even less, of the gross earnings was all that was necessary 15 or 20 years ago to maintain the property, those allowances were no longer sufficient. The general belief at the time electric power was introduced into street railway practice was that there would be a very material reduction in the operating expenses from the expenses of horse and cable roads.

Since the introduction of electricity changes had taken place toward larger cars and higher speeds, and with the larger cars heavier rails and better roadbeds had been introduced. With the increased speeds and larger cars had come larger generators, engines, boilers and larger power stations. Everything had increased, so that the conditions of 15 years ago, upon which the practice of those days was based, were no longer the conditions applicable to street railway practice with electric power, and it seemed to Professor Cooley that the conclusion that the operating expenses to-day were larger than were contemplated 15 years ago was a perfectly normal, natural and logical one.

#### ADVANCES IN LABOR AND MATERIAL COSTS

There had been a general advance not only in wages but also in the cost of a good many of the materials which entered into the expense of construction of railways. This tendency was a most serious consideration. It seemed to the witness that with the very general tendency of all things to advance, including the cost of living, nothing whatever going backward in the way of cost, the only solution of the street-railway problem in the future, if the properties were to be maintained, was not the present fare, but an increase of fare. These remarks were applicable to the entire country.

Answering a question on this subject by L. C. Manson, of counsel for the city, it was reiterated by Professor Cooley that the whole tendency of costs for labor and material was upward. There was a limit to the carrying capacity of a road and to the earning capacity of a car and no limit to the operating expense of a car, and the result must be, if the properties were to be maintained, an advance in the gross earnings, either by an increase of the rate of fare or by limitation of the transfer privilege. It was not possible to have a low rate of fare with the transfer privilege.

The number of transfer passengers in Milwaukee in 1906 was 33.40 per cent of the revenue passengers and the average for the last 12 years had been about 30 per cent. The average gross revenue per revenue passenger in 1906 was 4.3 cents; the revenue per revenue and transfer passenger averaged 3.22 cents. That simply meant that when all passengers who rode were included in the computation the earnings were going down toward 3 cents.

The witness stated that the question of the reduction of the rate of fare was considered in Chicago during the settlement, but not to any great extent because of the belief that it was not practicable to reduce the fare and give the transfers and through routes demanded.

W. J. Curtis, of counsel for the company, asked the witness how the Milwaukee company could have existed in the past and complied with his computation as to the proper amount of depreciation to set aside. Professor Cooley said that to some extent the road had been borrowing on the future and that probably a very largely contributory cause had been a most superior management and an esprit du corps that was admirable. The body corporate on the street railway in Milwaukee seemed to be a very unusual one.

The amount of depreciation which had been suggested as proper by the speaker could not be set aside in the first year of the corporate life of a railway company unless the money was borrowed. The general history of the street railroad business in this country had shown a marked tendency to an insufficiency of earnings to take care of the properties and therefore there would be insufficient money for depreciation. The larger the rate of fare the greater the gross earnings and therefore the possibilities of giving better service were increased. One was a function of the other.

#### TO MAKE INVENTORY COMPLETE

In a valuation the inventory to be complete must embrace not only the elements of the physical property that had been found by an inspection of the property, but also all of the elements that were not found, but which had really appeared in the property during its organization and during the period when it had been brought up to the condition in which it was when the inventory was made. The measure of the going concern should be taken when the earnings were sufficient to accomplish the original intent of the investment.

In a physical sense, the property might be a going concern simply because the wheels were turning, but the measure of the going concern at that time was, of course, less than at some other time when it was earning sufficient to return the interest on the cost, depreciation, expense of operation, taxes and a profit. Physically, the property would be a going concern when it began operation, but financially not until it reached full headway. Without any reflection on the subject, Professor Cooley would say that in determining the value as a going concern, the appraiser should stop when the property had a value as a going business sufficient to give a proper return on the investment.

Discussing further the various elements of depreciation, the witness spoke of casualties. He said that in mentioning the possible destruction of the property, he had in mind that the company was an agent of the city, exerting itself to supply transportation facilities to the city and exercising its very best judgment and that it did not desire an accident any more than did the city itself, but an accident had happened. It seemed to him that the business done by the company must be of a character to permit it to take care of happenings that were unavoidable. The city should be responsible to the extent of willingness to contribute a fare which would enable the company to insure itself if it liked.

Professor Cooley's idea of the depreciation fund was that it was not a fund to accumulate to a great extent, which in the end would be a distributed earning, but that it was a fund that would serve simply to maintain the integrity of the property at all times. In other words, it was incumbent upon the people to-day to so preserve the property that when their children inherited it they would find it preserved properly for their use. That was an obligation as he looked upon it. The citizens were just as much interested in preserving the property as the company.

He thought that in justice to the property, which was a magnificent one, all thought of whether it was this particular company or city should be taken away and the matter should be kept independent of any ownership or any particular responsibility and treated on a broad plane, separated from any personal character.

#### EXPENSES OF CONSOLIDATION

The inventory which was made in connection with an appraisal failed frequently to include money expended for

preparing the way to the construction of the property or to recognize such expenditure at anywhere near its actual amount. These were necessary expenditures in the acquisition of the several properties in a city preparatory to the investment which had produced a single system for the entire city as distinguished from five or six different properties before. No account was taken in such reproduction cost, as determined from the inventory, of the expenditures that were necessary to bring the several properties into one corporate whole.

Frequently in bringing several properties into one concrete whole the expense incurred had been great and seemingly out of proportion unless the advantages that might accrue as the result of the consolidation should be considered. If the advantage had been great enough, or was likely to be great enough, then the expense of bringing the property together, whatever amount it might be, was justified, and the expense became an actual and a proper investment, and one to be recognized in an inventory for the purpose of rate making.

The advantages to the public comprised a single system as against five systems, a single fare as against several fares and the ability to go from one part of the city to a distant part without change of cars; all had a value which the citizens were realizing and it seemed to Professor Cooley that the people should very properly recognize the cost of securing to themselves such a value. The advantage to the city was on the one side of the ledger and, of course, there was, or presumably should be, a corresponding advantage to the company. The constituent companies could have continued in business during the remainder of the life of their franchises and left the city without modern transportation facilities as compared with other cities.

The witness thought the necessity of scrapping large portions of the property which were acquired was the same with the new company as it would have been if each individual company had changed its horse power to electric power, maintaining its integrity and incurring as an individual company the expense of making the change. All over the country the same conversion from horse railways to electric railways took place; it had to be made.

#### BOND DISCOUNT

Mr. Miller stated that in making the appraisal of the Michigan steam railroads nothing was included for the cost of floating bonds.

Professor Cooley stated that the matter was discussed thoroughly with the board of review and it was determined with reference to the cost of floating bonds that each road would have to be treated separately. Some roads had been obliged to sell their bonds as low as 60 per cent, while others could dispose of their bonds at par or even at a premium, and the element was so uncertain and would require so extensive an investigation to arrive at proper quantities that it was determined to omit it altogether and state the fact in connection with the appraisal. The element of cost of procuring a going concern was not introduced for similar reasons. The time that would have been required to calculate this cost for each of the different properties was altogether too great.

Interest on cost during construction must necessarily be included as part of the cost of a going concern because the money to do the construction work had to be provided and interest paid thereon. The witness distinguished between two kinds of interest, one on construction and the other on the cost of getting the construction going. The principle was the same in the two. Interest must be paid

on the money invested as well as upon the money borrowed to take care of the deficiencies.

Reference was made by the witness to the work of the block signal and train control board of the Interstate Commerce Commission. He said that the board, of which he is chairman, had rejected numbers of devices simply because, while they produced greater elements of safety, they hindered or impaired the transportation facilities of the road; the great problem was to make the road do a greater volume of business in order that it might receive a sufficient return to take care of the property.

Professor Cooley recognized a very decided difference between the cost of creating a going concern and the value of a going concern. He had previously considered the subject of calculating the cost of changing the property from a static to a dynamic condition, and the value of the property after it had been so converted was another question.

Under cross-examination Professor Cooley was asked a question by Mr. Manson regarding his estimate that the cost of reproduction of the track and track structures would be about \$15,000 per mile. The witness had based his statement on the cost per mile of track in Chicago as determined in 1906, the estimates appearing in the reports of the Chicago appraisals and also upon talks with the heads of departments of the Milwaukee Electric Railway & Light Company.

#### CONTINGENCIES OF CONSTRUCTION

Mr. Manson asked how the allowance of 5 per cent for contingencies of construction was computed. The witness stated that he had been about 25 years arriving at his present knowledge of the cost of such contingencies. He had had occasion to make many estimates of the cost of construction and to know afterward what the construction actually cost, and from that knowledge he had learned that a contingency item in construction was absolutely necessary unless one added outright quantities which he did not expect to spend, but which he knew from experience he would spend. His contingency items had varied all the way from 5 per cent to 50 per cent, so that he thought that a 5 per cent allowance was pretty low for contingencies of construction. In this case he had divided his ordinary allowance in two on the theory that the inventory had disclosed many of the troubles that had actually been encountered and therefore a lesser number were left.

In the appraisal of the Michigan steam roads 10 per cent for contingencies was allowed at the close of the entire valuation. That covered contingencies of construction as well as of inventory and was more than the allowance in the Milwaukee case, because it was made at the end of the appraisal, not at the beginning. The results of the appraisal in Michigan in 1900 were increased in the valuation of 1903 for the very reasons that Professor Cooley had pointed out while testifying in the Milwaukee case. He thought the valuation was increased by nearly 25 per cent. In 1903 the engineers had learned something by experience and made a very careful study of a number of the questions that they were obliged to leave in doubt in 1900, and as a result of that study the value of the railroads was increased from about \$200,000,000 to about \$245,000,000, as he recalled it.

The addition of 5 per cent for contingencies in the valuation of the electrical distribution system was made by the witness on the assumption that a very careful inventory had preceded the calculation of the amount by the valuation staff of the commission. He believed, however, that it was impossible to make a close inventory of

overhead and underground construction work. In the Chicago valuation an allowance of 15 per cent was made on the overhead construction and 10 per cent additional.

Illustrating the fact that interest charges started long before the plant is ready for operation, Professor Cooley referred to a water-power installation in Wisconsin, on which bonds had been issued and had drawn interest for two years, although the plant did not turn a wheel and was only then about to begin operation.

#### ENGINEERING IN COST OF CARS

The witness was asked why he added 4 per cent for engineering to the cost of cars purchased from manufacturers. He said that specifications usually had to be worked up carefully to meet the requirements of the city in which the cars were installed and pains were taken to develop these specifications and plans.

Testifying further as to depreciation, the witness said that a new element, if put into a street railroad structure, began to depreciate instantly. A tie, for example, had a life of about seven or eight years dependent on circumstances and the kind of tie, and if the company had spent two years in laying its track the probabilities were that the ties were one-fourth or one-third worn out before operation started. The extent of the use of the rail had a material bearing on the extent of depreciation. Depreciation of some parts of power-plant equipment went on whether the equipment was used or not. Cars would suffer the normal depreciation that all wood suffered with age, but that would not be as great as the effect of use, which involved a strain of the parts of the car in addition. Car-bodies that were apparently in most excellent condition were sometimes simply rotten.

#### ERRORS IN CONSTRUCTION

It was wise for a company to look into the future and to build in anticipation of future needs and was likely to prove to be an economy to the people served by the company in that the expense of construction would be much less than if the construction costs were divided. A company might very wisely build in excess of its present demands, expecting thereby to save on investment in the future. If such construction should prove in the future to have been unwise, where it was thought in the beginning to be a wise move, the witness believed that it was an error which should be included as part of the going value, as the necessary additional expenditures would be brought about by the development of the art.

If the management at the outset was believed to be a good management and there was no criticism, but if in the years to come it was proved to be a bad management, then the many losses of the bad management which was believed to be a good one should be included. It seemed to the witness, however, that any business should call for the employment of men who were skilled in the art to which the business related. Frequently in the development of an industry it was necessary to employ unskilled assistants owing to the fact that skilled assistants were not available, and the art had to be developed independent of the knowledge of it in other centers. It might be that a business managed on lines which had been successful in the past had ceased to be remunerative, owing to advance of the art. Therefore it had become necessary to revive or regenerate the property to bring it up to the state of the art and that cost, it seemed to Professor Cooley, was a fair one to include in the cost of the property. If a property had been kept up constantly during its life, to the state of the art, this expense would have been incurred

and distributed over a period of years instead of being concentrated in a short period. No better illustration of this could be had than that of the transition period from horse car to the modern electric car.

#### HORSES GOOD MOTIVE POWER UNTIL ELECTRICITY WAS DEVELOPED

Up to the time electricity was applied in Richmond, Va., horses furnished very good motive power for street railways, the best for general purposes, excluding the cable, because that was applicable only to dense traffic. The men who were engaged in the street railway business prior to the introduction of electricity presumably did not know anything about the possible effect of the introduction of electric power and conducted their business as the past had taught them was necessary. Now the period was one of electric haul and the possibilities of change could not be foreseen. For the purpose of illustration, it might be considered that the flying machine would be adopted to take the place of electricity and that existing machinery would have to be scrapped and transportation companies be obliged to reinvest in flying machines. It seemed to Professor Cooley that it would be legitimate to add to the cost of the present plant the cost of the new plant.

The citizens demanded such changes and the corporations had to meet the demands. The fact of the insistence of the public upon a change to electricity was demonstrated by the existence of electric street railroads generally in all the cities of the land and also the fact that no municipality would consent to return to the older system of construction. In Chicago the cable roads were as good as they ever had been, worked as well as they ever had and produced as high profits as they ever had and perhaps even higher when they had to be scrapped. The people would not consent to have the cable roads continue in the streets. The companies there were willing to make the change if they could be assured of any adequate protection for the money to be invested. It did not need any demonstration to show that the public had demanded electric construction for the last 15 or 18 years and it was even talked of using electricity on steam roads. Electricity was predicted as one of the means of increasing the capacity of the steam roads in the future. In Chicago the company had a contract to operate the cable road for a number of years and could have insisted upon that right, but it was one of the conditions of the compromise that cable roads be abandoned and electric traction substituted and in this abandonment the city allowed the value of the full going value of the cable property.

The situation in New York was brought up and Professor Cooley said that he was not particularly familiar with it except to know in a general way that the transformation that had taken place from the old horse cars through the cable cars to electric cars had involved such enormous costs that it was practically impossible to swing the properties.

The question of reasonableness of the rate of return, of course, involved the question of reasonableness of investment. The reasonableness of investment involved as one of its elements the question of securing money for the undertaking. That might be a very important element, depending upon circumstances. If the bonds were sold at a very low rate from force of necessity, naturally the interest requirements of the property would be increased correspondingly.

#### APPRAISALS FOR VALUE AND FOR COST

It was testified by the witness that in referring to

the difficulties of making an inventory, he had endeavored to distinguish between an appraisal for value and an appraisal for cost. An appraisal for value took into consideration merely elements that were found, that were known to exist at the time of the appraisal, and the appraisal for the cost of property took in elements that had properly appeared in the cost accounts.

In discussing the increase in the cost of operation due to the employment of a higher grade of men on electric cars than were used on horse cars, the witness said that another element was that the help required in addition to that on the platforms was greater now than was needed in the earlier days of electric power. The repair gangs, forces in the power houses and other laborers had increased very generally. The cost of production of electric current per kw-hour had been decreasing with the large investments of capital in the large plants, but, of course, there had been a corresponding increase with street railroad traffic in the consumption of current.

#### INCREASE IN CURRENT REQUIRED

The amount of current required to operate a car per car-mile had increased in greater proportion than the increase in the weight of the car and in the load. While he had not developed any figures, in the old days the speed of cars was from 4 miles to 7 miles an hour, while it now ranged from 8 miles to 11 miles an hour. In the early days cars started very slowly, while now they started rapidly. The rapid acceleration was a tremendous factor in the consumption of current. If a car started 15 years ago in 5 seconds and started now in  $2\frac{1}{2}$  seconds, it required the use of four times as much current as in the earlier days. When the car was started there was the increased weight to propel above what existed in the earlier days. With the increase in weight there was an increase of other resistance. For instance, the wind resistance might be doubled or trebled.

#### LOSS DUE TO SHORTENED LIFE OF TRACK

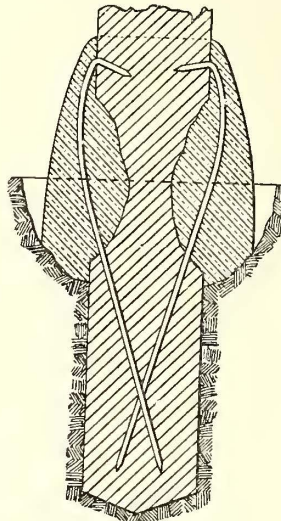
Professor Cooley discussed again the factor of depreciation due, for instance, to the requirements of the city that the track be torn out on account of repaving and before its life had expired. He said that when the pavement lasted 10 years and the track structure lasted 12 years and the pavement had to be renewed at the end of 10 years, it was better to remove the entire track structure so as to save tearing up the pavement again at the end of 12 years. By this process, however, the company lost two years of the life of the track structure in the expectation of saving the city or some one the cost of tearing up the pavement again.

When the company changed its alignment it was for the purpose of enabling it either to do a greater business or to save expense, one being the result of the other. In such a case there would be compensating advantages and, of course, it was also true that if the change was made at the demand of the City Council, an expense would be incurred.

As an instance of what he would charge to maintenance, the witness said that a piston rod nut of an engine might work loose and be detected by the peculiar sound. The cylinder head would be taken off and the nut tightened. The cost would be charged to maintenance in operating expenses. If the nut was not tightened and the cylinder and the entire engine were wrecked the cost of replacement would come from the depreciation fund, although sometimes it would be charged to maintenance.

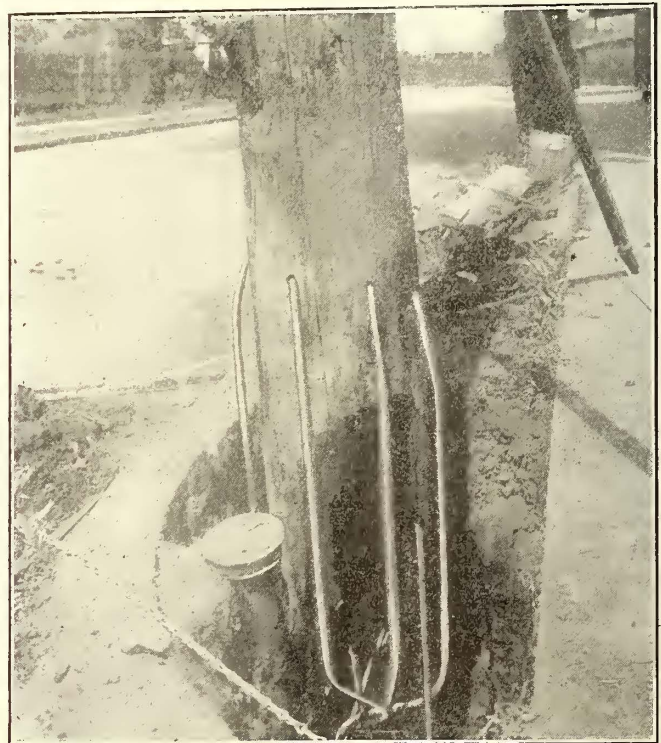
## REINFORCING WOODEN POLES

The limited supply and steadily increasing cost of wooden poles for electric light, telephone and railway transmission lines present a serious problem to large consumers of this kind of timber. Preservative treatment either by impregnation or painting offers a solution for prolonging the life and service of poles to be set in the future, but the constant renewals of old poles which were put in place before the value of preservative treatment was fully realized require enormous quantities of poles each year. It has been estimated that there are 50,000,000 wooden poles in use by electric companies in the United States, which require renewal at the rate of 3,500,000 each year. The cost of renewing a pole in place is much higher than the cost of setting a new pole, owing to the labor involved in removing and replacing the wires. Like every other large



Section Through Reinforced Pole

electric company, the Allegheny County Light Company, Pittsburgh, Pa., has expended large sums in renewing poles which were perfectly sound above the ground line, but which were dangerously decayed below that point. R. S. Orr, general superintendent of the company, devised last year a simple plan for reinforcing old poles which



Reinforcing Rods in Place in Badly Rotted Pole Butt

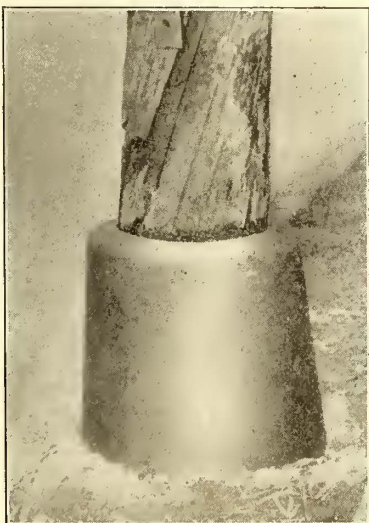
were sound and serviceable above ground with a cage of steel rods surrounded with a shell of concrete and thus prolonging their life for a period estimated as at least 10 years. In 1908 about 250 poles in various places in Pittsburgh and Allegheny were reinforced by this method and



the company is planning to apply it to more than 1000 poles during this season.

A short description of the method followed is of interest: The pole to be reinforced is supported by tripods or held securely in place by temporary guy ropes or wires; the earth is then removed for a distance of about 18 in. from the sides of the pole to a depth that will expose the solid portion of the butt remaining. The decayed portion of the pole is then scraped out. Steel rods  $\frac{1}{2}$  in. in diameter and from  $3\frac{1}{2}$  ft. 6 in. to 6 ft. long are used for reinforcing. The rods are pointed at both ends, the upper end being bent at right angles to form a dog or point from 5 in. to 6 in. long. The straight end of the rod is driven into the sound portion of the butt at an angle by the use of a special driving tool, as shown in one of the illustrations. The upper portion of the rod is then bent in toward the pole and the dog driven in to its full length. The length of the rod used is such as to permit the proper anchorage of its lower end in the sound wood of the butt and to allow the portion extending above ground to be of sufficient length to span the decayed section of the pole and be driven into perfectly sound wood. The points of the rods are usually driven into the pole from 12 in. to 18 in. above the ground level. From four to eight rods are used to form the reinforcing cage, depending on the diameter of the pole. Concrete is filled in around the pole, replacing the decayed portions of the wood and forming a protecting sleeve or envelope for the rods about 6 in. thick. This concrete extends above the ground sufficiently to cover the upper terminals of the rods and protect them from the action of the moisture in the air, forming a collar above ground and tapering from about 3 in. thick at the ground level to about  $1\frac{1}{2}$  in. at the top. It is finished off in a slightly fashion by a special sheet metal form designed for the purpose.

Where the butt of the pole is partly rotted away the rotten portions are removed and the space is filled in with concrete, thus providing an anchorage for the rods either in the solid wood of the butt or in the concrete. One of



Views of Finished Reinforced Bases

the engravings shows the rods twisted in the hollow butt before the concrete is put in. If the butt is entirely rotted away a concrete base is made of slightly larger dimensions than the pole and the reinforcing rods are firmly anchored in it at the bottom. The pole is then cut off square and allowed to rest on this concrete base. The upper portion

of the rods projecting from the base and surrounding the pole are then bent in and the dogs driven home in the usual manner. A concrete shell is carried up around the pole to protect the rods, thus giving poles reinforced by either method a similar appearance above ground.

Another of the illustrations shows a special form of reinforcement made necessary by the condition of the pole.



Driving the Reinforcing Rods

It was found that dry rot had weakened the center of the pole for more than 2 ft. above ground while leaving a sound exterior shell. The ordinary reinforcing rods were put in, but in addition four longer rods were anchored in the concrete base and the dogs driven into the pole well above the top of the concrete cap, where the heart wood was perfectly sound.

It is claimed for this method of reinforcement that the steel rods and concrete form a practically homogeneous mass superior in strength to the wood alone when new and equally capable of sustaining the side strain which every pole must stand. Tests made of a new pole and one reinforced as described have conclusively proved this fact.

The entire process is simple and a week's instruction to any ordinary intelligent workman or foreman will enable him to do the work effectively; in fact, less skilful labor is needed in reinforcing an old pole than in setting a new one. It has been demonstrated that the process will meet many varying conditions. The Allegheny County Light Company has reinforced about 250 poles without having a case of butt decay which could not be successfully handled. The average cost of reinforcing should not exceed \$3.50 at the most under ordinary conditions. The last 27 poles reinforced by the Allegheny County Light Company cost \$3.14 each for labor and material.

The saving in cost by using the method of reinforcement instead of renewing poles may not be realized by many of the light and railway companies who do not keep full reports of renewal cost. One large company using many thousands of poles annually and keeping very exact figures of its construction costs gives the average cost of

a 30-ft. chestnut pole at about \$9 set. Estimating \$6 as the cost of transferring wires and hauling the old pole away, which is perhaps too low, gives an average cost of \$15 for replacing a wornout pole of this size. The cost of renewing a pole of greater length largely exceeds this. The same company gives the cost of a 60-ft. pole as \$32 in new construction work. This difference is accounted for by the greater value of the pole itself and the increased labor and hauling charges. In case of renewal the difference is rather greater than less because the higher the pole the greater the number of cross-arms it usually carries to support the wires and cables and the transference of these is very expensive. It is not an infrequent thing for the renewal of a 50-ft. pole to involve a total expense of \$100. With the Orr method of reinforcing the cost of reinforcing a 60-ft. pole is very little more than reinforcing a 30-ft. pole.

The method of reinforcing has been fully patented and the patents are controlled by the Pittsburgh Reinforcing Pole Company, Pittsburgh, Pa.

### BOSTON ELEVATED SHOP ECONOMY

The Boston Elevated Railway Company has paid special attention to questions of shop efficiency during the past year or two and has made a systematic effort to turn out a greater volume of work for a given expenditure. As a result of these studies a number of general points may be cited which tend toward creating a more efficient organization.

Cleanliness throughout the entire shop is insisted upon, and more stress has been laid upon the matter of orderliness. Greater care has been taken to see that all tools and supplies are kept in the proper places when not in actual service, and systematic checking of tools has been demanded in all departments. Punctuality has been enforced more strictly through the use of time clocks and special effort has been made to start all jobs promptly when the working hours begin. All practices on the part of workmen tending to delay production have been discountenanced. Special thought has been given to the proper maintenance of existing tools and better arrangements of the plant have been made, including improved washing facilities for the employees. So far as possible the same set of men has been kept on the same class of work, and when a force has been sent to do work outside the home shop in distant car houses or other portions of the system, the same men are sent again and again. This saves time in getting around the city, saves inquiries and the investigation of credentials, explanations of local facilities and delays in starting work in unfamiliar locations.

The company has gained much by settling upon a fixed definite number of cars per day to be passed through its paint shop, regardless of the variations in the condition of individual cars. In some instances departments or sub-departments have been relocated and combined, as in the case of a tin shop which was formerly located in a rather dark corner of the plant. This was moved to a location on the north side of the building where no artificial light is required and the division combined with the brass-finishing shop. The productive capacity of the tin shop was increased by using compressed air in operating a metal stamper. Department foremen have been held responsible for the production of fixed numbers of specific jobs in a given time and a long series of studies has been made of the time which should be required to turn out a given piece of work. Finally, by the introduction and steady extension of piece

work the men have in general found it possible to earn substantial increases in wages and the company has gained through the production of a much larger volume of repairs and maintenance work per unit of labor expended.

### CRITICISMS OF INTERURBAN RULES REQUESTED

The report of the committee on interurban rules, presented at the annual meeting of the American Street & Interurban Railway Transportation & Traffic Association in October, 1908, has been published by the association in booklet form. In a letter addressed to the general managers of member and non-member companies, accompanying the booklet, President C. Loomis Allen says:

This tentative code was not distributed to the member companies before the convention, consequently those attending the convention were not sufficiently familiar with the code submitted to enable them to intelligently discuss the rules in detail. It was, therefore, decided that the association should print this code in pamphlet form, giving it as wide a circulation as possible, with the view of obtaining criticisms and suggestions. With these in mind the committee was to revise the code again, with the object of making it standard for interurban operation throughout the country.

We would respectfully request that you send to the secretary such criticisms as a careful study of the matter would lead you to make. If a satisfactory code is to be formulated it can only be done with the hearty co-operation of the managers of interurban properties, and we earnestly suggest the great importance of this question and urge that you give it your personal attention.

Replies should be sent directly to the secretary, 29 West Thirty-ninth Street, New York, not later than May 10, 1909, in order that the committee may have sufficient time to properly consider the many suggestions it is hoped will be received.

### PAMPHLETS ON ASSOCIATION WORK AND THE FARE QUESTION

Some pamphlets have been issued by the American Street & Interurban Railway Association relating to the work of the association and to the fare question. These contain articles by James F. Shaw, the president of the association, and by W. Caryl Ely, former president, discussing, respectively, the future and the value of the association; and articles on "The Reasons for Increased Fares on Massachusetts Street Railways" and various other articles and several editorials dealing with the financial situation confronting urban railways in several sections of the United States, all reprinted from recent issues of the *ELECTRIC RAILWAY JOURNAL*.

Another pamphlet gives "Facts of Interest Regarding the Membership of the Association." This states that "up to Feb. 15, 1909, annual dues have been received from 162 old companies, as against dues from 101 companies to the same date a year ago. In the same period 136 old associate members have paid their 1909 dues, as against 77 for the corresponding period of last year."

A list of the new active and associate members is given. The long list of new associate members shows their business connection and, if directly associated with railways, the department to which they belong.

A bill was introduced in the Prussian Diet on March 27 to empower the Government to spend \$56,000,000 on the extension, completion, improvement in equipment and partial electrification of Prussian railroads. The construction of a number of branch lines also is to be undertaken.

## RAIL CORRUGATION GRINDER USED IN PHILADELPHIA

The Philadelphia Rapid Transit Company has recently placed in service a rail corrugation grinder invented by H. B. Nichols, engineer of way. The machine, which is shown in the accompanying views, is the result of two years' experimental work and has proved so successful that several others are under construction. In speed it has been found at least four times as fast as hand grinders, and as workmen's fatigue is not a factor, its grinding is absolutely uniform. The machine now in use weighs 3800 lb., but is so constructed and balanced that it is easily removed and replaced in less than a minute by two or three men; consequently it offers no obstruction even if used in the daytime on lines with comparatively heavy traffic. It is arranged, however, with incandescent lamps for night operation as required. The new model will weigh 3500 lb., which is believed to be the most practicable minimum consistent with substantial construction and steady running.

As shown in the accompanying views, the grinder consists essentially of a grinder carriage or brickholder, the motor mechanism, the supporting truck and a pair of large wagon wheels to move the equipment when the grinder is not on the rails. The grinder carriage is mounted on one end of the truck and the motor on the other. The machine is held in proper vertical trim by an outrigger provided with wheels for the mate rail. A metal track brake forced down by a toggle joint lever prevents creeping on grades, but on level track the oscillations are so slight that they simply act as a shock absorber. The following paragraphs explain the construction and operation of the grinder in detail.

### SUPPORTING TRUCK

The supporting truck, which is centered over the rail to be ground, is a channel iron frame 18 in. wide with two main wheels which are laterally adjustable to permit the

that the bricks may be tilted to correspond to the level of the rail head. While the frame has only the horizontal reciprocating motion, the cast-iron block therein also has end guides for vertical movements.

It is Mr. Nichols' belief that flat grinders offer the only practicable solution and that wheel grinders are not effective for this work. He is therefore using special grinding bricks, which are clamped in sets of four between an abutment at one end of the inner brass frame and a vertically wedged plate at the other end. The bricks are of



Fig. 2—View of Motor End and Outrigger

such length that when placed  $\frac{1}{2}$  in. apart the grinder carriage has a stroke of  $24\frac{1}{2}$  in. The weight of the grinder carriage is 675 lb. and the pressure on the bricks is about 21 lb. per square inch. A cam lever is provided to raise the grinder carriage so that the bricks will not strike the pavement when the machine is taken off the track. Vertical screws are used to take up the wear of the bricks, and in general adjusting means are provided for all other parts subject to wear. The brick interstices previously mentioned serve for spillways, the grindings being washed off by pouring water through the carriage from time to

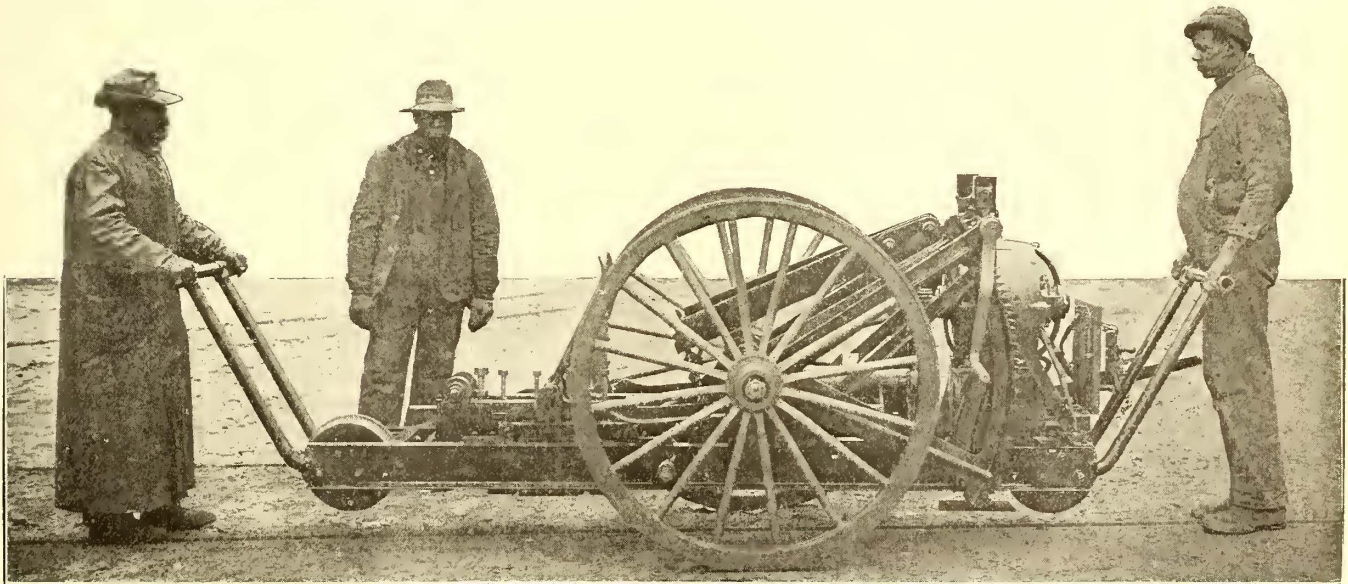


Fig. 1—Centering the Supporting Truck Over the Corrugated Rail

grinding of off-side rails on sharp curves. The ends of this truck are provided with push bars to propel the equipment whether on or off the rails.

### THE GRINDER CARRIAGE OR BRICKHOLDER

The grinder carriage, as shown at the left of Fig. 1, comprises a hollow slide frame and a cast-iron block reciprocated by the motor mechanism. The grinding bricks are held in an adjustable brass frame so pivoted at the bottom

time. These flat grinders are made of a carborundum mixture which contains such hard crystals that some of the abraded metal is taken off the rail like shavings from a metal planer.

### DRIVING MECHANISM

The driving mechanism requires only a 3-hp motor which has a rawhide pinion meshing into a cut gear. This gear is keyed to a shaft with a male cam block reciprocating

the rod connected to the grinder carriage. The development of this cam block is that of a harmonic curve—that is, the reversal occurs under zero conditions of momentum. The grinder carriage at starting is accelerated through about one-third of the stroke, has a constant speed through the middle third and slows to a stop on the last third. This method of reciprocation avoids sudden jerks, which would break the grinding blocks.

#### OPERATION OF THE GRINDER

When the grinder is to be placed in service the wheels of the supporting truck are centered about 6 in. over the

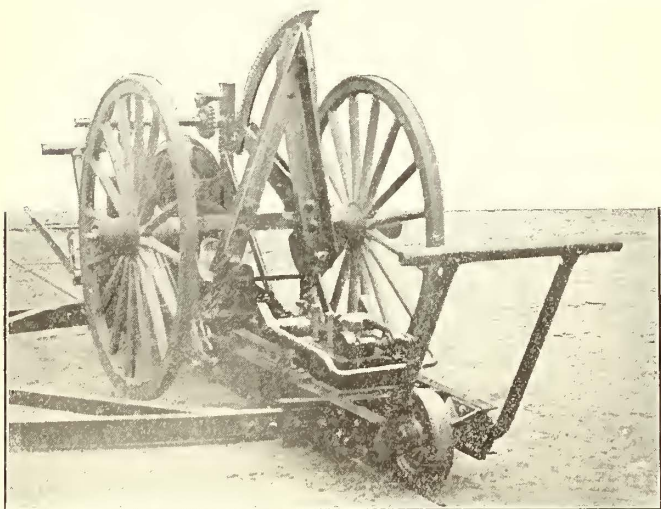


Fig. 3—Showing the Grinder Carriage and Chain Connection to Inverted V-Frame on Axle

selected portion of corrugated rail. The next step is to give a few turns to a large handle, the ratchet of which meshes into the segment of a gear. The latter is directly connected to a cranked axle which is provided with an inverted V-frame having chains secured to the center of gravity of the supporting truck. Consequently the turning of the cranked axle lowers the truck. A final turn of the same handle causes a small cam lever attached to the axle to bear against a roll on the side of the truck, thereby lifting the carriage wheels off the pavement. This prevents the

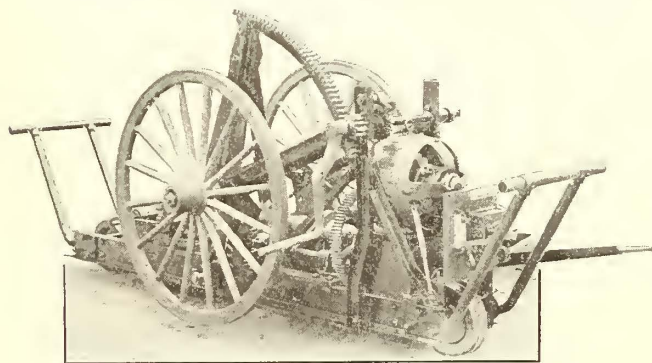


Fig. 4—View of Driving and Lifting Mechanisms

jarring of the large wheels, which are also saved from rattling by guides. The track brake is applied by the lever and ratchet, as shown on the left in Fig. 2, and the grinder carriage is lowered by turning over the cam lever illustrated in Fig. 3. Finally, the trolley connection is made and the motor started.

The machine is taken off the track simply by reversing the foregoing movements. The trolley feed is unhooked, the grinder carriage raised, the brake shoe taken up and

the supporting truck lifted by turning the ratchet handle in the opposite direction. One of the carriage wheels serves as a pivot to swing the entire equipment through 180 deg., as the first turn of the handle sets these wheels on the ground.

The satisfactory results which Mr. Nichols has obtained with this grinder in Philadelphia have led William D. Gherky, of the Heed Building, Philadelphia, to secure from him the rights for using machines of this type in other cities.

#### STORE ROOM PRACTICE OF THE PHILADELPHIA RAPID TRANSIT COMPANY

The Philadelphia Rapid Transit Company owns about 3800 cars, which are operated on the surface lines from 19 operating car houses. Inspection and light repairs to cars are carried out at all of these depots, but heavier repairs are made at one of the two general shops of the company. One of these shops is located in the northeastern part of the city, at the corner of Kensington and Cumberland Avenues, and the other is located in the old car house at Eighth and Dauphin Streets. The methods employed by this company in distributing equipment supplies from the general storeroom, which is also located in the building at Eighth and Dauphin Streets, to the 19 operating depots and to the Kensington Avenue shops presents a number of interesting features.

The general storeroom at Eighth and Dauphin Streets handles all supplies for the mechanical department, the operating department and the general offices. All heavy material for the track department is stored in and distributed from five division store yards, which also carry the maintenance and construction supplies of the department of lines and cables. The distribution of supplies for these two departments is entirely separate from the jurisdiction of the general store keeper and will be referred to briefly later on. Small supplies for the power house, including nuts, bolts, washers and similar manufactured parts, are drawn from the general storehouse when required; but coal, lubricating oil, waste and packing are delivered direct to the power houses, which make monthly requisitions for these supplies to the purchasing department.

The supplies of all kinds for the Market Street elevated and subway division are purchased through the office of the purchasing agent of the Philadelphia Rapid Transit Company, but as this line is a leased property its accounts are kept entirely separate from the accounts of the Philadelphia Rapid Transit Company, and its supplies are handled through a separate storehouse.

The Philadelphia Rapid Transit Company carries on its books only two accounts for supplies. One of these is the general supply account covering all of the material handled through the general storehouse at Eighth and Dauphin Streets; the other is a similar maintenance of way supply account covering all track material, also material used by the department of lines and cables. As material is purchased and placed in stock in the general storeroom, its cost is entered under the general supply account, which is carried as a capital liability on the balance sheet. Each month the disbursements from the general storehouse are deducted from this general supply account and charged directly to operating expenses, being divided among the several sub-headings of this general account, according to the use to which the material drawn out was put. The cost of coal, oil and other power-house supplies is charged

directly to operating expenses as delivered. At certain times, when a shortage of coal is threatened, large surplus stocks of coal are purchased ahead of requirements and a special capital account is opened on the books. As the surplus coal is used up its value is charged off to operating expenses against this special coal account.

The general storeroom at Eighth and Dauphin Streets is the central distributing point for all supplies required by the mechanical and operating departments. It is in charge of a general storekeeper, who reports to the purchasing agent. At the Kensington Avenue shops a branch storeroom is maintained under the direction of a storekeeper. This branch storeroom carries a stock of all supplies needed for the manufacturing and repair work carried on in the shop, but no supplies are issued from it direct to any of the operating depots. No stocks of such material as armature and field coil wire, paint and other supplies used solely in manufacturing and heavy repair work are carried in the Eighth Street storehouse. A complete stock of manufactured parts, however, is kept on hand at this place ready to be issued when required to any of the operating depots. All these rolling stock supplies and miscellaneous car house and office supplies, such as lanterns, brooms, fire buckets, stationery, ink, etc., are kept in stock at Eighth Street, and here also is kept the paper supply, which is issued from time to time to the printing department for use in printing transfers, tickets and office stationery.

An effort is made to limit the stock carried at each of the operating depots to an amount required for ordinary maintenance for not more than one week. Such supplies as are issued are charged to the car house foreman, who is responsible for their proper care and use. Each depot is provided with its own supply car, and a schedule has been arranged for the cars of all depots so that they make regular trips once each week, arriving at the Eighth Street storeroom at a fixed day and hour. When supplies are needed for an emergency these cars, of course, make special trips. The storehouse has a special freight car for its exclusive use. This car, which has a capacity of 30 tons and is mounted on double trucks, resembles a standard railroad box car, and is used for hauling the supplies from the railroad freight yards, with which the Philadelphia Rapid Transit Company has track connections, to the storehouse and for distributing supplies from the Eighth Street storehouse to the branch at the Kensington Avenue shops.

The keynote of the system of issuing supplies on this road is the requirement that for each new article delivered one worn-out or broken article of the same description shall be returned to the storeroom. This requirement covers all such parts as journal bearings, controller handles, trolley wheels, trolley catchers, brooms, oil cans and tools, ink bottles, and, in fact, anything which has a scrap value. Cast iron and malleable iron parts and such supplies as paper, waste, oil, brake shoes, etc., which are completely worn out or used up, or which have a comparatively small scrap value, are not subject to this requirement. It is not practical, of course, to actually charge up against the head of a department or any of the employees under him the scrap value of an article not returned, but a very effectual check against the abuse of the general requirement has been devised. The purchasing department requires that a requisition for new material which is not accompanied by the full number of scrapped articles to be turned in must be signed person-

ally by the head of the department making the requisition. If 12 new trolley wheels, for example, are ordered and only 11 are returned, the assistant general manager, who is the head of the mechanical department, must personally sign the requisition before it will be filled by the storekeeper. Any carelessness on the part of the depot foreman in collecting scrap is thus brought to the attention of the head of the department, and an investigation can be made as to the reason for the shortage. This plan has another advantage: it requires the prompt return of scrap material to the scrap bins at the Kensington Avenue shops. No scrap of any kind is allowed to accumulate in the operating depots, and as a result the total amount of scrap returned is much larger than before the plan was put into effect. All scrap of small value, which is not required to be returned with requisitions, is collected at

frequent intervals and shipped to the scrap bins for sorting and ultimate disposal.

The scrap bins at the Kensington Avenue shops are in charge of an inspector of the mechanical department, who acts as agent for the storekeeper in checking the quantities of scrapped material returned with requisitions. This man sorts over all kinds of scrap material turned in and makes a special study of broken parts for the benefit of the

Phila. Rapid Transit Company.	
RECEIVED FROM	
	<i>Depot</i>
Broken or worn out; to be replaced on requisition from Division Superintendent for same class of material.	
	Head of Department.
	190
This Credit to be Accepted in lieu of Old Material.	

#### Credit Ticket for Scrap Turned In

mechanical department, which is thus enabled to discover the nature of failure of parts of the equipment and to take steps to prevent them. The scrap inspector also sorts out all broken parts which can be repaired or utilized in any way in the manufacturing work in the shops. All bolts, nuts and screws turned in as scrap are tumbled in a foundry tumbler, which cleans off all mud and oil, and they are then sorted and picked over. Bolts with defective or worn-out threads are recut and put in stock, and perfect nuts, screws and washers are also returned. Bent or kinked trolley poles are straightened by heating and passing through a pair of grooved straightening rolls. Such wrought-iron rods and bars as can be straightened or welded and used again are sent to the smith shop and later put in stock. Once each month the company receives bids from junk dealers for scrap material on hand and makes a practice of disposing of all of it from month to month for the highest prevailing market prices. None is held as a speculation for higher prices.

In connection with the return of scrap, a credit system is used which allows all scrap to be promptly shipped to the Kensington Avenue scrap bins before new material is issued in its place. For all valuable scrap turned in without a requisition calling for an equal amount of new ma-

terial, a credit card is issued by the general storekeeper on memorandum of the scrap inspector. One of these cards, which are 4 in. x 6½ in. in size, is reproduced in an accompanying engraving. At any subsequent time the credits shown on these cards are accepted in lieu of old material when drawing new supplies. A credit card for six trolley wheels returned, however, is good only for six new wheels, and cannot be applied, for example, on a requisition for journal bearings.

In making out requisitions for car equipment supplies to be furnished the operating car houses, the requisition must be signed by the division superintendent and one of the five mechanical inspectors who have general charge of the inspection and light repair work in all of the 19 depots. They must state the number of articles wanted, the purpose for which used and the number of scrap articles returned, or the credit slips returned. If scrap is missing, the requisition must be signed personally by the assistant general manager, as before explained. These requisitions are forwarded to the general storehouse two or three days ahead of the scheduled trip of the supply car, and as far as possible they are filled in advance of the arrival of the car and are ready for loading without delay. The supply car goes first to the scrap bins at the Kensington Avenue shops and delivers any scrap which has accumulated during the week or which is to be credited on requisitions. The scrap inspector takes an accurate check count of the scrap delivered and issues a memorandum of the amount, which memorandum the crew of the supply car must deliver at the general storehouse before the new material called for will be delivered. This memorandum is checked against the requisitions on file in the storekeeper's office, and any shortages in scrap are deducted from the amounts of new material delivered.

When requisitions which cannot be filled from stock on hand are received from any of the operating depots at the general storehouse, the storekeeper makes out a requisition on the purchasing department, which immediately places an order for the material needed. The unfilled depot requisitions are kept on file until the necessary stock is delivered to the storehouse, when they are filled and transferred to the permanent files of requisitions.

The printed requisition blanks used by all departments for ordering supplies have spaces provided for entering on them opposite the name of the article ordered the price per unit quantity, and the total value of the stock ordered. In filling the order the storehouse attendants enter on the requisitions as the articles are removed from the storage bins the unit price, which is taken from the stock ticket kept in a holder over the bin. A clerk in the office of the purchasing agent checks these entries of unit prices and enters on the requisitions the total amount. Each day the requisitions received from each of the depots are gone over, and the articles ordered are segregated under four general heads, according to the use to which they are put, namely, motor repairs, car body and truck repairs, cleaning and supplies, and miscellaneous maintenance of equipment. The total value of each class of supplies issued on that day to each operating depot is entered on a daily distribution report, which is sent to the office of the assistant general manager. This report shows in condensed form the amount of supplies drawn by each of the depots and enables the assistant general manager to keep close check on the expenditures of his department for maintenance. Once a month the total value of the supplies drawn by each of the operating divisions for main-

tenance of equipment and other expenses is entered on a summary sheet, which is turned in to the general manager's office. The expenses of each depot are classified under the following seven heads: Motor repairs; car body and truck repairs; cleaning and supplies; miscellaneous maintenance of equipment; depot expenses; miscellaneous transportation expenses, and light account. Space is provided for entering the total mileage made during the month by the cars operated on each division, and also the total number of motors in service at each depot. The total cost of supplies for the month is shown on this sheet for each depot, and also the unit figures of cost per car-mile and cost per motor.

The cost accounting of the manufacturing operations in the Kensington Avenue shops is very simple. When the stock of any manufactured article in the storeroom gets low the storekeeper makes out an order on the mechanical department to manufacture the required number of new pieces. The mechanical department draws from the Kensington Avenue branch storeroom the required amount of raw material to fill the order. The labor cost of manufacturing the material is charged directly to operating expenses without being entered in the general supply account. As the manufactured supplies are issued to the depots for maintenance purposes, the value of the raw material only which was drawn for use in their manufacture is charged against the general supply account. No complicated bookkeeping is involved in this plan. The storekeeper is very careful to make sure that for a given amount of raw material issued for manufacturing purposes an equivalent number of manufactured articles are returned to stock. Any discrepancies are carefully investigated and the charges adjusted.

The storekeeping methods and blank forms described above are the result of many years of study and earnest effort to reduce the inherent evils of a large storeroom as much as possible.

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#### JOINT COMMITTEE ON ACCOUNTS, ENGINEERING AND ACCOUNTANTS' ASSOCIATION

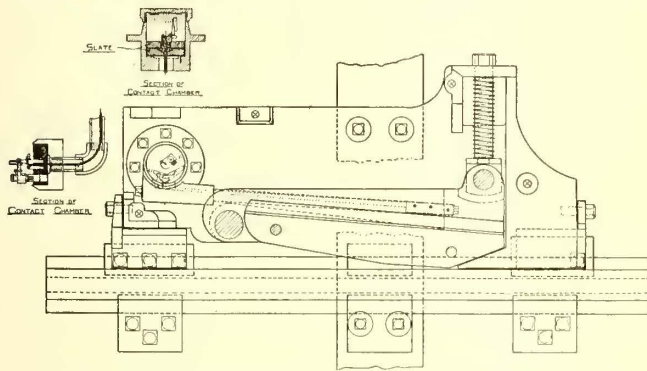
The joint committee on accounts, the appointment of which was directed at the last annual meetings of the American Street & Interurban Railway Engineering Association and the American Street & Interurban Railway Accountants' Association, has been named. R. N. Wallis, president of the Accountants' Association, has appointed the following: C. L. S. Tingley, vice-president, American Railways Company, Philadelphia; F. B. Lasher, Mohawk Valley Lines, New York; P. S. Young, comptroller, Public Service Corporation, Newark, N. J. Paul Winsor, president of the Engineering Association, appointed the following: Wm. G. Gove, superintendent of equipment, Brooklyn Rapid Transit Company, Brooklyn, N. Y.; Chas. Hewitt, superintendent of motive power, Philadelphia Rapid Transit Company, Philadelphia; John Lindall, superintendent of rolling stock and shops, Boston Elevated Railway, Boston. Mr. Gove has been named as chairman of the joint committee.

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A scheme has been prepared for an electric railway from Tiflis to Vladikaukas, a distance of about 130 miles. It will cross the Caucasus range through the Kvinamski Pass. A daily service of 20 freight trains and passenger service of eight trains every 24 hours will be given.

### SIGNAL CONTACT MAKER FOR THIRD-RAIL SERVICE

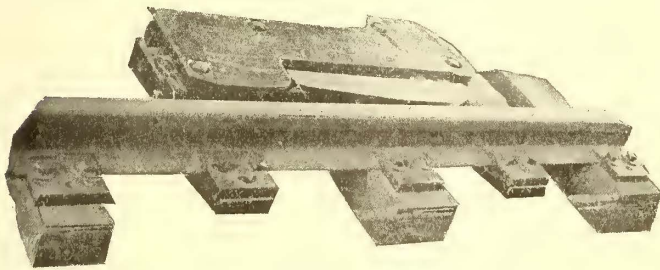
The United States Electric Signal Company, of West Newton, Mass., has recently perfected a track type contact maker intended for third-rail installations and other roads where an overhead contact would be inapplicable. The principal object sought in its design was to prevent moisture from penetrating the contact chamber through packed openings or bearings. The contact maker illustrated is 33 in. long and 14 in. wide. It consists of a bed plate with bracket extensions for attachment to the rail,



Signal Contact Maker for Third-Rail Service

a movable shoe, and a contact chamber containing the movable contact mechanism. The shoe is secured by a pivot at one end, its other end being free to move when operated by the flange of the car wheel passing between it and the rail.

The contact chamber has a pipe, which extends out from the bed plate to which it is secured. This pipe contains a lever which fits rigidly a short distance into the outer end of the pipe, and is tapered from there to the contact chamber. The pipe lever, being carried loose in this manner, will not bend when the surrounding tube is bent. Since the tube has one end attached to the stationary contact chamber and the other to the movable end of the shoe, it must bend whenever the shoe is actuated. The inside lever, however, will be deflected only at the small end in the chamber, to which the movable contact is connected. This action will cause the movable contact to move from



Signal Contact Maker in Track

its normal position, and thereby touch the stationary spring carrying the connecting wires from the signal box.

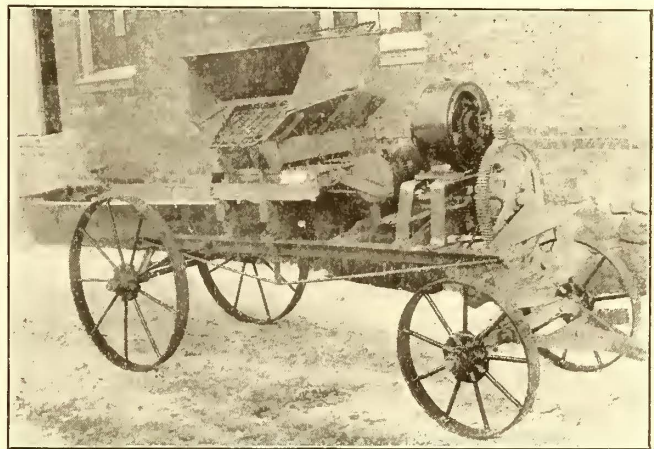
The tube is sealed at the outer end by a cap and at the inner end by being screwed into the contact chamber with leaded threads, as for steam fitting. The cover for the contact chamber is also screwed down with leaded threads, making it completely watertight. The operating wires leading from the contact chamber are run through a gas pipe similarly threaded into the contact chamber and reaching underground to the signal box. The entire contact maker is protected by a cover which leaves exposed only the narrow gap needed for the flange contact.

The shoe has a cold-rolled, case-hardened steel wearing

surface, which is interchangeable and inexpensive to replace. The bracket extensions on the bed plate which secure the switch to the rail are adjustable to accommodate the various heights of standard T-rail, and are bored and set to adjustment at the company's factory from the customer's sketch of dimensions.

### MOTOR-DRIVEN CONCRETE MIXER

The Cement Machinery Company, Jackson, Mich., has recently perfected an attachment by which an electric motor of any desired capacity and type can be used to drive a Systematic concrete mixer. By reason of this attachment the mixer is especially suited for electric railway work and in other places where electricity can be obtained for operating the motor. Power is supplied through an improvised lead, tapped to a commercial feed wire or trolley wire. The application of electric motor drive to concrete mixers mounted on trucks and wheels has, it is thought, never before been attempted, though the use of electric motors on stationary mixing plants is quite common. The Systematic mixer is usually provided with either an Ideal or an International gas engine, but when it is desired to use electric power the metal housing and the



Motor-Driven Concrete Mixer

gasoline engine are removed and steel standards on which the motor is mounted are attached in their place.

The accompanying engraving shows a standard motor-driven concrete mixer furnished by this company for the Brazilian Government at Rio de Janeiro. This mixer has high wheels, low hoppers, chainless and springless mechanism, and its initial cost is low. It is made in various capacities and can be used wherever high-grade continuous-batch concrete is desired.

The frame of the mixer is built of trussed 3-in. angle iron, and the bolsters are built of heavy cast iron. The cement and the sand and gravel hoppers are also constructed of cast iron. There are three of these hoppers, one on each side of the machine, and the third at the top and center. Either outside hopper can feed anything from a 98 fineness up to 3-in. in diameter. The center hopper can be used for cement, coloring material, lime, waterproofing compounds, or anything of like fineness. With these three hoppers any desired mixture can be delivered to the barrel of the machine. When the mixer is mounted on trucks having 24-in. front wheels and 36-in. rear wheels, the side hoppers are raised only 42 in. above the ground. The end from which the mixed product is discharged is 23 in. above the ground in the standard machine, but this

height can be regulated by using different sized wheels. The wheels are wrought iron, mounted on rolled steel axles.

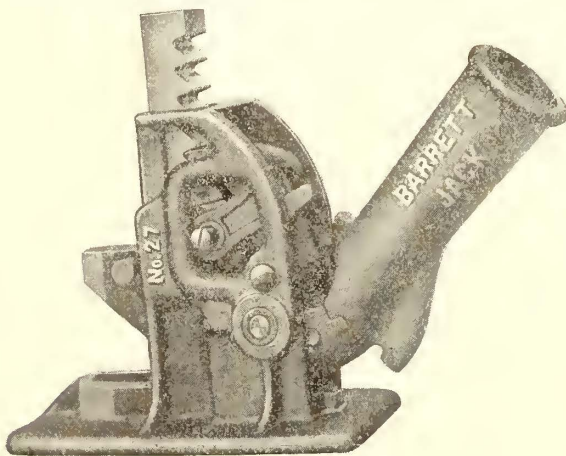
The mixing barrel, made of one piece of No. 10 gage steel, is 5½ ft. long (without the 1-ft. hood), 20 in. wide at the top, and 14 in. wide at the bottom. Its mixing paddles are arranged so that the mixture is turned forward and backward and thoroughly mixed before reaching the end from which it is discharged. The material is delivered to the barrel by an accurate and positive oscillating box feed, which feeds from each of the hoppers continuously to produce a uniform proportion. The feed is regulated by a "proportioner," which is a slide type of valve fitted at the bottom of the feed hopper and capable of delivering a mixture proportioned from 1:1 to 1:20. Locks are provided for locking the proportioning slides, thus making it impossible to change the mixture inadvertently. The mixing barrel has at the bottom double-hinged doors, 6 in. x 18 in. in size, which can be opened to allow the barrel to be cleaned quickly in emergency cases, but under normal conditions the machine is self-cleaning. These mixers are built for capacities ranging from 30 to 150 cu. yd. a day and vary in weight from 1600 lb. to 2400 lb.

The Systematic mixer also has proved satisfactory as a mortar mixer. Many of these machines are now used in New York and other large cities for mixing the mortar for the construction of large buildings. When the mixers are used for mortar the feed boxes and hoppers are not required.

The builder of this machine is also the pioneer manufacturer of the adjustable Monarch concrete block machine, the New York face-down and side-face block machine, the Normendin, the Peninsular, the Camaco, the Model and wide-range concrete block machine, the Favorite mechanical tamping sand cement machine and several other types of cement produce machines. The company has been established since 1900.

### A NEW TRACK JACK FOR THIRD-RAIL ELECTRIC ROADS

The accompanying engraving illustrates a new type of Barrett track jack of special design, which is intended for use on lines equipped with third-rail. With a third-rail located close beside the track rail there is danger in using



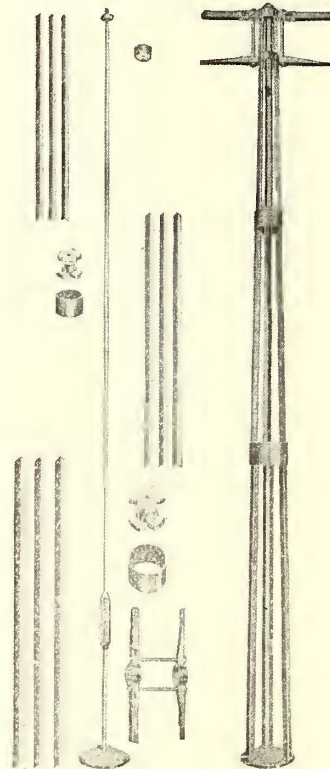
Track Jack for Third-Rail Lines

the ordinary type of track jack, which must be placed on the outside of the track rail, because the handle or lever may come in contact with the third-rail and cause a serious short-circuit. The new jack illustrated is built very low, so that it can be used inside the track rails with perfect safety. When the jack is dropped the top is 2 in. below the lowest

point of locomotives or cars, and it is not necessary, therefore, to remove the jack to allow a train to pass. This allows track work to be done without sending a flagman a long distance back and holding up trains until the jack can be removed. The jack has a good raise and embodies all of the superior operating and constructional features of other types of Barrett jacks. It is made by the Duff Manufacturing Company, Pittsburg, Pa.

### SECTIONAL STEEL POLES

The Sciple Sectional Pole Company, Minneapolis, Minn., has brought out some novel designs of steel poles made of various steel shapes to form a strong though light and



Parts and Assembled View of Sectional Steel Pole

symmetrical framing for railway and transmission lines. The type shown in the accompanying illustration is composed of three sets of steel angles, the abutting ends of which are received by a recessed cast spool. The angles and spool are held in place by a band slipped over the spool and longitudinal angles. At the top the converging angles enter a recessed cap. The rigidity of the pole is maintained by an inside turnbuckle tie rod extending from the base to the cap. These poles are practically steel towers, and as such they can be designed to meet any conditions of load and wind strain. They can be erected with very little apparatus, as the joint provides a strong connection without bolts or rivets. The ordinary types of cross-arms may be attached to this pole with clevis bolts, but the manufacturer is prepared to supply the special design shown. The weight of the latter cross-arm comes squarely upon the top instead of on the side of the pole.

### REMARKABLE SUCCESS OF UNUSUAL THERMIT RAIL WELDS

The ELECTRIC RAILWAY JOURNAL of June 27, 1908, contained a detailed description of some novel thermit rail welding done for the Union Railway Company, of New York. This work consisted in making 125 welds on a very shallow rail used in asphalt paving on and near the Central drawbridge at West 155th Street and Sedgwick Avenue, New York. During the following August the Goldschmidt Thermit Company also welded in its factory a number of compromise joints between the shallow bridge rail and the standard girder rail used at the approaches.

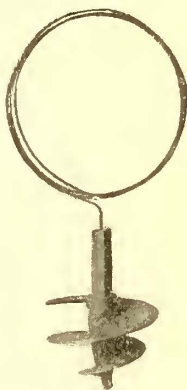
As both types of welds were of great interest in proving the adaptability of the thermit process for unusual conditions, it was determined recently to inspect their service behavior in company with J. D. Kent, chief engineer of the Union Railway Company. This investigation



showed that every weld was perfect. In fact, Mr. Kent stated that not a single defect had appeared since the original installations. The only change that has been made was required by the transfer of the eight lift pieces from the bridge to the roadway. Lorain guides are used at the drawbridge ends to prevent the flanges of jumping car wheels from tearing up the asphalt.

### A NEW GROUNDING DEVICE FOR LIGHTNING ARRESTERS

Much attention has been given by electric railways to providing efficient lightning arresters for the protection of transmission lines, but not so much attention has been given to improved methods of conducting high frequency lightning discharges, as well as low-voltage battery current, to the ground. The Delta Electric & Manufacturing Company, Chicago, Ill., has developed the Universal non-inductive ground, which, it is claimed, possesses many advantages over the grounding devices commonly used. The Universal non-inductive ground consists of a cast-iron screw point covered with a copper coat. It can also be made of solid copper. The screw point, which is illustrated, can be made in any size desired, and is so constructed that it may be screwed down into the ground by means of a specially devised wrench to moist earth, or to any desired depth. A copper lead of either bare or covered wire is soldered to the screw point for connection to any type of lightning arrester. It is designed to replace the expensive copper plate grounds usually used, and is guaranteed to provide an absolute non-inductive low resistance course to the ground. It can be installed in less than 20 minutes with a nominal cost for labor, and is readily placed in position where the digging of holes is not feasible.



Screw Ground-Plate

### STEEL CATENARY BRIDGES FOR ROCHESTER, SYRACUSE & EASTERN RAILROAD

The Rochester, Syracuse & Eastern Railroad, of which Thos. H. Mather is chief engineer, has purchased steel bridges for supporting the catenary trolley construction on the extension now being built from Port Byron to Syracuse. These bridges will be of the same design as the bridges used on the Syracuse, Lake Shore & Northern from Baldwinsville to Phoenix and Fulton. This type of structure was developed from the earlier type used on the Syracuse, Lake Shore & Northern from Long Branch to Baldwinsville. Owing to the recent drop in the price of steel it was found after comparing the cost of the catenary overhead construction complete, using these bridges, with the cost of a similar construction using wooden poles and span wires, that the difference was only about \$500 per mile of double-track road, and it was therefore decided to use the bridges.

The bridges are to be set 300 ft. apart on tangents, and on curves the spacing is reduced to 200 ft., and pull-off poles will be used where required. The standard height of the trolley wire is 18 ft., and the bridges are 28 ft. center to center of bents. Wooden pole construction is used on the Rochester, Syracuse & Eastern for about 62 miles of double-track road, and the equipment of steel bridges ordered will be used on the completing link between Roches-

ter and Syracuse. Anchor bridges are placed only where, on account of running into city or village streets, the construction changes from catenary trolley to ordinary trolley. These bridges are to be manufactured by the Archbold-Brady Company at its shop in Syracuse.

### CAR WASH DISINFECTANT

Palustrol is a disinfectant made by Fred C. Adams, Chicago, Ill., for preventing the spread of disease. It has been used for several years past by many railway companies for deodorizing and cleansing street cars, railway buildings and other public places. The manufacturer states that when Palustrol is properly used it prevents contagion and leaves a clean and wholesome odor which is more pleasant than that left by coal tar and similar disinfectant products. It is asserted that this disinfectant does not adhere disagreeably to the clothing of people frequenting the places purified by its use. This cleanser is principally an essential product of pine oil, and as such has a pleasant odor. It is actively volatile and evaporates quickly. Since this product is a non-poisonous, non-corrosive preparation, it can be used with impunity. It is used in the proportions of 1 part Palustrol to 100 parts water, and is applied either as a spray or as a wash. In the proportions given, this preparation makes an inexpensive disinfectant, costing less than 2 cents a gallon.

### ANTI-FRICTION BRONZE FOR ARMATURE AND JOURNAL BEARINGS

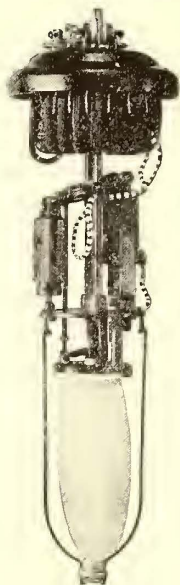
Thomas Paulson & Son, of Brooklyn, N. Y., are planning to exploit on a larger scale than before their anti-friction bronze, which has been used for all classes of bearing service for over 25 years. The company has made a specialty of this alloy, which it states will not cut or otherwise injure the journal nor require as much machining as phosphor or other bronze bearing metals. Special stress is laid on its high tensile and crushing strength, for satisfying the extreme demands of high-speed electric railway service. This composition is now used in many kinds of machine and automobile work with successful results. The company also is prepared to furnish babbitt metals of any desired composition for special purposes. In addition, it conducts a department to do a general foundry business, including the making of all kinds of castings in copper, aluminum, brass, zinc, phosphor and manganese bronze.

### SPECIAL LAMPS FOR RAILWAY AND MACHINE SHOP SERVICE

The Clark Incandescent Lamp Company, Detroit, Mich., has brought out an incandescent lamp which is especially suited for cars, machine shops and other places where lamps are subject to severe vibration. The novel features embrace the use of a heavier filament and a thicker bulb. The reinforced filament serves to delay materially the inevitable loss in illuminating power and the stronger bulb is of particular value in situations where wire guards are impracticable. These lamps are made in all standard sizes from 2 cp to 50 cp, inclusive, and with bulbs of any desired coloring or frosting. The finished lamps are divided in two grades, the "Detroit" type representing those which have passed the highest tests, and the "Peninsular," those which have fallen a little short of the mark, although made of the same materials.

### AN ARC LAMP FOR 25-CYCLE CIRCUITS

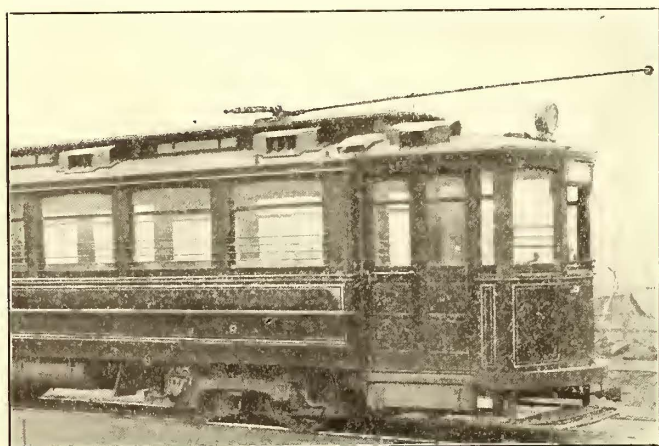
Heretofore the only low-frequency enclosed arc lamp available has been a modification of some lamp designed for higher frequency circuits, such modifications consisting of the use of extra or more flexible springs to take up the extreme vibration of the mechanism. A construction embodying the use of very light springs is decidedly questionable, as such springs must stand the strain caused by the inrush of starting current. To meet the severe conditions involved in the operation of such lamps the General Electric Company has brought out the lamp shown in the accompanying cut. The frame is of the well-known two-rod type, and the mechanism consists of a rocker frame carrying the lamp magnet and a suitable current-adjusting counterweight. The armature is of the standard laminated type construction, but is stationary and held rigidly to the lamp base casting. By the use of this considerable weight in the moving element and by making the armature a mechanical part of the lamp frame, all objectionable vibration is absorbed or deadened, thereby permitting the elimination of all springs. The lamp is said to be as quiet and free from vibration in starting and operating as standard lamps for higher frequencies. Where this lamp is to be operated on 220-volt or 440-volt circuits an external as well as internal compensator must be used, and a third binding post placed on the lamp top. For nominal 110-volt circuits the lamp is self-contained.



25-Cycle Arc Lamp

### ELECTRIC CAR VENTILATOR

The General Railway Supply Company, Chicago, Ill., is now placing before a wider clientele the Garland car ventilator, a device which has been extensively used on steam railroads for several years, and more recently has met with favor on some large electric railways. This ventilator was designed by T. H. Garland, general agent of the



Ventilators on Chicago Railways Company Car

refrigerator service of the Chicago, Burlington & Quincy Railroad at Chicago. It is constructed upon the aspirator and injection principle, and is made of No. 24 galvanized iron. It is 30 in. long and 18 in. wide, and is formed to fit the curvature of the roof. Two flaring ducts, one opening

toward the front and one toward the rear of the car are provided with each ventilator. These lead into a main exhaust duct, one end of which opens through a deck window into the car and the other toward the edge of the roof.

The action of the ventilator is governed by the motion of the car. When the car is running, air is forced into the forward flaring duct and is directed by its sides towards the outer opening of the main exhaust chamber. In passing through this chamber a partial vacuum is formed



Section of Roof Ventilator and View as Installed

and the vitiated air is drawn from the top of the car, and in turn is carried to the outer end of the duct. The current of the outside air in passing over the mouth of the main duct also forms a partial vacuum at its outer end, and likewise sucks the air from the inside of the car.

In order to replace the vitiated air drawn out, intake ducts are placed at the corners of the car. The air from these ducts is carried to small diffusing drums which are constructed around electric heaters under the car seats, by means of which the air is warmed. Four intakes are also provided in the floor near the center of the car. These connect with air-gathering ducts which are located under and at the sides of the car. The air entering through these ducts is directed to the heaters, through which it passes and is diffused. By this method no cold air is distributed inside of the car and no drafts are created.

Tests made on street cars show that each ventilator will exhaust about 100 cu. ft. of air per minute. The manufacturer recommends that three of the standard-size ventilators be installed on each side of the monitor deck and two smaller ones be placed in each vestibule. By this arrangement from 50,000 to 60,000 cu. ft. of air per hour is exhausted. The intake ducts will supply an ample quantity of air for all requirements of ventilation.

The new cantilever bridge over the East River at Blackwell's Island, connecting New York and Queens, was opened for traffic on March 30. The bridge cost \$20,000,000 and has a main span 1182 ft. long; its total length, including approaches, is 7636 ft. Four trolley tracks have been built on the roadway deck and two elevated tracks above. The carrying capacity is estimated to be 125,000 passengers per hour.

The Keihan Electric Railway is building the third and longest electric railway in Japan. Its object is to link the former capital of the country, Kyoto, with Osaka. The total length of the new line is 30 miles, with a double track throughout its entire length, and the generating plant has a total power of 2550 kw, made up of three 850-kw turbo-generator sets. The electrical work is being done by Dick, Kerr & Company. The turbines are being built by Willans & Robinson, and the boilers by Babcock & Wilcox. The cars are being built. The line is to be standard.

## LONDON LETTER

[From Our Regular Correspondent.]

As stated in the *ELECTRIC RAILWAY JOURNAL* recently, the Board of Trade has communicated with the various municipalities and companies operating tramways, advising them to equip their cars with speed indicators, but not compelling them to put an indicator on each car. The Tramways & Light Railways Association has taken up this question with the Board of Trade, and is desirous of securing information as to experiments with indicators, as from results already obtained the association does not consider that any satisfactory speed indicator has yet been produced. The association states also that the recommendation of indicators in the old "steam" days was practically a dead letter, and that, considering the enormous number of passengers carried annually and the few fatal accidents, no case has been established for the adoption of the instrument. The objection is also made that the indicator would only increase the burdens of drivers.

An interesting paragraph in a London contemporary calls attention to the number of pennies handled by the London County Council Tramways in a year. The figure is put at 200,000,000, giving an average of more than 500,000 a day. The British penny is a large coin, and as only one-quarter to one-half of those collected are returned to passengers, the Council has to deal with about four tons of metal in the shape of coins, for the banks will not take them. Consequently, a special department has had to be arranged, whose duty it is to find customers for the coins. This department packs them in parcels of 5 shillings each and delivers them by vans to various customers, chiefly large manufacturers, all over London.

The municipalities of Scotland are stirred by the fact that the North British Electric Power Syndicate has entered into arrangements with various railway companies for way-leaves for cables, the intention of the syndicate evidently being to transmit power from one or more generating stations to factories and works in the vicinity of the various railways. A deputation sent to the Board of Trade was received by Mr. Tennant, Parliamentary Secretary to the Board, who replied that he thought Glasgow was unduly alarmed, but gave no indication as to what his department was prepared to do, remarking that he thought it extremely improbable that any unauthorized body was likely to compete against the municipalities. He suggested, also, that a test case might be made to decide whether railway companies were entitled to authorize the use of their lines for electric cables.

The surface contact system does not appear to be increasing in popularity in England. Wolverhampton and Lincoln may be said to be the only examples which are working satisfactorily. Wolverhampton has quite a large system, and from the annual reports the difficulties there seem to have been overcome, and the system works well, whether as economically as an overhead system it is a little difficult to say. The short system at Lincoln is also satisfactory, but nowhere else does the surface contact seem to have approached satisfaction. Last year it was removed from the Wexborough lines, and in the annual report of the Hastings Tramways the possible dividends of the shareholders have all gone to the maintenance of the two or three miles of Dolter surface contact system which the Hastings Tramways was compelled to install on the front, as the corporation would not permit overhead construction. The Dolter system is also in Torquay, and the Board of Trade has refused to sanction any further extension of the system and is seriously considering whether it will not shortly be compelled to ask that the system be removed. The extension to Paignton will be equipped with the overhead system. As has been frequently noted in these columns, the experiments made by the London County Council on the Bow Road with the surface contact system has not proved satisfactory. The system is not in regular operation, and Mr. Mordey, the expert retained by the Council to report, has been experimenting after midnight with a car equipped with a special condenser to try and obviate the faults.

The London United Tramways, which operates a large system in the western suburbs of London, has suffered a considerable loss in revenue recently. Eight or ten years ago, when the company was started, 8 per cent dividends were paid on the ordinary shares of the par value of £10, but which changed hands freely at £20. For the past few years no dividend has been paid on the ordinary shares, and this year the dividend even on the preferred shares has been reduced to 3¾ per cent, so that the ordinary shares now stand at about £2. The reasons for such depression are, of course, complex, but are ascribed largely to the increased competition of the motor omnibus, the improved services on the old railways and the newer services on the tubes.

The year just ended was anything but satisfactory. Even the Franco-British Exhibition seemed to take away the pleasure traffic which the company has enjoyed in other years. The divisible balance for dividends was only £61,500, compared with £71,700 in 1907 and £92,000 in 1906.

For the last two years or so Oxford has been discussing tramway problems, but no substantial progress seems to have been made. Some little time ago, as the situation seemed to be hopeless, Sir Alexander Kennedy was consulted on the subject, and he has now presented a long report to the City Council with regard to the Oxford Tramways. The dispute centered around surface contact systems, all of the various surface contact companies having presented propositions. Sir Alexander has stated most definitely that he does not think it would be advisable to adopt any one of these systems for Oxford. He advises the City Council to oppose the present bill which the company has in Parliament, and suggests that the corporation get the undertaking back into its own hands and inform the company that the Council is willing to compromise on the question of conduit and overhead systems. Nothing definite has been decided.

The annual official audit by the Local Government Board of the accounts of the London County Council has just been presented to that body for discussion. Dealing with the tramways, the auditor states that they appear to be worked on a very sound financial basis, and that adequate provision seems to be made for all contingencies which are likely to arise. This is in direct contradiction to the view taken by Messrs. Peat and Pixley, which was reported in the *ELECTRIC RAILWAY JOURNAL* last year, and which stated that the London County Council had lost enormous sums in the tramways, a view with which no one else seemed to agree. The present report shows that the receipts of the tramways were more than £1,250,000 during the year, and as the expenditures were less than £750,000, there was a surplus to the credit of net revenue account of over £550,000. The capital expenditures during the year were £3,260,983, and in the discussion on the report Sir John Benn clearly stated that if more money had been spent the necessity for raising the rate recently would have been avoided, as more money would have been earned. The delay alone in electrifying the Mile End Road Tramways, where the experiment with the surface contact system was tried, accounted for a loss of £333,000. A special meeting of the Council is to be held in April to discuss whether the 5½ miles of tramways in Hammersmith (now operated and owned by the London United Tramway Company), in accordance with the provision of the Tramways Act of 1870, shall be purchased.

A. J. J. Pfeiffer, late general manager of Calcutta tramways, who has just returned from India, has opened offices as consulting engineer at Broad Street House, New Broad Street, E. C. Mr. Pfeiffer has had wide experience in traction work, electric light and power transmission in America, India and on the Continent. Among other important undertakings with which he has been connected are the Niagara Falls transmission undertaking and the equipment of the Milan-Varese third-rail high-speed electric railway.

A. C. S.

The benevolent society organized in July, 1900, by the Grosse Berliner Strassenbahn to care for aged employees of the company and for the widows of former members has now 6810 members and a fund of 6,959,594 marks. The report for the year 1908 shows: Income from dues, 381,566 marks, from the company 435,322 marks and from interest 264,485 marks. Since July 1, 1905, when pensions were inaugurated, 165 employees and 44 widows have become beneficiaries. It was decided that after Jan. 1, 1909, the maximum pension should be increased from one-fourth to one-third of the wages on retirement, in accordance with the Government pension law. At the end of the fiscal year the sick benefit society had 10,293 male and 41 female members. This society employed 81 male physicians, 3 female physicians and 55 specialists. There were 7429 cases, with a total of 104,957 sick days. Free medical service and medicines are also given up to a maximum period of 26 weeks to the wives and children of the members. Injuries caused in service involved 658 members for 13,606 sick days. The income of the society from dues, including the balance from the preceding year, was 499,239 marks; from contributions for the care of relatives, 37,008 marks; from interest, 13,895 marks, with additional amounts from other sources, making a total of 600,980 marks. After deducting all expenses there was a surplus of 22,215 marks, of which 10,140 marks was turned over to the reserve fund, which now totals 374,700 marks. A fund is set aside for relief of indigent employees. During 1908 relief was given in 70 cases at a cost of 2761 marks. The employees of the company also had a loan society, which numbers 7800.

# News of Electric Railways

## Cleveland Traction Situation

A meeting of the Council committee of the whole was held on March 29 for the purpose of considering the street railway ordinance introduced on March 22. Mayor Tom L. Johnson presided. After reviewing the matter at some length, and stating that the ordinance merely presented a plan upon which to work, and was not the particular plan of any one so far as details are concerned, he said that the plan is to use the ideas suggested by Judge Tayler and to find some way of putting them into operation. Mr. Johnson then said it was not his purpose to enter into a long discussion, but that he would like to hear from the officers of the Cleveland Railway.

Horace E. Andrews, president of the Cleveland Railway, spoke for the company. He said that he and his associates had spent a week studying the matter, and that they are in favor of the Tayler plan. He said, however, that there are some differences of opinion as to the manner of carrying out the plan, and that Attorney John G. White had been requested to prepare an ordinance which would embody the details that would be favored by the company. Mr. White, however, did not act as the attorney of the company in this matter, but prepared the ordinance largely upon his own convictions. To a large extent it follows the wording of the ordinance prepared by City Solicitor Baker, and differs only where Mr. White felt that revision was necessary.

The White ordinance makes the maximum fare 5 cents, or 6 tickets for 25 cents, while the Baker ordinance provides for 7 tickets for 25 cents. This change was the source of considerable discussion. Mr. Andrews said that he felt that the maximum fare should be such as to attract money, and that the lower maximum fare would not have the same attraction as the higher one. So far as the officers are concerned, he said, the rate of fare does not make any difference, as they are assured 6 per cent on the investment for their stockholders. Because the city administration is reasonably sure that the maximum fare will not be necessary to produce that percentage of profit, Mr. Andrews said he believed that it would not make any material difference what the figure is for the maximum charge. However, the higher it is placed the easier it will be to secure money for improvements and extensions. He said that necessity demands that several million dollars be spent on the property at once and that \$1,000,000 a year will be required after the first improvements are made in order to keep pace with the growth and necessities of the city.

The initial rate of 3 cents in the Baker ordinance, Mr. Andrews said, is too low to pay expenses. He said it would be better to make a figure that would produce the amount needed instead of having to make it up later. Mayor Johnson suggested that the fare in the ordinance must not be placed so high that the people will not vote for it on a referendum vote. Both Mr. Andrews and Mayor Johnson believe that the stock will have to be sold in Cleveland. The former said he had sounded several Eastern financial men, but did not receive much encouragement. He is of the opinion, however, that they would take bonds if the company is given a franchise that would protect the property.

Some of the Councilmen objected to capitalizing the deficits made during the past six or eight months; but Mayor Johnson said this is so small that the interest charges would be increased very little thereby. He stated that several million dollars of the earnings of the company in the past have been used in betterments and extensions and that the small amount of water injected into the stock in this way has been, or will be, offset. He said that the company should start with a clean slate as far as possible. Along this line Mr. Andrews said he thought that the debts of the company would have to be paid from the earnings.

Relative to the probable fare required for the future Mr. Andrews said that he believed the rate will be higher than at present, from the fact that some roads have already been compelled to increase their fare. The Public Service Commissions in New York, he said, have adopted a system of accounts which shows clearly that in some cases money that should have been set aside for depreciation has been paid out in dividends. In order to comply with the requirements of the commissions and still pay fair dividends, he said that there would not be much opportunity to reduce the rate of fare on any of the roads. In the year that the commissions have been at work they have required no company to make a reduction, but, on the other hand, have instructed some of the companies to increase their charges.

Mr. Johnson said that after the profit of 6 per cent is assured the officers are likely not to care whether the fare

is reduced, and might desire to increase expenses rather than to reduce them. For this reason the Mayor thought that close supervision should be maintained.

A representative of the labor organizations stated that objection had been made to the clause limiting the wages of motormen and conductors to an average of the wages paid in Pittsburg, Buffalo and Detroit. He also said that the rule that only motormen and conductors in uniform would be allowed to ride free on the cars was an objection. Mr. Andrews stated that both these conditions had been omitted from the White ordinance. He said that if the property was turned back to the company under a new ordinance the company wanted to carry all its employees free of charge and to live up to the contract made in good faith with the motormen and conductors before the lease was signed. He said that he believed in paying the men fair wages and wanted to be free to do so. Mayor Johnson insisted that some rule should be adopted that would not allow the wages to become unreasonable.

One of the hardest points to settle will probably be the manner of supervising the operations of the company through a proposed street railway commissioner. The company desires freedom to take such measures as its officers and directors see fit for the good of the service, without continually seeking favors. The meeting adjourned until April 1.

## Subway Proposals in New York

Theodore P. Shonts, president of the Interborough Rapid Transit Company, New York, addressed a letter to the Public Service Commission of the First District of New York on March 24, in which he reiterated that his company was opposed to the proposed extension of the Hudson & Manhattan Railroad from Thirty-third Street and Sixth Avenue to the Grand Central Station, at Fourth Avenue and Forty-second Street, only because it might interfere with future extensions to the New York subway. Mr. Shonts said that the first level on Forty-second Street is occupied by the present subway, that the second should be reserved for future north and south subways, and that the third level belongs to the Steinway tunnel. He concluded that if the Hudson & Manhattan Railroad is permitted to occupy the second level in Forty-second street all future lines in New York crossing Forty-second Street between Sixth Avenue and Park Avenue will have to be made on the fourth level.

In reply, William G. McAdoo, president of the Hudson & Manhattan Railroad, said that the present line of the Interborough Rapid Transit Company now occupies the second level at Fifth Avenue, the first level having been reserved for a north and south line by the old Rapid Transit Commission. The plan of the Hudson & Manhattan Railroad is to occupy the third level at Fifth Avenue and Forty-second Street, according to Mr. McAdoo. Thus the fourth level could be used by the Steinway Company in extending its line. Mr. McAdoo reiterated that the extension of his road could be built without affecting the operation of the present subway lines.

At a hearing before the Public Service Commission on March 29 it developed that there is a pipe gallery in Forty-second Street that would interfere with the construction of the Hudson & Manhattan Railroad, and that the loop at the terminus of the Steinway tunnel below Forty-second Street and Park Avenue carries the tracks beyond Forty-second Street and into the ground beneath Park Avenue for a distance of 30 or 40 ft. The hearing on March 29 closed with the Interborough Rapid Transit Company agreeing to furnish the commission all the information in its possession relating to the situation around the Grand Central Station in the matter of the pipe gallery and the proposed connection with the Lexington Avenue subway if built in accordance with the plan of the Interborough Rapid Transit Company.

## Metropolitan District Railway Meeting

The half-yearly meeting of the Metropolitan District Railway was held in London on Feb. 11. Sir George S. Gibb, chairman of the company, presided. The gross revenue amounted to £261,874, an increase of £37,411, or 16.67 per cent. The working expenses were £153,868, a decrease of £2,201. The company carried 31,503,722 passengers, an increase of 5,694,990, or 22 per cent. The passenger earnings were £243,117, an increase of £38,235, or 18½ per cent. The season-ticket revenue amounted to £22,043,

an advance of £6,691. Of this amount £10,000 could be traced as directly attributable to the traffic to and from the Franco-British Exhibition.

It was stated at the meeting that every company engaged in transporting passengers in London, supported by private capital, was suffering from the unsatisfactory condition of traffic. It was cited that the average receipt per passenger carried by the nine urban railways in London only ranged between 1.45d. on the North London (the lowest), and 2.03d. on the Central London (the highest). Mr. Gibb said that he had received several letters from shareholders suggesting that they should make further increases in their fares. The fixing of fares was a matter of policy. Some years ago some people who had the initiation of policy thought that the encouragement of traffic by very low fares was the way to prosperity. It had proved to be the way to misfortune. The prolonged and unhappy effort to carry on business on the basis of an inadequate price for the commodity supplied was an illustration of the power of a false idea. Mr. Gibb said he was not an advocate of high fares, and intimated that some few individual fares might even require reduction. The circumstances of the moment, he said, must govern the action of the moment, but fares must ultimately be fixed at figures which experience justified. To the correspondents who had been good enough to write him on the subject he must reply that nothing could be done at present, but the result of their experience on the District might gradually have its effect.

#### Investigation of Kansas City Railway

In accordance with the offer of the Metropolitan Street Railway, Kansas City, Mo., to place its books and records at the disposition of the city for the purpose of ascertaining the exact conditions which govern street railway operation in Kansas City, the City Council and the City Utilities Commission have retained Arthur Young & Company, Chicago, Ill., to prepare a report for them and have instructed Arthur Young & Company to ascertain:

Actual money expended by the Metropolitan Street Railway for its physical properties, betterments and equipment and actual development of system. Amount of bonded debt, preferred stock, common stock and other borrowed money, if any. Amount of gross income and sources of income and the disposition of same, whether it is for depreciation, repairs, betterment, extension, interest, dividends, damage to property or persons, or other purposes. Amount of so-called fixed charges and operating expenses and what constitutes the fixed charges and the operating expenses and all other data, facts and figures necessary for this committee to know, ascertaining the gross income and net income, and what would be a proper or necessary amount or per cent of the receipts to set aside for maintenance and repairs of system and necessary per cent to cover renewals and depreciation, so as to establish a fund to provide equipment and accommodations that will insure comfort, convenience and service for the public and such other and all other information as the expert accountant may deem necessary, or that the commission may from time to time recommend.

**Twin City Rapid Transit Company Bulletins.**—The Twin City Rapid Transit Company, Minneapolis, Minn., has published in pamphlet form the series of 27 full-page advertisements comprising a history of the Minneapolis Street Railway from 1873 to 1908. These advertisements were abstracted in the issues of the ELECTRIC RAILWAY JOURNAL for January and February, 1909.

**Manila Strike Called Off.**—The strike and boycott by the employees of the Manila Electric Railroad & Light Company, Manila, P. I., was declared off on March 25. The men quit work on March 4, demanding an increase in pay and a readjustment of the hours of labor. Non-union Filipinos and Americans were engaged at once to man the cars under a strong police force, and as stated on page 480 of the ELECTRIC RAILWAY JOURNAL of March 13, 1909, the strike had worn out by March 6. Thus the action of the employees in declaring the strike off was merely a formality which was purposely delayed by the union.

**Removal of Offices of Third Avenue Railroad.**—The Third Avenue Railroad, New York, has completed the work of renovating and extending its car house at 129th Street and Third Avenue, New York, mention of which was made in the ELECTRIC RAILWAY JOURNAL of Jan. 9, 1909, page 80, and has removed its offices to the remodeled building from the car house at Sixty-fifth Street and Third Avenue. The building contains the general offices of the Third Avenue Railroad and the Union Railway and the offices of the heads of the engineering department and the claim department. J. S. McWhirter, superintendent of car equipment of the

company, retains his office in the barn at Sixty-fifth Street and Third Avenue. A feature of the building is a clubroom for the exclusive use of employees of the company, which contains billiard and pool tables, chess and card tables, a small library and other equipment, to retain the attention of the men and afford them recreation when they are off duty.

**Missouri Electric Light, Gas & Street Railway Association.**—Arrangements are now being made for the third annual meeting of the Missouri Electric Light, Gas & Street Railway Association, to be held on April 15, 16 and 17 at the Colonial Hotel, Springfield, Mo. The program this year calls for several long sessions, and a very interesting list of papers has been prepared for presentation and discussion. The convention will be called to order at 10 a. m. on April 15. The address of welcome will be responded to by W. B. Hays, president of the association, after which Mr. Hays will address the association. The program for the morning will be concluded with an executive session. The convention will reconvene at 1:30 p. m. for the presentation and discussion of the papers "Insurance and Public Service Plants," by C. W. Hough, and "The Tungsten Lamp from the Central Station Manager's Standpoint," by Paul J. M. Loewe. On April 16 the session will be opened at 9:30 for the presentation and discussion of the paper "Equitable Rate Making," by C. W. Hough. At the session in the afternoon, which will be called at 1:30 p. m., these papers will be presented and discussed: "The Value of an Engineering Equipment Station," by Prof. H. B. Shaw; "Some New Features of High Tension Transmission," by O. Wiemer. The banquet will be held at 7:30 p. m. on the evening of April 16. On April 17 the session will be opened at 9:30 a. m. Two papers, "Office System and Accounting," by N. J. Cunningham, and "Building of the Day Load," by E. L. Callahan, will be presented and discussed. There will be an executive session at 1:30 p. m. on April 17, after which the delegates will visit the power plant of the Springfield Gas & Electric Company.

**Annual Convention of Arkansas Association of Public Utility Operators.**—The second annual convention of the Arkansas Association of Public Utility Operators will be held at Hot Springs, Ark., on May 12, 13 and 14. The headquarters of the association will be at the Arlington Hotel. The session of the association on May 12 will be opened at 10 a. m. for the registration of members and friends. The meeting will be formally called to order at 11 a. m. At the morning session, the minutes of the previous meeting will be read, applications for membership will be balloted and reports of the executive, finance and by-laws committee and of the secretary and treasurer will be presented. At the afternoon session on May 12, the president of the association, D. A. Hegarty, treasurer and general manager of the Little Rock Railway & Electric Company, will present his address. The following papers have been announced for presentation at the meeting, but the exact program has not yet been arranged: "Relation of Operation of Public Utilities to Public," by J. M. Hewitt, general manager, Mariana Electric Lighting Company; "Filtration Modern Water Supply," by S. A. Stearns, manager, Home Water Company, Little Rock; "Gas Man—His Troubles," by B. C. Fowles, general manager, Pine Bluff Corporation; "Use and Abuse of Street Railway Transfers," by C. J. Griffith, general superintendent, Little Rock Railway & Electric Company; "Tungsten Lighting," by J. E. Cowles, superintendent, electrical department, Little Rock Railway & Electric Company; "Damage Suits," by S. E. Sawyer, attorney, Hot Springs Street Railway; "Question Box," by W. H. Walkup, superintendent, Searcy Light & Power Company. Arrangements have been made by the Business Men's League of Hot Springs to entertain the delegates and ladies, and the prospects now are that there will be a goodly number of representatives of public utility corporations in attendance. The progress of the association during the past year will be reviewed during the course of the convention.

#### LEGISLATION AFFECTING ELECTRIC RAILWAYS

**Connecticut.**—The most important work of the session is now in progress, for hearings are being held on the proposal to create a public utilities commission of three members in accordance with the report presented by the special committee on corporations appointed by the General Assembly of 1907. Those in favor of the measure were heard on March 24. The opposition was heard on March 25. The hearing on March 25 was not concluded, however, and will be continued on April 1. As the committee has intimated that those in favor of the measure will be permitted to reply, there is no telling when the hearings may be concluded. Ralph O. Wells, secretary of the committee on corporations, which is responsible for the measure, explained its scope and provisions on March 24, and cited the

evils it is intended to correct. He said that it should be borne in mind that the proposed commission is not wholly a new body, as it is intended to supplant the present railroad commission. He laid particular stress upon the fact that under the provisions of the measure the rights sought in many bills that now have to be considered as special legislation could be granted or disapproved by the new commission, thus materially cutting down the length of the session of the Legislature or giving that body more time for the thoughtful consideration of general matters of really significant import to the whole State. Arthur C. Graves, New Haven, for the opposition, on March 25, said that demands for legislation of the kind proposed had recently developed into a kind of hysteria to emulate examples elsewhere, and concluded that sentiment for the bill was largely artificial. Mr. Graves also said that there is much ill-informed talk about overcapitalization and corporation abuses. He concluded with the statement that the bill creates a commission which is at once executive, judicial and legislative, and the enactment of the measure might mean the beginning of the end of the State's constitutional form of government. L. S. Storrs, vice-president of the New England Investment & Security Company and president of the Springfield (Mass.) Street Railway, also opposed the measure. He said that in Massachusetts a bond issue is not permitted until a railway is in operation and that additional issues of stock are not permitted unless dividends are paid. The result, according to Mr. Storrs, is that equipment suffers and extensions are checked. He said that rates of fare are being increased in Massachusetts, whereas rates are somewhat lower in Connecticut, and development has been more rapid recently in Connecticut than in Massachusetts. The committee on railroads has reported unfavorably the following bills: To compel the removal of snow by street railways; to regulate fares on the Hartford & Springfield Street Railway. Both reports have been accepted.

**Massachusetts.**—The committee on legislative matters has received an estimate from Secretary Beal of the Boston Transit Commission relative to the cost of restoring elevated train service in the Tremont Street subway in Boston, as proposed by a bill now before the committee on mercantile affairs. The Transit Commission reports that the work would cost \$55,000, exclusive of the expense which the Boston Elevated Railway would sustain in alterations of track construction and equipment. The Boston Elevated Railway opposes the restoration of the trains on the ground of interference with the present rapid transit service and the reduction in traffic capacity which such a move would impose on the Washington Street tunnel and Atlantic Avenue elevated lines. The House has referred to the next General Court the petition of F. A. Lawler for legislation to require the Boston Elevated Railway to furnish service on Geneva Avenue, Boston. The bill introduced into the House on the petition of E. W. Ross for legislation to restrict the hours of labor of women and minors employed by public service corporations to the period between 6 a. m. and 6 p. m. has been given leave to withdraw by the committee on labor, to which it was referred for hearing. Petitions favoring the discontinuance of the elevated structures on Washington Street, Boston, and the extension of the Washington Street tunnel to the Dudley Street terminal of the Boston Elevated Railway have been referred by the Senate to the committee on metropolitan affairs, which has several subway and local transportation measures under consideration, as outlined in the *ELECTRIC RAILWAY JOURNAL* of March 20, page 524. Three bills relative to the development of electric transportation facilities in the Berkshire district by the New York, New Haven & Hartford Railroad are now before the committees on railroads and street railways, sitting jointly. Hearings have been closed on the Lawrence bills requiring the New York, New Haven & Hartford Railroad to dispose of its stock in the Boston & Maine Railroad and in domestic street railways, to prohibit railroads from acquiring an interest in other railroads, electric railroads or street railways, and to determine the value of stock of consolidated railroads and street railways through a specially appointed commission. The committee on street railways has closed its hearings on the Russell bill relative to the consolidation of properties of the Boston Elevated Railway and the West End Street Railway, and on the Elder bill authorizing the Boston Elevated Railway to extend its elevated lines from Sullivan Square, Charlestown, through Somerville to Medford.

**New Jersey.**—The Martin public utilities bill was passed by the House on March 24. Opposition to the measure is very strong, and the prospects are that it will be lost in the Senate. On March 25 Mr. Voorhees of Middlesex moved to reconsider the measure, but Mr. Lyons moved to lay the Voorhees motion on the table, and the Lyons mo-

tion was carried. Mr. Martin, the author, made a motion to reconsider the Lyons vote just before adjournment, on March 25, but the motion was lost. The measure abolishes the present railroad commission and creates in its place a public utilities commission of four members to be named by the Governor with the advice and consent of the Senate, the salary to be \$6,000, except for the chairman, who shall receive \$6,500. The term of office is made four years. The commission is empowered to appoint all necessary officers and is given authority to regulate all street railway traction, canal, express, gas pipe line, oil pipe line, electric light, heat, power, water, sewer, subway, telephone, telegraph and railroad corporations in the State.

**New York.**—The railroad committee has had referred to it the privileged resolution offered in the Assembly by Assemblyman Goldberg, New York, calling upon the Public Service Commission of the First District to furnish the Assembly within 30 days with a complete report on the commission's investigation relative to the restoration of transfers in Manhattan and the Bronx, and in particular as to what the commission has done regarding the transfer problem involving the Central Park, North & East River Railroad. Carrying out the recommendation of Governor Hughes in a special message to the Legislature, and the suggestions of Attorney-General O'Malley, Senator Mead and Assemblyman Waddell, chairmen, respectively, of the Senate and Assembly committees on taxation and retrenchment, have introduced a bill amending the tax law by making changes in regard to procedure upon return of a writ of certiorari obtained to review a special franchise assessment. The proposed law is designed to facilitate pending litigation involving about \$41,000,000 in special franchise taxes. The bill provides that these proceedings shall be taken direct into the Supreme Court for trial without delay, instead of having them referred to referees. A bill approved by the Public Service Commission of the First District of New York has been prepared for introduction which will give that body power to accept the offer of the Bradley, Gaffney, Steers Company, mention of which was made on page 563 of the *ELECTRIC RAILWAY JOURNAL* of March 27, 1909. Senator Cobb has introduced a bill to permit common carriers, railroads and street railways to issue bonds payable at periods of more than one year when necessary for reimbursement of moneys actually expended for purposes for which the corporations are permitted to issue bonds under the present law. The bonds, however, must be issued pursuant to the terms of a mortgage theretofore executed by the corporation with the approval of the proper commission. The bill amends the Public Service Commission law.

**Pennsylvania.**—With only two weeks remaining of the present session, less than 100 of the more than 1000 bills introduced have reached the Governor, and the prospects are remote for bills getting out of committee, inasmuch as appropriation measures will now have the right of way. Three sessions a day will be the rule until final adjournment on April 15. The following new measures were introduced last week: Prohibiting persons not employees, or not in danger upon the cars of street railways or railroads, from alighting from the cars of any railway while the same are in motion; regulating the use of electricity in cities of the first class; providing for the examination and licensing of electrical contractors and certain electrical engineers; for the supervision and inspection of electrical installations in said cities; for the inspection of places of amusement maintaining electrical machinery or devices making the violations of the provisions thereof a misdemeanor and prescribing the punishment therefor; authorizing and empowering street railways and railroads heretofore or hereafter incorporated to connect their tracks and to interchange their cars, whether passenger or freight; conferring upon street railways and the lessees or operators thereof the right to transport all kinds of freight and property for reasonable compensation. The House has passed finally the bill allowing municipalities of the third class to tax the real estate of public service corporations for local purposes. This bill is being opposed by the electric railways and steam railroads. The House has defeated on final passage the bill making it a misdemeanor to trespass upon the right of way of any steam or electric railway other than upon a public highway. After a public hearing the railroads committee of the House killed the Kiess bill giving the State Railroad Commission the right to regulate issues of stocks and bonds of steam railroads and electric railways. Ellis Ames Ballard, representing the Philadelphia Rapid Transit Company, spoke against the Dempsey bill, requiring electric railways to equip their cars with vestibules and retiring rooms. The committee killed the bill. The Creasy bill compelling electric railways to transport freight has been referred to a sub-committee.

# Financial and Corporate

## New York Stock and Money Market

March 30, 1909.

After a week of light trading, the stock market yesterday and to-day has shown a revival of interest. The tone, even throughout the days of dull trading, has been strong and prices have advanced almost steadily. These advances have been especially marked in the old favorites which have been the market leaders for the last year. Union Pacific, Amalgamated, Reading, and especially Steel common, have been strong and popular with buyers. Taken altogether, the feeling in Wall Street is very satisfactory. The gross earnings of the railroads are increasing steadily and the increases in net earnings are sufficient to insure a continuance of dividends. The so-called steel war, while not bringing out the business that was anticipated, is not causing manufacturers to lose money. There is no longer any fear that the new tariff law will destroy the profits of the industrial corporations and there is a hope that the new bill will be adopted by the end of the fiscal year and the decks cleared for an active revival of business in the early autumn. The fact that commercial business continues to be light does not mean discouragement.

The securities of the traction companies on Manhattan Island continue to be weak and fairly active. Prices have regained but little of the losses sustained when they broke so sharply a week ago. If any definite plans for reorganization of the Interborough-Metropolitan system have been formulated they have not been announced. That there will be no attempt to delay the foreclosure sales is generally admitted. Just what method will be adopted by the Interborough-Metropolitan Company to protect its holdings in the Metropolitan Street Railway is unknown. Many traders believe that the Interborough-Metropolitan Company has already completed its financial plans.

The bond market remains good and money continues to be plentiful and rates easy. Call money to-day was quoted at 1 1/4 to 2 per cent, and 90-day loans at 2 1/2 to 2 3/4 per cent.

### Other Markets

In the Boston market, traction securities continue to be of minor importance. Only small lots were offered and prices remain practically stationary. Boston Elevated has been selling at 127 to 129, Massachusetts Electric common at 14 1/2 and the preferred, which has been rather more active than any other traction issue, at 72 to 72 1/2.

Traction securities were fairly active in the Philadelphia market. Philadelphia Rapid Transit and Union Traction especially were bought and sold readily, but price changes were insignificant. The tone of each was strong. At the present time Union Traction seems to be the favorite of the traders.

In Chicago, little was done in traction securities. Small lots of Chicago Railways, series 2, have been sold occasionally and some Subway stock found its way into the market, but there was no particular interest in the trading. Other securities were practically neglected.

United Railways bonds found a good market in Baltimore. The incomes sold at 53 1/2 to 54 and the 4s at 87 1/4. The funding 5s sold at 79 3/4. A few shares of United Railways stock sold at 11 1/2, but the trading in this issue was light.

Quotations of various traction securities as compared with last week follow:

	Mar. 23.	Mar. 30.
American Railways Company, Philadelphia.....	*45 3/4	*45 3/4
Boston Elevated Railway.....	126 3/4	129
Brooklyn Rapid Transit Company.....	71 1/4	76 1/4
Chicago City Railway.....	*185	*185
Cleveland Railway.....	—	—
Consolidated Traction Company of New Jersey.....	a77 1/2	a77 1/2
Consolidated Traction Company of New Jersey, 5 per cent bonds.....	a106	a106
Detroit United Railway.....	*61	*61
Interborough-Metropolitan Company.....	12	12 7/8
Interborough-Metropolitan Company (preferred).....	37 3/4	38
Manhattan Railway.....	143	*143
Massachusetts Electric Companies (common).....	14 3/4	14 1/2
Massachusetts Electric Companies (preferred).....	71	72
Metropolitan West Side Elevated Railway, Chicago (common).....	*19	*19
Metropolitan West Side Elevated Railway, Chicago (preferred).....	*48	*48
Metropolitan Street Railway.....	*28	23
North American Company.....	*78 3/4	79 3/4
Philadelphia Company, Pittsburg (common).....	41 3/4	42 1/2
Philadelphia Company, Pittsburg (preferred).....	*42 3/4	42 1/2
Philadelphia Rapid Transit Company.....	28	28 7/8
Philadelphia Traction Company.....	92 1/2	93
Public Service Corporation, 5 per cent collateral notes.....	a100 1/2	a100 1/2
Public Service Corporation certificates.....	a82 1/2	a82
Twin City Rapid Transit Company, Minneapolis (common).....	*105	104 1/4
Union Traction Company, Philadelphia.....	53 7/8	55

a Asked. \* Last sales.

## Annual Report of Berlin Street Railway

The Grosse Berliner Strassenbahn, operating the street railway system of Berlin, Germany, has recently issued its annual report for 1908. The company had a prosperous year, paying a dividend of 8 1/4 per cent on a capital stock of 100,082,400 marks, despite a decrease of traffic in the last three months as compared with 1907. The drop in travel was due partly to the industrial depression, notably in the building trades, and to the inauguration of service on some elevated-subway extensions. The amortization fund was increased by 2,007,515 marks and the renewal fund by 2,660,000 marks; the interest on funded debt was 231,689 marks; the profit was 9,946,674 marks. In accordance with the franchise conditions, the company paid to Berlin and other municipalities 2,650,748 marks from its gross earnings, and to the municipality of Berlin alone 889,326 marks from its net earnings. During the fiscal year the company's reserve fund reached the legal point of 10 per cent of the capital, so that no additions will be necessary.

The company settled some important litigation with the city whereby the latter must reimburse the railway for any traffic losses which may be incurred from the opening of the proposed north and south subway. Similarly the municipality will have to make good any losses in traffic which the Grosse Berliner Strassenbahn may suffer through the contemplated operation of municipal cars over the city tracks.

During 1908 the railway carried 397,200,000 passengers, an increase of 5.02 per cent over 1907; the income from passenger service was 37,836,922 marks, an increase of 5.17 per cent; the number of car-kilometers was 90,961,698 (56,396,252 car-miles), an increase of 6.12 per cent; the gross earnings per car-kilometer were 41.6 pfgr (17.3 cents per car-mile), a decrease from 42 pfgr in 1907. The comparative gross earnings from all sources were 38,496,353 marks, against 36,592,441 marks in 1907, and the comparative total expenditures were 21,569,950 marks and 20,255,066 marks. In 1908 the operating expenses were 56.03 per cent, and in 1907 55.35 per cent of the total income. The expenditure for salaries and wages of the transportation department was 9,593,824 marks, and for all departments 12,707,502 marks. The company spent 739,344 marks for employees' welfare purposes, including old age and invalid pensions, widows' and orphans' funds and sick benefits.

The cost of power was 4,542,794 marks, equivalent to 21.07 per cent of the total expenditures. In 1907 the cost of power was equivalent to 22.47 per cent, and the reduction is ascribed to the introduction of wattmeters on the cars during the latter part of 1908.

The maintenance of way and feeder lines cost 950,549 marks; damages and insurance, 670,724 marks, of which 201,258 marks are held in reserve. The cost of car maintenance was 3,012,758 marks.

During 1908 the total amount of track was increased from 521.7 km to 526 km (326 miles). The total number of cars in service was 2495. The total number of employees was 10,488, of whom 1116 are employed on subsidiary lines. The earnings of these latter lines are not included in the preceding figures on wages and salaries.

## Annual Report of London Street Railway

Gross earnings of the London (Ont.) Street Railway in the year 1908 were \$235,032, a slight increase over the previous year. Operating expenses were \$167,567, or 71.3 per cent of earnings. Of the total expenditure for operating expenses, \$41,702 was used for maintenance; this sum is equivalent to 24.9 per cent of the total operating expenses, or 17.7 per cent of gross earnings. The earnings for two years compare as follows:

	1907.	1908.
<b>EARNINGS:</b>		
Passengers.....	\$226,510	\$230,866
Miscellaneous.....	5,867	4,166
Gross earnings.....	\$232,377	\$235,032
<b>EXPENSES:</b>		
Maintenance:		
Way and structures.....	\$17,295	\$13,574
Equipment.....	24,279	28,128
Transportation:		
Power plant.....	32,883	30,125
Car service.....	65,865	68,845
General.....	27,703	26,895
Total operating expenses.....	\$168,025	\$167,567
NET EARNINGS.....	\$64,352	\$67,465
<b>DEDUCTIONS:</b>		
Interest on bonds.....	\$25,000	\$25,006
Interest on overdraft.....	2,229	3,449
Total deductions.....	\$27,229	\$28,455
NET INCOME.....	\$37,123	\$39,010

In his statement to shareholders, Henry A. Everett, the president, said, in part:

"Your directors met the committee of the city council relative to this matter in accordance with their request on Feb. 6, 1908, but since then there have been no further developments.

"Your directors have great pleasure and satisfaction in being able to state that the sentiment in the community generally is favorable to the company, and it is the constant aim of the management to so improve the service as to merit the good will of the patrons.

"A committee of citizens desirous of obtaining Sunday cars secured the consent of the council to authorize a vote on the matter at the municipal election in January, which resulted in a substantial majority in favor of same.

"Your directors disposed of \$50,000 of bonds during the latter part of the year at a very fair price, considering the financial depression and prices of like securities.

"In view of the general decline in business throughout the country we draw your attention with pleasure to the increase in the gross earnings and surplus for the past year. We confidently expect that the coming year will prove quite as satisfactory."

The statistical statement contained in the report, showing various results from 1896 to 1908, inclusive, gives the following for the last three years:

	1906.	1907.	1908.
Gross earnings.....	\$202,911.68	\$232,376.59	\$235,032.40
Operating expenses and taxes.....	\$159,428.39	\$168,024.88	\$167,566.72
Expenses, per cent of earnings.....	78.5	72.3	71.3
Net earnings.....	\$43,483.29	\$64,351.71	\$67,465.68
Net income, per cent of capital.....	3.50	6.88	7.10
Passengers carried.....	5,502,555	6,321,994	6,442,998
Car earnings, per revenue pass., cents	3.67	3.63	3.64
Transfers .....	860,668	1,039,362	1,062,306
Total passengers.....	6,363,223	7,361,356	7,505,304
Car earnings per passenger, cents.....	3.13	3.07	3.07
Car mileage.....	1,310,483	1,435,993	1,427,353
Gross earnings per car-mile, cents.....	15.48	16.18	16.47
Operating expenses per car-mile, cents.....	12.16	11.70	11.74
Net earnings per car-mile, cents.....	3.32	4.48	4.73
Number of miles of track.....	31.45	33.25	33.25
Gross earnings per mile of track.....	\$6,451.88	\$6,988.77	\$7,068.64
Population (city estimate).....	44,704	47,769	49,431

#### Memorandum by Court in Sale of Metropolitan Street Railway, New York

The following memorandum supplements the extracts from Judge Lacombe's decree ordering the sale of the Metropolitan Street Railway, New York, under foreclosure, on June 1, which were published on page 566 of the ELECTRIC RAILWAY JOURNAL of March 27, 1909:

"The elaborate provisions proposed as to inventory of the personal property are rejected, not because of the great labor involved in complying with them, but because they seem impracticable and unnecessary.

"The cars will be listed, described and identified by numbers, and so will the larger units of machinery. The annual inventory and the books of the receivers will be open to bidders, who will be given access to all power houses, shops, car and storage barns. Certainly no one will bid for this railroad property without the advice of skilled and experienced engineers, whose inspection of the property and what may be found on it, coupled with the list of cars, etc., provided for in the decree, will give all the information needed for the exercise of an intelligent judgment.

"The suggestion that the bidder should have some security against receivers' disposing of material and supplies at intermediate sale and delivery is not persuasive; the only disposition that can properly be made of them is to put them into the road or its operation. If, for example, the supply of coal runs down during the period and is not replenished the purchaser will not get as much coal as he saw when he made the survey, but per contra there will not be an unpaid coal bill to that extent for him to assume the obligation of paying. If 500 tons of rails are taken from supplies and laid on the yokes, he will get them just the same as if they remained in storage.

"The Central Park, North & East River Railroad objects to having its lease included among the properties sold since it has taken back its road upon non-payment of the rent. That road and also the Twenty-eighth & Twenty-ninth Street Crosstown Railroad and the Fulton Street Railroad are not included for reasons stated in the opinion filed.

"Under the right reserved to the purchaser to refuse to adopt any particular lease or traffic agreement, it is possible that one or more of the leased lines may be thrown off, but the court is unwilling at this stage of the proceedings to permit a complete disintegration of the system. For that reason the proposed clauses providing that on the request of any one interested the property be offered in separate parcels are not approved. To do so would put it in

the power of the owners of roads which are now money-makers for the system to take them out of it."

#### Annual Report of International Traction Company

Gross earnings of the International Traction System of Buffalo for 1908 were \$5,056,741, a decrease of \$218,087, or 4 per cent, from the previous year. Operating expenses were reduced \$267,970, and amounted to 54.2 per cent of gross earnings. No details of the operating expenses are given, but there was appropriated for "depreciation" \$403,280, or 7.7 per cent of gross earnings. The appropriation for this purpose was larger than that made in 1907, which amounted to \$269,022, or 4.9 per cent of gross earnings. The figures for two years compare as follows:

EARNINGS:	1908.	1907.	Increase.
Passenger .....	\$5,056,742	\$5,272,112	*\$215,370
Freight .....	98,251	103,756	5,505
Mail .....	1,818	1,938	*120
Express .....	2,772	2,606	166
Advertising privileges.....	36,000	35,166	834
Income from securities owned...	606	600	6
Miscellaneous .....	30,794	28,892	1,902
Gross earnings.....	\$5,226,983	\$5,445,070	*\$218,087
EXPENSES:			
Operating expenses.....	\$2,831,469	\$3,099,439	*\$267,970
Depreciation .....	403,280	269,022	134,258
Taxes .....	297,106	284,141	12,965
Total expenses.....	\$3,531,855	\$3,652,602	*\$120,747
Total income.....	\$1,695,128	\$1,792,468	*\$97,340
Fixed charges.....	1,522,837	1,480,208	42,629
Net income for year.....	\$172,291	\$312,260	*\$139,969

\* Decrease.

Thomas Penney, the president, states in his report to stockholders:

"The decrease in gross earnings is the direct result of the general business depression prevailing during the year.

"The high standard of service given to the public has been carefully maintained, and improvements in the equipment and transportation facilities have been made consistently with the established policy of the company. The pay-as-you-enter cars have demonstrated their advantages for quicker and safer transportation and there are now 80 of this type in service. Additional lines will be furnished with this improved equipment during the current year.

"The integrity of the property has been fully maintained. Liberal appropriations were made from income to the fund for depreciation to cover expenditures on account of extensive renewals and replacements of track, paving, rolling stock, and other equipment."

#### Organization of New York State Railways

The organization of the New York State Railways has been completed by the election of the following directors: W. K. Vanderbilt, Jr., W. C. Brown, E. V. W. Rossiter, John Carstensen, A. H. Harris, Horace E. Andrews, Walter N. Kernan, A. M. Lindsey, and Granger A. Hollister. The directors organized by electing the following officers: President, Horace E. Andrews; vice-presidents, W. K. Vanderbilt, Jr., John J. Stanley, Walter N. Kernan (also general counsel), C. Loomis Allen and E. J. Cook; secretary and auditor, J. C. Collins; treasurer, E. L. Rossiter; assistant treasurer, C. A. Tucker; assistant secretary and general auditor, A. L. Linn, Jr.

The New York State Railways is a consolidation of the Rochester & Eastern Rapid Railway, Rochester Railway and Rochester & Sodus Bay Railway. It has acquired the railway securities heretofore held by the Mohawk Valley Company. The latter company still retains its gas and electric lighting interests. The principal office of the New York State Railways will be at Rochester.

**American Light & Traction Company, New York, N. Y.**—Emerson McMillin, president of the American Light & Traction Company, in order to correct misapprehension regarding the extra stock dividend to be paid by the company in February, 1910, issued the following statement on March 26: "There is no probability that there will be a change in the policy of the company in the near future in regard to the payment of cash dividends. In fact, a meeting of the executive committee was held on March 25 chiefly for the purpose of reaffirming the policy mapped out at the organization of the company on July 1, 1901. At that time it was the belief and the intention of the board that the company should pay no dividends on the common stock for three years, and then pay 3 per cent and increase the rate 1 per cent per annum until 8 per cent would be reached. After



that to hold the dividend at 8 per cent but pay a stock dividend of probably 10 per cent per annum, indefinitely if the earnings warrant it, the preferred stock always receiving its 6 per cent. The company's earnings have been equal to our estimates, and the executive committee will recommend to the board that a 10 per cent stock dividend be paid in November, 1909, so as to receive the cash dividend Feb. 1, the date for the next increase in amount of cash dividend, the rate remaining at 8 per cent. On present earnings the rate of 8 per cent cash and 10 per cent of stock can be continued indefinitely."

**Boston (Mass.) Elevated Railway.**—The protective committee of the stockholders of the West End Street Railway is sending to shareholders of the West End Street Railway a report of its findings upon the proposed consolidation of the West End Street Railway and the Boston Elevated Railway. The committee suggests that the merger be carried out by exchange of common and preferred stock of the West End Street Railway into first and second preferred shares of the Boston Elevated Railway of the same par value, instead of \$100 par as suggested in the present bill. Both issues should be closed, according to the committee, and dividends made cumulative. The committee also says both the first and second preferred issues of Boston Elevated Railway should be secured by deeds of trust, so that dividends on these stocks shall be the first lien on gross earnings after operating expenses, taxes, interest on such amounts of West End Street Railway and Boston Elevated Railway as at the time of their issue do not exceed the amount of Boston Elevated Railway stock outstanding, together with subway rentals and rentals of lines other than the West End Street Railway, now under lease to the Boston Elevated Railway. Dividends on both issues at the rate of 8 per cent and the division of some \$1,317,000 of net free assets of the West End Street Railway among the preferred and the common stockholders of the West End Street Railway are also suggested.

**Buffalo & Lake Erie Traction Company, Buffalo, N. Y.**—The Public Service Commission of the Second District of New York has approved the lease of the property of the Buffalo & Lackawanna Traction Company by the Buffalo & Lake Erie Traction Company for 999 years.

**Eastern Ohio Traction Company, Cleveland, Ohio.**—Robert D. Beatty, receiver of the Eastern Ohio Traction Company, has made application to the Cuyahoga County Common Pleas Court to sell the Cleveland and Chagrin Falls division of the property under foreclosure, the action being taken under a suit brought by William N. Gates. Some of the bondholders recently organized under J. R. Nutt and it was supposed that a reorganization would be attempted by them. It seems now that there will be competition from others who are interested in seeing the property operated as an entire system, as at present. The receiver states that there is due on bonds secured by first mortgage, \$231,854.81, held largely by the Guardian Savings & Trust Company, Cleveland, Ohio, and \$116,171.02 on second mortgage, held by the old Dime Savings Bank Company, Cleveland, Ohio. There is also something due on consolidated mortgage bonds and \$20,466.66 on receiver's certificates. It is said that the division is not paying expenses and for this reason the sale is asked.

**Indianapolis, New Castle & Toledo Railway, New Castle, Ind.**—The Union Trust Company, Indianapolis, Ind., as receiver of the Indianapolis, New Castle & Toledo Electric Railway, has been ordered by Judge Carter of the Superior Court at Indianapolis to issue receiver's certificates for the completion of the road, limiting the cost, however, to \$450,000. The road has been completed for about three-fourths of the distance between Indianapolis and New Castle.

**Lehigh Valley Transit Company, Allentown, Pa.**—A special meeting of the stockholders of the Lehigh Valley Transit Company has been called for May 26 to consider the authorization of an issue of bonds to the amount of \$1,500,000, to take up the floating debt, amounting to about \$500,000, and for improvements and extensions.

**Norfolk & Portsmouth Traction Company, Norfolk, Va.**—At the recent annual meeting of the stockholders of the Norfolk & Portsmouth Traction Company, the directors were re-elected with the exception of A. J. Phillips, who is succeeded by W. G. Jackson. The officers were all re-elected.

**West India Electric Company, Ltd., Kingston, Jamaica.**—The West India Electric Company, Ltd., has made public its earnings for 1908. The gross receipts were \$217,410, as compared with \$198,845 for 1907. The operating expenses were \$92,040, as compared with \$94,805 for 1907. The fixed charges were \$49,044, as compared with \$46,953 for 1907. The net income was \$76,325, as compared with \$57,086 for 1907.

## Traffic and Transportation

### Report of Philadelphia Committee on Transfer Abuse

The complete report of the joint special committee of Councils of Philadelphia, which visited various cities in order to secure information bearing on the local transit problem, has been issued. One part of the report, relating to the abuse of transfers, is as follows:

"The transfer problem is one of the most serious with which the railway managers have to contend, and all agreed that its abuse was great, without offering any remedy.

"Mr. Shonts, of the Metropolitan System in New York, went into the subject at great length. He said: 'I went into the question (of transfers) some time ago and found some very interesting statistics. I was told that the original idea of a transfer was to confine it to one transfer. That was extended by legislation. In September, 1907, 57 3/10 per cent were taking transfers and they were trafficking in them, and while the surface lines had a law passed making that punishable we could not get the courts to convict any person; the law was a dead letter. The average fare ran down from 4.94 to 3.11.' Again speaking of the abuse of the system, he said: 'The privilege is used or abused by a large percentage of passengers to make a round trip to their starting point for a single fare. Many years' experience with transfers on a large system confirms the conditions that the use of transfers to any extent is a constant menace and source of loss.'

"Mr. Sergeant, vice-president of the Boston Elevated Railway, speaking of the transfer system in Boston, said:

"We have but one fare, straight 5-cent. We have opportunity for free transfers that is altogether too wide for us to live under.' He explained that where possible, transfers were made by agent instead of checks or tickets to minimize the abuse, and stated that the transfer system was terribly abused.

"Mr. Winter, of the Brooklyn Rapid Transit Company, referred to the trading in transfers in that city, saying:

"The transfer system affords much traffic in saloons, shops, bootblack stands, etc. A friend came down and stopped at his shoemaker's, and said, 'I will go down and do some shopping,' and the clerk said, 'Can I give you a transfer?' 'What's that?' 'We have these for a good many of our customers.' That sort of thing is going on right along.'

"John I. Beggs, president of the Milwaukee system, when asked whether it issued a transfer on a transfer answered emphatically, 'No, sir, that is a crime.' He explained at length how passengers took transfers which they did not intend to use and gave them to their friends, thus defrauding the company of a cash fare from the second passenger. The Milwaukee company issues transfers only when asked for at the time a fare is paid; they are plainly marked 'not transferable,' and the date and hour are plainly punched on the ticket so that if 'correctly issued by the conductors and properly used by the passengers under the conditions they are issued, there would be no abuse.'

"In Pittsburg, also, the transfer must be asked for when the fare is paid, and the same provision is about to be put into effect in Buffalo."

The report states concerning the Cleveland situation:

"In compiling this report it has been found impossible to include any data with relation to the Cleveland situation. Mr. du Pont, the president of the Municipal company, stated that he was unable to answer the formal questions submitted, and in the course of his general examination admitted that the 3-cent fare was an experiment. As the experiment has since failed and the city voted to put the property back in the hands of its former owners, the Cleveland conditions, as your committee found them, throw little light in working out the problems in Philadelphia."

### Hearing by Massachusetts Railroad Commission on Fares in Salem

The Massachusetts Railroad Commission held a hearing on March 24 on the petition of the Mayor and the City Solicitor of Salem for a reduction in fare on the Boston & Northern Street Railway between Salem and Boston. The city was represented by Acting City Solicitor Quinn and the company by its attorney, Bentley W. Warren, Boston. Mr. Quinn contended that the existing fare of 20 cents between Salem and Boston is unreasonable. Mr. Warren stated that the company made no promise of a 5-cent fare on this line between Salem and Lynn. The distance from Town House Square, Salem, to Scollay Square, Boston, is 14.713 miles. The 20-cent fare applies from any part of

Salem to Boston and from any part of Beverly, beyond Salem, to Boston, from which through service is maintained.

Mr. Warren said that simply because a few persons wanted a lower rate did not lay the burden of proof of the reasonableness of the existing rate on the company. The Boston & Northern Street Railway serves a population of 700,000, every one of whom would be glad to require the company to prove the reasonableness of any rate which is not accepted as the limit of cheapness. It is true that by patronizing the Loring Avenue line through Swampscott and Lynn, and using transfers, one can go from Salem to Boston for 15 cents, but this condition is the result of local consolidations, is not a through fare, and the rate of 15 cents is in existence on a route patronized by only a few people.

The through line from Salem to Boston was built at great cost to provide fast through service, in large and expensive cars, and is very generally patronized in the travel between the two cities. The company could not afford to maintain this line on a lower fare. The present rate figures 1.25 cents per mile, which is very reasonable. Some of the rates on the Boston & Northern Street Railway are too low, as a result of local conditions and consolidations, and if the absurd rates now in force on some parts of the system were applied generally the company would go into a receiver's hands inside of six weeks. As long as the public is not inconvenienced it should make no difference how and where the units making up the through fare are collected. The company is just beginning to recover from the effect of the industrial depression, and a review of the condition of the company as a whole shows that a reduction is out of the question if the credit of the company and its ability to serve the public are to be preserved. Attention has been called to the heavy riding on Sundays and holidays as an evidence that the line pays a large return. The commission should consider the traffic on the other 300 days of the year. Mr. Warren concluded by offering to supply the commission any data it desires bearing on the case. The commission took the matter under advisement.

#### Hearing on Side-Door Subway Cars in New York

The hearing on the operation of side-door trains in the New York subway was continued before Commissioner Eustis of the Public Service Commission of the First District of New York on March 25. The Interborough Rapid Transit Company was represented by A. A. Gardner as counsel and Frank Hedley, vice-president and general manager. Bion J. Arnold, consulting engineer to the commission, and Geo. A. Damon, who was in charge of the tests with the side-door train for the commission, were in attendance. Mr. Arnold's report to the commission covered the period of operation of the train from Feb. 16 to Feb. 27, when it was withdrawn to make some minor alterations proposed by Mr. Arnold. During the 10 days the train was in operation it made more than 115 trips and according to Mr. Arnold, fulfilled in a degree greater than he expected, the requirements for which it was designed. Mr. Arnold said in his report that the public being unfamiliar with the cars caused much confusion and that the guards and station men in general did not seem to know what was expected of them in handling the train. He said that despite these difficulties the data which were collected by the inspectors of the commission, and the observations which he made while riding on the train support the following conclusions:

"1. Although the train often carried from 25 to 40 per cent heavier load than the trains immediately preceding and following, the duration of the stops at the principal express stations was no longer than the other trains and very often was much less.

"2. When the trains were heavily and equally loaded the side-door train demonstrated its ability to save from 10 to 15 seconds of the time required by the trains of regular cars.

"3. The public readily learned to go in one door and leave by the other with a surprisingly small amount of confusion.

"4. The conflict between the leaving and entering passengers was entirely eliminated."

As mentioned in the ELECTRIC RAILWAY JOURNAL of March 27, Mr. Arnold recommended that when the side-door cars are again put in operation the eight cars now ready be put into service in eight separate trains, thus giving the public an opportunity to become accustomed to their operation.

Mr. Arnold said that there was an inspector of the commission on the side-door train, that there was an inspector on the train preceding the side-door train and one on the train following the side-door train and that inspectors of the commission were detailed to the principal stations to make

observations. Mr. Hedley said that he did not agree with Mr. Arnold as to the efficacy of the train, and asked to be permitted to inspect the figures of Mr. Arnold for the purpose of reconciling them with statistics which he had prepared. Mr. Arnold agreed to this and the hearing was adjourned until April 1. Mr. Hedley said that he would prefer in the meantime not to operate the train. There was no objection to this by the commission.

#### Indiana Commission Asks for Rules Governing Employees

The letter addressed by the Railroad Commission of Indiana, under date of March 22, 1909, to the electric railways of the State asking for information regarding the requirements of applicants for employment and the method of instructing employees in their duties and enforcing rules, follows:

"The Railroad Commission of Indiana, through formal reports made to it, and from its official investigations, is advised that a large proportion of accidents upon the electric railways is caused by the failure of employees to obey standard operating rules or special instructions in force for the same movement of trains. To the end that the commission may have all attainable information regarding methods used in examining applicants for employment, in instructing employees regarding rules and their duties under them, and the systems adopted for enforcing observance of said rules, it requests of you the following statements, with full explanation thereof:

"A statement showing, as to each of the following classes of employees, namely, conductors, motormen, towermen, telegraph operators, train dispatchers, any other employees engaged in operating trains, what examination or inquiry, if any, is made previous to their employment in or promotion to such positions, as to their mental and physical capacity, their experience, habits and general fitness for the proposed employment.

"A statement showing what steps are taken to require of each employee a competent knowledge of the operating rules governing his duty and conduct as such employee.

"A statement showing what examinations or investigations are made from time to time, either regularly or otherwise, to keep informed as to whether employees of the said several classes are familiar with the rules and instructions governing their duties and conduct, and what measures are taken to improve the effectiveness of operating rules from time to time and their applicability to disclose accident situations.

"What record, if any, is kept of violations of rules and instructions committed by any of the aforesaid employees?"

"What system of rewards or other method of recognition is adopted, as an inducement and encouragement to employees to become proficient in the rules and to render faithful service?"

"Any other information which may, in the opinion of the chief operating officer of each of said railways, be of use to the commission in investigating the causes of accidents so far as the latter result from neglect by employees or non-observance by them of rules and instructions."

#### Schenectady Railway Denies That 5-Cent Fare Is Unjust or Unreasonable

The action of the Schenectady (N. Y.) Railway in discontinuing the sale of six tickets for 25 cents on the city lines, leaving the rate of fare 5 cents beginning on March 1, was followed by a complaint to the New York Public Service Commission, Second District, by a committee of citizens. After this complaint had been made, an answer to the various charges which it contained was filed with the commission by E. F. Peck, general manager of the Schenectady Railway. This answer is as follows:

"The defendant, answering the complaint herein, denies that it availed itself of certain franchises, rights and privileges as provided for in an ordinance adopted by the Common Council of the city of Schenectady on May 28, 1907, notably laying double tracks on Park Place and Nott Street, but alleges the fact to be that an additional track was laid on said streets by said company by virtue of and in accordance with the terms of its original franchises granted to said company prior to the adoption of said ordinance by said Common Council, and further alleges that the aforesaid ordinance was of the nature of a proposed contract between the city of Schenectady and the Schenectady Railway, but that said contract was never executed by the said railway company, was never consummated and never became effective, and that by reason thereof said railway company did not accept or avail itself of any of the proposed privileges or franchises therein contained.

"Defendant denies that the rate of fare of 5 cents charged by it for local service is unjust or unreasonable.

"Defendant denies that the rate of fare now in force between Albany and Schenectady and Schenectady and Troy is unjust and unreasonable.

"Defendant denies that its service is inadequate, but believes that the service rendered by it is as good as can be given, taking into consideration its track facilities and the other attendant conditions. Defendant refers to its tariffs, timetables and schedules on file with the commission and prays leave to refer to same with the same force and effect as though included in this answer.

"Defendant denies that its passenger station is inadequate.

"Defendant denies that it maintains a mechanical apparatus on State Street, Schenectady, in front of its waiting room without permission from the city. It alleges that it has permanently discontinued the use of such apparatus, and that whatever alleged detriment to the service has been caused thereby has been removed.

"Wherefore, the defendant asks that the complaint herein be dismissed."

#### Rear Cars for Women in Hudson River Tunnel

The Hudson & Manhattan Railroad, operating the tunnel under the Hudson River between New York and New Jersey, has issued the following notice:

"Beginning March 31, 1909, and continuing until further notice, the rear car on every train leaving Hoboken for New York between the hours of 7 a. m. and 9 a. m. and leaving Twenty-third Street and Sixth Avenue, New York, for Hoboken between the hours of 4:30 p. m. and 7 p. m. will be reserved for the exclusive use of ladies.

"This is an experiment which the management hopes will prove successful in practice, and which it reserves the right to terminate if it should be found to work unsatisfactorily.

"Uniformed porters wearing red caps, will be found on the platforms at the Hoboken Terminal and at the Twenty-third Street and Sixth Avenue station, New York."

In explanation, Wm. G. McAdoe, president of the Hudson & Manhattan Railroad, said:

"We believe that progressive railroad management demands that new problems, as they arise, should be met and solved rather than be disregarded or postponed. When the suggestion about separate cars for women was first made we doubted its practicability. After careful consideration, however, we have become convinced that it ought to be tried in actual practice. We are heartily in favor of anything which will make it more comfortable for women and children, particularly those who have to use crowded public utilities, and we hope that the result of our experiment will demonstrate that the plan is not only practicable, but that it will accomplish the desired purpose."

The Public Service Commission of the First District of New York at its meeting on March 26 adopted a complaint order requiring the Interborough Rapid Transit Company to answer within 10 days the complaint of the Women's Municipal League that inadequate accommodations are provided by the company for women passengers in the subway and to show cause why the rear car of each express train should not be reserved for women as suggested by the league.

**Limited Service Between Toledo and Fort Wayne.**—On April 1 the Ohio Electric Railway, Cincinnati, Ohio, will establish limited service between Toledo and Fort Wayne, the same date that has been set for beginning the Toledo-Dayton service.

**No Special G. A. R. Rates.**—At a meeting of the representatives of the traffic departments of the electric railways in Indiana, held at Cleveland, Ohio, before the meeting of the Central Electric Railway Association on March 25, it was deemed advisable not to make any reduction in rates to the G. A. R. Encampment at Crawfordsville, Ind., on May 19 to May 21, 1909.

**Special Excursion Fare Over Ohio Lines.**—At a meeting of the representatives of the traffic departments of the electric railways of Ohio, held in Indianapolis on March 13, it was recommended that a rate of one and one-half the first-class fare for the round trip be made to Newark, Ohio, good going June 14, 15, 16, 17 and 18, and returning up to June 19, from all points north, south and west of Dayton, Ohio, and north of Urbana and Mansfield, all tickets to be marked excursion, and that the excursion fare shall not in any case be lower than the regular round-trip rate from Dayton, Urbana and Mansfield to Newark.

**New Indiana Law Does Not Apply to Interurban Railways.**—Charles B. Riley, secretary of the Railroad Commission of Indiana, writes that J. F. McClure, of the Indiana

Railroad Commission, did not prepare an opinion holding that the 2-cent fare law applied to electric railways, as published in last week's issue. The opinion expressed by Mr. McClure was an oral one, given to some steam railroad men in conference, in which the law was construed to the effect that in transportation charges all fares should be based on the nearest multiple of five, whether charged for a ticket or collected on the train by the conductor. Electric roads were not considered in the conference.

**Complain of Fare Between Albany and Rensselaer, N. Y.**—Residents of Rensselaer appeared before the Public Service Commission of the Second District of New York recently in the interest of the complaint of the Rensselaer Chamber of Commerce against the 6-cent fare charged between Albany and Rensselaer by the United Traction Company. The Rensselaer people hold that the company is violating chapter 358 of the laws of 1905 which provides for a 5-cent fare between Albany and Rensselaer. Lewis E. Carr, attorney for the United Traction Company, contended that the company was only charging a 5-cent fare and that the extra cent was for bridge toll exacted by the Albany & Greenbush Bridge Company.

**Railroad Inspectors of Indiana Increase Scope of Inspection.**—The Railroad Commission of Indiana has addressed the following communication to all steam and electric railways in Indiana: "The Railroad Commission of Indiana has instructed its corps of inspectors to enlarge the scope of their inspection of cars, so as to include both defects penalized by the State law and those having no penalty affixed, but which render the operation of cars dangerous. Hereafter your equipment will be inspected for such defects as cutting out of air; crippled hand brakes; broken cut chains; hand brakes missing; defective grab irons; broken or missing brake shoes; defective couplers, and other defects in safety appliances and general condition."

**Committee of the Transportation & Traffic Association Meets.**—J. W. Brown, superintendent of transportation of the West Penn Railways, Pittsburg, Pa.; C. D. Emmons, general manager of the Fort Wayne & Wabash Valley Traction Company, Fort Wayne, Ind.; W. R. W. Griffin, general superintendent of the Rochester Railway, Rochester & Suburban Railway and the Rochester & Sodus Bay Railway, Rochester, N. Y., all of whom are members of the committee on training of transportation employees of the American Street & Interurban Railway Transportation & Traffic Association, met at Cleveland on March 25 to plan committee work preparatory to formulating their report for the 1909 convention.

**Proposal for Interurban Terminal in Cincinnati.**—The Federated Improvement Associations of Cincinnati have taken up the subject of presenting a bill in the Legislature in 1910 in the interest of a terminal for the interurban electric railways operating into Cincinnati. It is proposed that the State abandon the canal at a point south of the Mohawk Bridge and that all the ground be used for surface, elevated or subway tracks for the entrance of all the interurban lines to the city. The right of way is to be 32 ft. wide. This will leave 50 ft. on each side of the tracks, which it is proposed the city shall boulevard. The plan includes an operating company, which shall build the tracks and suitable passenger and freight stations and charge each road 1 cent per mile for each passenger and 1 cent per passenger for the use of the depot and for the maintenance of a ticket office. Charges are also to be made for express and freight handled at the depot. The local fare is to be 5 cents. W. C. Culkins is president of the Federated Improvement Associations.

**Freight Station Proposed at Columbus.**—Plans are being considered by the Ohio Electric Railway for the erection of a freight station in Columbus, Ohio. The company expects to maintain the present station for passenger business only and to handle all freight from the new station. The site at Town Street and Third Street on which it is proposed to erect the new freight station is a part of the site on which the Schoepf syndicate expected to erect an interurban union station several years ago. The company was unable to secure certain concessions from the city in connection with the proposed union station and did not carry out the plan. The ground for the building was all optioned, however, and is said to be still at the disposal of the company. One feature of the company's plan is to obtain a franchise from the city for a line on Town Street to connect the line at Scioto Street and Town Street, where cars coming into the city from the west enter the loop, with the opposite side of the loop at Third and Town Streets. The object of this is to avoid running freight cars around the loop. The company also proposes to ask permission to divert all through passenger cars including limited cars to this cutoff, thus shortening the distance in the city and saving time.

## Personal Mention

Mr. Howard D. Manington has resigned as secretary of the Ohio Railroad Commission to become secretary of the Ohio Coal Operators' Association.

Mr. Borden D. Whiting, of the New Jersey Board of Railroad Commissioners, has been elected president of the Board of Railroad Commissioners, to succeed Mr. David Baird.

Mr. Charles J. Hughes, counsel for the Denver (Col.) Tramway Company, is the subject of the article "Pike's Peak or Bust" in the "Who's Who—and Why" page of the *Saturday Evening Post* of March 27, 1909. Mr. Hughes is the new Democratic senator from Colorado.

Mr. William Barclay Parsons, New York, who was recently elected a director by the Underground Electric Railways, London, Eng., sailed for Europe on March 23 to study traffic problems in London. Mr. Parsons is familiar with the situation in London, having been retained by the British Government to serve as advisory engineer to the Royal Commission on London Traffic.

Mr. H. T. Bunn has resigned as treasurer and auditor of the Knoxville Railway & Light Company, Knoxville, Tenn., to accept a similar position with a department store in New Orleans, and Mr. Leon Fender, secretary of the company, has been elected secretary and treasurer of the company, and Mr. J. E. Tappan has been appointed auditor of the company.

Mr. W. D. Wright, the newly elected president of the New England Street Railway Club, is superintendent of equipment of the Rhode Island Company, Providence, R. I. Mr. Wright was engaged in central station lighting work for several years previous to 1890, when he entered the railway department of the Thomson-Houston Company and engaged in installing railway plants. In the fall of 1891, while in the employ of the Thomson-Houston Company, Mr. Wright assisted in the work of electrifying the Union Railroad, Providence, and after the road had been accepted, he entered the employ of the Union Railroad, as chief electrician. He continued in this position until 1901, when he was appointed superintendent of equipment, and has since held that position with the Rhode Island Company, successor to the Union Railroad, the Woonsocket Street Railway and the Pawtucket Street Railway. Mr. Wright has been a very active member of the New England Street Railway Club for several years, being on various committees of the organization, and in 1908 was elected vice-president of the club.



W. D. Wright

## OBITUARY

Thomas Fitzgerald, general manager for the receivers of the Norfolk & Southern Railroad, Norfolk, Va., died at his home in Baltimore, Md., on March 28. Mr. Fitzgerald was born at Fairmont, W. Va., on Jan. 1, 1853, and was in the employ of the Baltimore & Ohio Railroad 42 years, becoming general manager of the company in January, 1905. He continued in this position until Jan. 1, 1908. The Norfolk & Southern Railroad operates an electric line from Norfolk to Virginia Beach and also an extensive steam railroad system.

John H. Starin, vice-president of the original Rapid Transit Commission of New York, and head of the Starin City, River & Harbor Transportation Line, died at his home in New York City on March 22. While he was a prominent figure in the business life of New York City, for 34 years a member of the Chamber of Commerce and at one time a Congressman, Mr. Starin will be best remembered for his successful work as a Rapid Transit Commissioner. Together with Mr. Alexander E. Orr and Mr. Abram S. Hewitt, he was a member of the commission at the time the contract was awarded for constructing the present subway. His great ability as an organizer and his long experience in transportation problems of wide scope eminently fitted Mr. Starin for the position he so long occupied in the railway and business world. Mr. Starin was 83 years old.

## Construction News

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

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

### RECENT INCORPORATIONS

\***Ozark Traction Company, Eureka Springs, Ark.**—This company has been incorporated for the purpose of building an electric railway from Eureka Springs to connect with towns in north Arkansas. Capital stock, \$50,000. Officers: S. M. Mitchell, president; W. T. Ayers, vice-president; B. J. Rosewater, secretary; O. H. Orendorf, treasurer.

\***Modesto Interurban Railway, Modesto, Cal.**—This company has been incorporated in California for the purpose of constructing an interurban railway from Modesto to Empire, Waterford and Oakdale, also from Modesto to Newman and Crows Landing. It will be about 53 miles in length. It is stated that the company intends to operate gasoline electric cars. Capital stock, \$200,000, of which \$57,000 has already been subscribed. Directors: T. K. Beard, G. P. Schafer, H. T. Crow, W. H. Frazine, George Perley, D. E. Saunders and L. L. Dennett, all of Modesto.

**Lewiston Terminal Company, Ltd., Lewiston, Idaho.**—This company has been incorporated in Idaho for the purpose of laying tracks in Lewiston which are to be sublet to all interurban railways as terminals at a uniform rental or basis of charge when companies now building toward Lewiston shall reach the city limits. Capital stock, \$100,000. Incorporators: W. F. Kettenbach, J. M. Keatings, E. J. Hall, Wm. A. Libert, Wallace Stainton, M. A. Means and J. B. Morris. [E. R. J., Feb. 6, '09.]

\***Western Shore Electric Railway, Florence, Neb.**—This company has been incorporated to build an electric railway from Florence to Blair. Capital stock, \$150,000. Incorporators: L. M. Allen, L. C. Nebergall, Don C. Gould, J. F. Munro, and T. J. McVittie.

\***Erie & Union Railroad, Union City, Pa.**—This company has been chartered for the purpose of building an electric railway from Crooked Street, Union City, over the old-established grade of the Union & Titusville Railroad to the Erie water front at the junction of Mill Creek and Lake Erie. Capital stock, \$250,000. Directors: Wm. J. Smith, Titusville, president; Jesse L. Straus, New York, N. Y.; Cornelius M. Sexton, South Orange, N. J.; Charles E. Wellborn, Weston, N. J.; S. Grumbine, A. Egbert and B. E. Currie, Titusville.

**Inter-County Electric Railway, Topton, Pa.**—This company has been chartered for the purpose of building a high-speed electric railway between Lyons and Allentown, 21 miles. Capital stock, \$250,000. Directors: Maxwell H. Bochow, Topton, president; George F. Souwers, Bateman Saddington, Joshua H. Fisher and Fred R. Perry. [E. R. J., March 27, '09.]

### FRANCHISES

**New Castle, Ind.**—The City Council has refused to grant a franchise to W. L. David and L. C. Nichols, Findlay, Ohio, who are planning to build from Muncie to New Castle. [E. R. J., March 27, '09.]

**La Porte, Ind.**—The ELECTRIC RAILWAY JOURNAL is informed by the Indiana Union Traction Company that an error was made on page 487 of the issue of this paper for March 13, where it was stated that the Indiana Union Traction Company had filed a petition with the County Commissioners of La Porte, Starke, Pulaski and Cass Counties for a franchise for the construction and operation of an interurban railway through the counties to connect Logansport, Winamac, Bass Lake, Knox, La Porte and intermediate towns.

**Topeka, Kan.**—The Topeka Railway has asked the City Council for an amendment to its franchises granting the company three more years in which to build extensions to its lines.

**St. Joseph, Mo.**—The Interstate Railway and the Missouri River & Cameron Railway have applied to the County Court for rights-of-way for their proposed electric railways which are projected between St. Joseph and Kansas City. Both companies contemplate double tracks, on 80-lb. rails. The Interstate Railway will be equipped with the third-rail system, while the Missouri River & Cameron Railway is a combination electric and steam road and will use an overhead trolley. The projectors of both contend that they have obtained at least 75 per cent of the right-of-way, and that the actual construction will begin this spring. Joseph A. Corby is president of the Interstate Railway. [E. R. J., Jan. 16, '09.]

**St. Louis, Mo.**—The City Council has amended the franchise of the Illinois Traction System so that it will be per-

mitted to operate trailers over its terminal tracks in the streets of St. Louis. The Illinois Traction System is now building a bridge over the Mississippi River at St. Louis which, with terminal approaches, will cost about \$3,000,000. It is planned to give a bridge-car service between the heart of the business district in St. Louis and Granite City, Ill. A large terminal property in St. Louis has been purchased on which tracks will be laid for the accommodation of inter-urban passenger and freight trains. The present amendment to the franchise permits the company to handle freight and passenger trailers, including Pullman sleeping cars, over the 4½ miles of street track which is to form the loop through the city.

**\*Florence, Neb.**—The Western Shore Electric Railway, which was recently incorporated to build an electric railway from Florence to Blair, has applied to the Florence City Council for a 50-year franchise to operate a street railway over Calhoun road and the river road in Florence and over certain streets which will connect the two.

**Omaha, Neb.**—The County Commissioners have granted the Nebraska Traction & Power Company a franchise to cross certain public roads. The company proposes to build an electric railway from Omaha to South Omaha, Ralston and Papillion, a distance of about 6.5 miles. [E. R. J., Jan. 23, '09.]

**\*Oklahoma City, Okla.**—It is stated that Homer W. Hurst, Holdenville, has applied to the City Council for a franchise to build and operate an electric street railway in Oklahoma City.

**\*Roseburg, Ore.**—Application has been made to the City Council of Roseburg, by Kendall Bros., owners of the local water and light systems in Roseburg, for a franchise to build a street railway in Roseburg.

**\*Salem, Ore.**—The City Council has extended A. Welch's street railway franchises for 90 days, increasing its bond from \$5,000 to \$7,000.

**Grove City, Pa.**—The Slippery Rock & Grove City Railway has applied to the City Council for a franchise to construct a street railway over the streets of Grove City. The proposed railway will extend from Slippery Rock to Grove City via Harrisville. The company has an engineering corps at work making the surveys for the route. [E. R. J., Oct. 24, '08.]

**Johnstown, Pa.**—The City Council has granted the Southern Cambria Railway and the Johnstown Terminal Railway a two-years' extension of time in which to have their electric railways in operation between Johnstown and Ebensburg.

**Waco, Tex.**—The City Council has enacted an ordinance granting the Citizens' Railway a franchise to extend its railway across the Brazos River, on the suspension bridge, into East Waco.

**Ogden, Utah.**—The Ogden Rapid Transit Company is said to have applied to the City Council for a franchise to extend its railway south on Wall Avenue from Twenty-fifth Street to Thirty-second Street.

**Wauwatosa, Wis.**—The Town Board has granted the Milwaukee Light, Heat & Traction Company, Milwaukee, Wis., a franchise to build and operate a street railway over certain streets of Wauwatosa.

#### TRACK AND ROADWAY

**Tampa-Sulphur Springs Traction Company, Tampa, Fla.**—L. Brill, manager, advises that this company is engaged in building 2½ miles of track, 70-lb. 7-in. rails being used.

**Tri-City, Northeastern & Interurban Railway, Port Byron, Ill.**—J. W. Simonson writes that this company has been formed for the purpose of building an electric railway from Watertown to Hampton, Rapids City, Port Byron, Cordova and Albany. It has not yet been decided when the company will begin the construction of its proposed railway. Capital stock authorized, \$10,000. Officers: J. W. Simonson, Port Byron, president; W. H. Ashdown, Port Byron, vice-president; George W. Turner, Hampton, secretary; C. H. Peck, Albany, treasurer; Wallace Treckler, chief engineer. [E. R. J., Jan. 16, '09.]

**Central Illinois Traction Company, Mattoon, Ill.**—This company has awarded the contract for the excavating and building the lake at Urban Park to Loomis & Rose. Active work has already begun on the lake, which is to be 200 ft. x 1000 ft. It will have an average depth of 12 ft. It will also be supplied with boats, bath houses and bathing pools.

**St. Joseph Valley Traction Company, Elkhart, Ind.**—J. D. Wood advises that this company has already constructed a 20-mile section of its proposed railway which is to connect Elkhart, Bristol, Middleburg, Shipsman and Lagrange. It is the intention of the company to construct the railway

into Elkhart this year, a distance of 15 miles, also to connect with the Toledo & Western Railroad on the east at Pioneer, a distance of 25 miles. Mr. Wood states that gasoline motor cars will be operated at first and later on the railway will be equipped for electrical operation. Capital stock authorized, \$700,000; bonds authorized, \$700,000. Headquarters, Elkhart. Officers: H. E. Bucklen, 275 Michigan Avenue, Chicago, Ill., president; W. B. Pratt, Elkhart, vice-president; Stafford Maxon, Elkhart, secretary; C. H. Winchester, treasurer; R. Jones, Langrande, manager.

**Gary, Hobart & Valparaiso Traction Company, Hobart, Ind.**—Blake A. Mapledoram, chief engineer, writes that this company is planning to begin the construction of its proposed electric railway April 10. The railway as now proposed will be 17.5 miles in length, with extensions contemplated, and will connect the cities named in the title. The company has recently established its headquarters in Hobart. [E. R. J., Dec. 26, '08.]

**Consolidated Street Railway, Strong City, Kan.**—George A. Crum, secretary, advises that this company expects to relay 50 tons of new 36-lb. T-rails and to purchase 2000 ties, also braces, splices and spikes.

**Wichita Railroad & Light Company, Wichita, Kan.**—W. R. Morrison writes that this company expects to begin work within a few weeks on the construction of 4½ miles of new track. All material for this improvement has already been purchased.

**Shreveport (La.) Traction Company.**—This company expects to place contracts during the next few days for special work and renewals of curves amounting to \$3,500. L. M. Levinson, general manager.

**Gallatin Valley Electric Railway, Bozeman, Mont.**—It is officially announced that this company has placed a contract with Westinghouse, Church, Kerr & Company, New York, N. Y., for the construction of its proposed electric railway which it is to extend from Bozeman to Ferris, Hot Springs and Salesville. About 16 miles of single track are covered by this contract. Officers: H. S. Buel, president; Charles B. Anderson, secretary; George Cox, treasurer. [E. R. J., Dec. 19, '08.]

**Third Avenue Railroad, New York, N. Y.**—The Public Service Commission of the First District has granted Receiver Whitridge of the Third Avenue Railroad permission to continue the work on the Fort George extension.

**South Shore Traction Company, Patchogue, N. Y.**—The Public Service Commission of the Second District has given its approval for the South Shore Traction Company to construct and operate an extension of its railway in the villages of Sayville and Islip.

**Rochester, Syracuse & Eastern Railroad, Rochester, N. Y.**—Announcement is made that this company has let the contracts for the construction of its extension from Port Byron to Syracuse; to I. M. Luddington, Rochester, the contract for the construction of the roadbed for one-half the distance between Port Byron and Syracuse; to the American Bridge Company, New York, the contracts for five steel railroad bridges have been given. These will be placed over canal and railroad crossings between Port Byron and Syracuse. The company has further purchased and contracted for 125,000 ties to be used in the track work.

**Columbus, Delaware & Marion Railway, Columbus, Ohio.**—It is reported that John G. Webb, president of this company, is arranging to construct the gap between the northern terminus of the Columbus, Delaware & Marion Railway at Marion and one of the lines out of Toledo. The proposed extension will extend from Marion to Fostoria by way of Upper Sandusky, or to Findlay, by way of Carey.

**City Railway, Dayton, Ohio.**—T. E. Howell, general superintendent, states that this company expects to relay and pave one-half mile of double track.

**Columbus, Marion & Bucyrus Railway, Delaware, Ohio.**—The Supreme Court has affirmed the decision of the Marion County Circuit Court giving this company the right to cross the tracks of the Toledo, Walhounding Valley & Ohio Railroad, near Bucyrus, at grade.

**\*Simcoe Electric Railway & Power Company, Midland, Ont.**—It is officially announced that this company will begin this year the construction of an electric railway to connect Penetanguishene, Midland, Victoria Harbor, Waubaushe and Coldwater. The company expects to build a power plant at Big Chutes, on the Swern River. It is the intention to furnish power for lighting purposes. Capital stock authorized, \$500,000. Bonds authorized, \$400,000. Provisional directors: James Playfair, Douglas L. White, W. Finlayson, Midland; W. J. Sheppard, Waubaushe, and W. J. Lovering, Toronto.

**Portland Railway, Light & Power Company, Portland, Ore.**—This company is said to have placed an order with

the Lorain Steel Company for 1500 tons of steel rails. The rails will be used on the construction work of the railroad during the coming summer and the order was made for immediate delivery. Part of the rails will be 6 in., 72 lb., and the remainder 7 in. and 80 lb. The order includes only a part of the rails that will be needed for additional construction during 1909.

**South Bethlehem & Saucon Street Railway, Bethlehem, Pa.**—This company has awarded a contract to W. F. Glöse, Fountain Hill, for a fill of 1500 ft. on Weaver's farm, near Centre Valley. It is said that the other work of extension of the railway from Colesville to Centre Valley will be performed by the company's forces.

**Mercer County Street Railway, Greenville, Pa.**—It is stated that A. G. Shaw, chief engineer, and 10 surveyors have begun the final survey for this company. The surveys are being made from New Wilmington to Big Bend, a distance of 11 miles, the only unsurveyed stretch on the 42 miles from New Castle to Conneaut Lake. This railway is being built under the franchise of the New Castle & New Wilmington Railway, which has recently been purchased by the Mercer County Street Railway. [E. R. J., Feb. 27, '09.]

**Valley Traction Company, Lemoyne, Pa.**—The Supervisors of East Pennsboro have given permission to the Valley Traction Company to double track its railway from Rossmoyne Street, Lemoyne, to the river.

**Meadville & Conneaut Lake Traction Company, Meadville, Pa.**—This company expects to soon begin the construction of a 1700-ft. spur from its present terminus in Linesville to the Pennsylvania Railroad depot. The company also expects to build two 50-ft. girder bridges. F. R. Shryock, general manager.

**\*Pittsburg, Pa.**—J. H. Barrett, 331 Fourth avenue, Pittsburg, chief engineer of the proposed electric railway between Rochester and Mars, writes that the project is at present only in a preliminary stage. The surveys have been completed and the majority of the rights of way have been secured. Mr. Barrett states that he is now at work securing the necessary franchises. It is expected that the company will be prepared to begin construction about July of this year.

**\*Laurens, S. C.**—At a business meeting of the Laurens Chamber of Commerce, the matter of an electric railway from Laurens to Clinton was the subject of considerable discussion, which resulted in some definite action on the part of the business men concerned. Committees were appointed to get the movement in shape. The committee appointed on incorporation consists of: Robert A. Cooper, W. R. Ritchey, Sr., and A. C. Todd.

**Corsicana (Tex.) Transit Company.**—J. W. Carpenter, president, writes that this company is ballasting its track; also displacing the light rails with heavier ones.

**Port Arthur (Tex.) Street Railway.**—H. J. Myers advises that this company will soon work on its proposed 6-mile electric street railway in Port Arthur. The plans call for the construction of a power plant and repair shop at Port Arthur. An amusement park will be operated by the company, but its location has not yet been decided upon. Ten cars will be purchased. The officers have not yet been elected. Principal office, 501 Conover Building, Dayton, Ohio. [E. R. J., March 27, '09.]

**\*Clintwood, Va.**—It is reported that the business men of Clintwood are planning to organize a company to build an electric railway from Clintwood to the nearest point on the Carolina, Clinchfield & Ohio Railway, which is being constructed through Dickenson County down the McClure River. The length of this electric railway will be about 6 miles. Some of those who are interested in the enterprise are Roland E. Chase, A. A. Skeen and Columbus Phipps, all of Clintwood.

**Roanoke Railway & Electric Company, Roanoke, Va.**—J. W. Hancock, general manager, reports that this company is engaged in constructing an extension of its railway in the town of Salem for a distance of about a mile.

**Vancouver (Wash.) Traction Company.**—It is stated that this company intends to begin construction work on the extension of the electric railway from its present terminus at the St. John Road to Orchards, a distance of 5 miles, within 30 days after the farmers in that section raise a bonus of \$10,000 and sign contracts granting free rights of way through their property to the railway.

**\*Wheeling, W. Va.**—Albert M. Shenk is reported to have announced that he has closed a deal with Pittsburgh capitalists to build a high-speed electric railway that will connect Wheeling and Pittsburgh. A railway will be constructed from Wheeling to Middletown, in Washington County, Pa., 15 miles, and thence 30 miles to Pittsburgh. A 90-minute service between the two cities is proposed.

## SHOPS AND BUILDINGS

**Gary, Hobart & Valparaiso Traction Company, Hobart, Ind.**—This company, which proposes to build an electric railway from Gary to Hobart and Valparaiso, will erect its car house in Hobart. The building will be 41 ft. x 128 ft., will be of brick with fireproof roof, and will contain three tracks, the center one to be a pit for the examination and care of cars from underneath. This building will contain a conductors' wash room and lockers. The cars to be accommodated in this building will be two 50-ft. cars, two 40-ft. cars, one express car and one snow plow. Blake A. Mapledoram, Hobart, chief engineer.

**Corning & Painted Post Street Railway, Corning, N. Y.**—This company advises that it will begin within a few weeks the construction of an addition to its repair shop. B. L. Bradley, superintendent.

**Second Avenue Railroad, New York, N. Y.**—Maynicke & Franke, architects, have filed for the Second Avenue Railroad plans for rebuilding the old car house of the company on Second Avenue, from Ninety-sixth Street to Ninety-seventh Street, to comply with an order issued by the Buildings Department to repair the structure, which was recently found to be unsound in various parts. The old foundations and parts of the outer walls, which are in a sound condition, will be utilized in the reconstruction, and the building will be finished with an ornamental façade crowned by a crenelated parapet cornice. It will be three stories high. The alterations, it is said, will cost \$300,000.

**Rome City Street Railway, Rome, N. Y.**—The new office and car house erected by this company to take the place of the building burned Oct. 28 last have been completed. The structure is of brick, with concrete roof and steel girders, and is fireproof. There are accommodations for 30 cars and a snow plow. The size of this building is 60 ft. x 150 ft., and here is located the private office of the superintendent. Adjoining are the smith shop, oil, storage and boiler rooms.

**Cincinnati (Ohio) Traction Company.**—It is stated that plans are being prepared by Thomas Elliott, chief engineer of this company, under the direction of W. Kesley Schoepf, president, for a clubhouse for employees of the Cincinnati Traction Company, to be built at the Brighton car house at a cost of \$15,000. The building will contain the offices of the Street Railway Employees' Protective Association, a large assembly hall, billiard and pool tables, bowling alleys, library and baths, and possibly a café.

**Belton & Temple Traction Company, Temple, Tex.**—This company on March 19 awarded a contract to H. D. McCoy, Cleburne, for an extension to its car house at Midway. This addition will provide for a paint shop and more storage room.

## POWER HOUSES AND SUBSTATIONS

**Keokuk Electric Railway & Power Company, Keokuk, Ia.**—This company announces that it is in the market for 1 150-kw railway generator. A. D. Ayres, manager.

**Citizens' Railway & Light Company, Muscatine, Ia.**—This company advises that it expects to award contracts during the next three months for a steam turbine and generator. E. M. Walker, manager.

**Gary, Hobart & Valparaiso Traction Company, Hobart, Ind.**—This company, it is announced, will erect its power plant in Hobart, close to the car house. Both will be under one roof but with a fireproof wall between them. This building will be constructed of brick and will be 47 ft. x 98 ft. In the boiler room section will be located three 300-hp boilers and in the other section will be the engine and other machinery. The equipment will also include two 450-hp non-releasing, 4-valve Ball engines, to which will be directly connected two 300-kw, 600-volt generators. The company will erect both the car house and power station itself.

**Edgerton Tramway Company, Ltd., Stellarton, N. S.**—This company is reported to have purchased the power plant of the New Glasgow Electric Company, Ltd. It is proposed to move the plant from New Glasgow to the former company's buildings at Stellarton. It is probable that considerable new equipment will be installed.

**Western Ohio Railway, Lima, Ohio.**—It is officially announced that this company is considering the purchase of an 800-kw generator. F. D. Carpenter, general manager.

**London (Ont.) Street Railway.**—It is announced that this company expects to use additional power for the coming summer season, but it has not yet been decided as to what kind of electrical equipment will be installed. C. B. King, manager.

**Meadville & Conneaut Lake Traction Company, Meadville, Pa.**—The ELECTRIC RAILWAY JOURNAL is informed that this company is planning to purchase mechanical stokers. F. R. Shryock, general manager.

# Manufactures & Supplies

## ROLLING STOCK

**San Jose (Cal.) Railway** will purchase from 16 to 20 new double-truck cars.

**Consolidated Street Railway, Strong City, Kans.,** expects to purchase 1 car this year.

**Keokuk (Iowa) Electric Railway & Power Company,** will purchase 3 18 or 20-ft. car bodies.

**Port Arthur (Tex.) Street Railway,** a proposed electric road, will soon purchase 10 motor cars.

**Little Rock (Ark.) Railway & Electric Company** is in the market for 11 double-truck, center-aisle trail cars.

**Grand Rapids (Wis.) Street Railroad** will buy four motor cars through the Knox Engineering Company, Chicago, Ill.

**Lowell & Fitchburg Electric Street Railway, Ayer, Mass.,** suffered a loss of three large cars and a snow plow in a fire which destroyed the company's car house in Ayer.

**Fairmont & Clarksburg Traction Company, Fairmont, W. Va.,** will purchase within two weeks several sets of motor equipment for single-truck cars and also a number of trucks.

**Long Island Railroad, Long Island City, N. Y.,** will, it is reported, purchase 120 steel passenger motor cars, for service in the Pennsylvania tunnels into the New York City terminal of the Pennsylvania Railroad.

**Tioga Traction Company, Wellsboro, Pa.,** a proposed road of which W. A. Seltz, Jersey Shore, Pa., is promoter, expects to purchase two 60-ft. interurban, semi-convertible cars for use when the road is completed.

**Tampa-Sulphur Springs Traction Company, Tampa, Fla.,** mentioned in the *ELECTRIC RAILWAY JOURNAL* of Jan. 2, 1909, as contemplating the purchase of six 12-bench cars, has ordered four 12-bench open cars from the American Car Company.

**Union Traction Company, Sistersville, W. Va.,** has ordered two 45-ft. closed cars and one 15-bench open car from the Cincinnati Car Company, Cincinnati, Ohio. Standard Motor Truck Company's O-50 trucks and National Brake & Electric Company's semi-automatic air brakes were specified.

**Findlay-Marion Railway & Light Company, Columbus, Ohio,** mentioned in the *ELECTRIC RAILWAY JOURNAL* of Feb. 13, 1909, as being in the market for 12 cars, advises that they will buy passenger, baggage and freight cars. In addition to this equipment it will purchase 2 electric locomotives.

**Geneva, Waterloo, Seneca Falls & Cayuga Lake Traction Company, Seneca Falls, N. Y.,** mentioned in the *ELECTRIC RAILWAY JOURNAL* of March 20, 1909, as having purchased 8 cars from The J. G. Brill Company, through Meikleham & Dinsmore, New York, advises that 13 double-truck, closed cars were ordered from Wason Mfg. Company's works.

**Gary, Hobart & Valparaiso Railway, Valparaiso, Ind.,** mentioned in the *ELECTRIC RAILWAY JOURNAL* of March 20, 1909, as being in the market for 4 cars, advises that Standard O-60 trucks have not been specified and that it will purchase 2 50-ft. and 2 40-ft. passenger cars, 1 express and 1 snow-plow car. The company expects to have the road in operation in a few months.

**Michigan United Railways, Lansing, Mich.,** which was reported in the *ELECTRIC RAILWAY JOURNAL* of Feb. 20, 1909, to be in the market for four interurban cars, also plans to purchase five double-truck city cars for use on the company's lines in Jackson and Lansing. These cars will have 28-ft. bodies, an overall length of 41 ft., and a width over posts of 8 ft. 3 in.

## TRADE NOTES

**Baldwin Locomotive Works, Philadelphia, Pa.,** announce the death, on March 23, 1909, of William P. Henszey, one of the partners of Burnham, Williams & Company, who had been connected with the works since March 7, 1859.

**P. Edward Wisch Service, New York, N. Y.,** recently secured evidence which resulted in the sentence of a conductor on March 22 to three months in jail for stealing fares on Newark cars of the Public Service Railway of New Jersey. The detective agency presented eight witnesses to prove the conductor's guilt.

**Cameron Electrical Manufacturing Company, Ansonia, Conn.,** during the past year did not materially reduce its working force and the over-product has been put into stock. The company has now over 2000 new commutators of all types and sizes in stock. This policy of keeping a large stock of commutators on hand in the spring and fall, about the time when the railways are overhauling their summer

and winter cars, has been adhered to for a number of years.

**Standard Varnish Works, New York,** announce that L. Robinson has been appointed manager of the insulating department of the company, with headquarters in New York. Mr. Robinson has been identified with the Standard Varnish Works during the past four years. For 15 years previous to Mr. Robinson's connection with the Standard Varnish Works he held numerous responsible positions in the operating departments of electric railways in the United States, Canada and Europe.

**W. P. Pressinger, New York,** who recently resigned as general manager of the compressor department of the Chicago Pneumatic Tool Company, has organized the W. P. Pressinger Company, to handle the vacuum-cleaning machines, both portable and stationary, made by the Keller Manufacturing Company, Philadelphia, Pa., and formerly sold by the Chicago Pneumatic Tool Company. The new company has opened offices and salesrooms at 1 West Thirty-fourth Street, New York City, and will establish local agencies at all distributing points throughout the eastern states.

**D. & W. Fuse Company, Providence, R. I.,** advises that tests were made recently to compare the properties of its Deltabeston magnet wire with those required and covered by the United States Government specifications. The specification reads in part as follows: "When subject to a temperature of 160 deg. C., neither the asbestos covering nor the waterproof compound shall be injuriously affected. Six-inch samples of wire, with carefully paraffined ends shall be immersed in fresh water at a temperature of 22 deg. C. for a period of 24 hours. The percentage of water absorbed by the insulation during such immersion shall not exceed 4 per cent." As the result of these tests, Deltabeston magnet wire was chosen and the contract was awarded to the D & W Fuse Company.

**Wonham, Magor & Sanger, New York, N. Y.,** manufacturers of the H.B. life guard, advise that a demonstration of the successful operation of the H.B. guard was made on March 24, when a motorman in the employ of the Metropolitan Street Railway, New York, fell in front of a car of the Third Avenue Railroad equipped with the H.B. guard and, in spite of the fact that the car was running at a high speed, the prostrate motorman was picked up unhurt. The account of the accident printed in the *New York Times* follows: "Frederick W. Whitridge, receiver for the Third Avenue Railroad, says that he has in use a street car fender that will really save lives. A demonstration of its usefulness was made this morning, when Thomas Cummings, a motorman on the Metropolitan Street Railway, fell in front of a northbound Third Avenue car at Ninety-ninth Street and Third Avenue. In spite of the fact that the car was bowling along at a high speed, Mr. Whitridge says the wheel guard caught the prostrate motorman up, carried him until the power was shut off, and dumped him out safe and sound with no more damage than the mussing up of a uniform. Mr. Whitridge, who has not thought particularly well of the Public Service Commission's experiments with dummies, has notified the members of that body of his success with a real live subject." Wonham, Magor & Sanger announce that George E. Willis, for six years with the Sterling-Meaker Company, has accepted a position with Wonham, Magor & Sanger. Mr. Willis has represented the Sterling-Meaker Company in all parts of the country and has an extensive acquaintance throughout the United States.

## ADVERTISING LITERATURE

**Cheatham Electric Switching Device Company, Louisville, Ky.,** is distributing a booklet describing in detail its automatic switching device. The general agent of this company is Samuel Bowman, St. Louis, Mo.

**Goldschmidt Thermit Company, New York, N. Y.,** publishes in *Reactions* for the first quarter of 1909, an illustrated description of various forms of welded compromise joints as well as many other applications of thermit.

**Allis-Chalmers Company, Milwaukee, Wis.,** has issued, in pamphlet form, a description of the hydro-electric development of the Great Northern Power Company, the largest of its kind in the world, and located near the head of Lake Superior.

**The J. G. Brill Company, Philadelphia, Pa.,** in its *Brill's Magazine* for March, publishes an interesting article on the conditions which govern the type of car for service in Detroit. Instructions are also given as to the proper method of ordering repair parts of Brill trucks.

**Dossert & Company, Inc., 242 West Forty-first Street, New York,** has just published its fourth annual catalog of Dossert solderless connectors, cable taps and terminals. The pamphlet contains descriptions of several new designs of connectors in addition to the styles heretofore made.

TABLE OF MONTHLY EARNINGS

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.

Table with multiple columns: COMPANY, Period, Gross Income, Operating Expenses, Gross Income Less Operating Expenses, Deductions From Income, Net Income. The table lists earnings for various companies like AKRON, O., BELLINGHAM, WASH., BIRMINGHAM, ALA., CHICAGO, ILL., CLEVELAND, O., DALLAS, TEX., DETROIT, MICH., EL PASO, TEX., FT. WAYNE, IND., FORT WORTH, TEX., GALVESTON, TEX., HARRISBURG, PA., HOUGHTON, MICH., JACKSONVILLE, FLA., KANSAS CITY, MO., KNOXVILLE, TENN., LITTLE ROCK, ARK., MEMPHIS, TENN., MILWAUKEE, WIS., MINNEAPOLIS, MINN., MONTREAL, CAN., OAKLAND, CAL., PADUCAH, KY., PENSACOLA, FLA., PHILADELPHIA, PA., PLYMOUTH, MASS., PORTLAND, ORE., ST. JOSEPH, MO., ST. LOUIS, MO., SAVANNAH, GA., SEATTLE, WASH., TACOMA, WASH., TAMPA, FLA.