Electric Railway Journal

Consolidation of Street Railway Journal and Electric Railway Review

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Let's Confine Attention to Essential Transportation Service

THE chartered car is a good thing in times of peace when a surplus of men and rolling stock is available. It is likely to prove a bad proposition this summer in those communities where the war has brought the need for applying every car-mile possible to war plant transportation. In ordinary times, for example, the chartered car may earn at least as much money as cars in regular service, but this would hardly be the case where properties are clamoring for cars, more cars and still more cars. Thus self-interest and patriotism combine to shelve this class of special service for the time being.

Closely related to the chartered car is park service. Usually the bulk of this is the transportation of women and children during the afternoon at what is really a non-profitable rate of fare since so many children ride free, at half rates or even where no general reduction is customary for pleasure travel. If the runs are so long that the return is made during the evening peak, this class of service becomes a positive detriment to the needs of war-work transportation and ought to be curtailed if not utterly eliminated. One might even go a step further by discouraging excessive pleasure riding on Sundays if it is to private resorts where strong drink is sold, for this means a strain on the patience of overworked car men. In these times with jobs so easy to get, the shrewd operator will not encourage the kind of travel that makes motormen and conductors too tired to show up the following Monday. He will realize that it is both better business and better patriotism to give the best possible regular service, leaving the cultivation of chartered car, park or other auxiliary service to post-bellum days. His task now is to get the biggest possible war-service mileage per car and per man, using any free time for the repair of the one and the recuperation of the other.

Every City Should Adopt the Skip Stop and Save Coal for Next Winter

TO THE AVERAGE citizen, the arrival of warm weather has settled the fuel question, at least so far as any present worry about it is concerned. Actually, this is just the time when there should be great savings because they will count more towards relieving next winter's shortage if made now than later. The National Fuel Administration realizes this, as can be seen from its recent announcement that between 50,000,000 and 60,000,000 tons must be saved by the nation at large if the householders and industrial plants in this country are not to suffer during the coming winter. The only way in which this shortage can be overcome is through the co-operation of every coal user in the country.

Electric railways, as large power users, have an important duty to perform in this campaign. Through the introduction of the skip stop alone the Fuel Administration expects that a saving can be made of 1,000,000 tons of the fifty million which will be required by the nation to get through next winter comfortably. Some fifteen cities were mentioned in our issue of last week as having introduced the skip stop, but this number is insignificant compared with the possibilities, and every company which has not done so ought to take this matter up promptly with its city authorities. In so doing it should have the hearty assistance of every non-war industry in its community, because if there should be any deficiency in fuel next winter it will come out of the quota of these industries and not out of the supply to which the electric railway is entitled. There should surely be an incentive also to the average citizen to support a movement like this which has the double purpose of giving him better transportation this summer and helping to keep his home warm next winter. The local fuel administrator can be counted upon to assist in such a campaign because of the prominence placed by the National Board upon this particular economy. Here is a case where everyone gains.

How Can Boiler Excess Air Be Controlled?

IN THE last mechanical issue, that for May 18, Hartley LeH. Smith, in his article on the boiler plant, mentioned some boiler tests which showed that, regardless of other variables, for a given flue draft the least coal consumption produced the best economy. The tests were fifteen in number and they were run with an overfeed stoker and semi-bituminous coal. The results suggest that there are certain aspects of power generation by combustion of coal which are still not thoroughly understood. Even some men ostensibly acquainted rather intimately with the coal furnace problem do not quite appreciate these. Witness this question. Suppose that a boiler test has been run and has shown about rated capacity but excess of air, say 90 per cent above theoretical requirements. Suppose that it is desired to repeat the test with the stipulation that the steaming rate shall be about the same as in the first test, but that the excess air shall be but about 60 per cent above theoretical requirements. Suppose the boiler to have a furnace with hand-fired grate and forced draft. Now the question is: How can substantially unchanged steaming rate together with reduced excess air be insured?

To say that the answer is simple will not be enough. It isn't simple. The Electric Railway Journal invites expression of opinion in the matter. We may hint that the crux of the problem is that excess air is not one of the independent variables. It is, in fact, dis-

tinctly a dependent variable. The forced-air pressure, the rate of coal firing, the thickness of fire and the flue draft are independent variables. The steaming rate is another dependent variable; it is the capacity of boiler and furnace. Excess air is certainly related to the efficiency. But how can one with confidence so alter the independent variables shown by one test not to be most suitable so that steaming rate may be held approximately constant while the excess air is altered to suit? The subject is open for discussion.

Keeping the Substation in Operation in Wartime

THE labor shortage has hit the electric railway substation a hard blow. As a rule railway operators are young men much needed by Uncle Sam, either as soldiers or workers in manufacturing plants engaged in essential war work. They must be replaced either by older men or by women, unless the substations can be made automatic. If automatic apparatus could be secured quickly, no doubt the installation of this type of control equipment would be many times more rapid than it is. Even with deliveries as slow as at present it would be well to plan the installation of such equipment as soon as it can be obtained, which means ordering at once. In the meantime, and in those cases where the automatic seems not immediately applicable, what is to be done for substation attendance?

The first resource is naturally the ranks of men not eligible for war duty. Such men are apt to be steady and dependable, but lacking in alertness and resourcefulness, that is to say "nerve." Possibly their virtues and defects about balance. They are, however, accustomed to wages higher than are usually allotted to the substation operator. Somehow these men and the railways must get together on a compromise. They will have to be paid a little more but must realize their shortcomings with respect to this particular class of work.

Young women ought to make good operators and on the day shifts there could be no possible objection to their employment. Occasionally there are heavy tasks to be done, such as pulling large direct-current feeder switches, but this heavy work is of short duration. The operator must have the physical strength for such tasks, although great endurance need not invariably accompany it. If women should prove otherwise capable, eventually air or electric power could be applied to heavy switch opening and closing. This matter of women employment must be tried out before we can definitely answer the question "Are women suited to substation operation?"

An ideal arrangement for this difficult situation in some instances would seem to be to make the running of the substation a family affair by turning it over to a man and his wife. They could employ a helper or utilize a young fellow in the family. Their home should be a part of the substation. The work could be divided so that the man could be on duty at times of peak load and could be called in case of any emergency. The woman could take the "off" hours and the helper could relieve either or both as arranged. The amount which could be paid for this service would be attractive to many who might be able to save house rent, and as a war measure at least the plan would be justifiable.

Some Electric Railway Problems the War Labor Board Must Solve

DISCUSSION before the National War Labor Board in Chicago recently when the wage controversies of the Detroit and Cleveland companies were being presented brought out some interesting features of the labor situation as it affects the electric railway industry in the United States during war times. Coming so close upon the award of larger pay to steam road employees and the increase in freight and passenger rates to meet the new costs, the points of difference must have appealed strongly to the members of the board because here were cases in which, even though the demands of the men were just, the financial inability of the companies to meet them was apparent.

Surely, here is a problem for the national authorities if, as Chairman Walsh said, the employees are to receive what is due them, no matter what readjustments or additional legislation may be required to accomplish this result. New precedents are being established every day. Perhaps, then, we may look with confidence to this new board to point a way out of the difficulties surrounding the electric railways in their need for increased revenues.

The employees were not placed in an enviable position by the exhibit of the Detroit company which showed that they do not accept the opportunity to earn the maximum pay. In the month of March, 1918, 59 per cent of the trainmen worked twenty-six or more days, according to this evidence. Those who put in full time drew an amount in wages which should have enabled them to meet the cost of living. The conclusion is plain that those who did not use their opportunity to the utmost were not showing a proper spirit to meet industrial conditions during a time when there is a shortage of labor.

"Hours of service" was another question which engaged the attention of the board, and Chairman Taft evidenced his familiarity with urban railway conditions when he suggested that public demands for service during peak hours might make it necessary to arrange schedules on a basis which gave a wide range of "outside hours" for men working on the cars. The Massachusetts nine-in-eleven-hours law passed several years ago did not correct these conditions and only resulted in an arrangement by which the men were paid extra for hours of duty outside the maximum in the statute.

The Railroad Wage Commission in its recent report met a similar situation fairly when it said: "This, moreover, is not the time, in the judgment of the commission, to make experiments which might lessen the output of that commodity which railroad men produce—tons of freight hauled and numbers of passengers carried. The one thing now imperative is volume of and speed in railroad output." The commission also refused to penalize the employers for too long a work day, "at a time when urgent and serious necessity compels sacrifice from all." The electric railway situation calls for treatment equally as fair, because not only are these companies doing their share to speed up war work, but the circumstances under which they operate cannot be met by shortening the working day of the employees.

A question asked by Chairman Taft during the hearing indicated his opinion that electric railway work is attractive, and one of the reasons mentioned as

making such employment inviting is its steadiness. Conductors and motormen who are being lured to other occupations by offers of higher pay should keep this point in mind. The average electric railway is giving fair wages to its employees, and if it cannot compete with the extremely high pay offered in certain war industries it is usually due to financial inability. The reasons for this handicap are apparent to all fair-minded persons, most of all to the employees who continue to collect the same unit of fare which their predecessors collected for several generations. There is only one way out of the dilemma and that is to obtain increased revenue. Organized labor can do its share to impress this on fare-regulating agencies, and meanwhile it should be patient in helping the employing companies to struggle along.

The capable members of the War Labor Board will undoubtedly recognize in these conditions a situation different from that of any other dispute which may come under their jurisdiction. Federal Judge Alschuler recently granted advanced wages to thousands of stock yards employees, and in doing so he made the point that "we are not here met with the ofttimes embarrassing and influential contention that the profits of the industry will not warrant the demanded hours or wages." With the electric railways this contention is "embarrassing and influential" and should have considerable weight with any board called on to add to the burdens of a business which is limited in its prospects of increased revenue. The moral influence of the War Labor Board should go a long way toward overcoming any barriers which may stand in the way of meeting the just demands for improved service, fair wages and adequate return on investment.

Country Needs More Commissioners Like Mr. Straus

OSCAR S. STRAUS, chairman of the Public Service Commission for the First District of New York, has tendered his resignation to Governor Whitman and asked to be released from active duty not later than July 1. At the time of his appointment to fill the vacancy caused by the removal of Edward E. McCall, Mr. Straus refused to accept the post for a full five-year term. Now he desires to lay down the duties for he considers that the major part of the work for which he was appointed has been finished, and he feels that his experience better fits him for other work of importance in this hour of national need.

It must be a source of great gratification to Mr. Straus to be able to look back upon an active life of more than three-score years and seven, with its large amount of important work in the service of the public. Mr. Straus is a conscientious and honest worker and a broad-minded man, the kind needed at the head of regulative bodies. He has won the respect and loyalty not only of his associates and co-workers, but also of the public and the officials of the utilities under his jurisdiction. Governor Whitman showed great sagacity in appointing such a capable man to such a responsible position. Let us hope that he will show equally as good judgment in choosing a successor.

Now more than ever, regulation demands men of high type. The preservation of utilities from the danger of increased costs and fixed rates is a national necessity. The successful prosecution of the war and the general welfare of the people demand the maintenance of the utility industry at the maximum of efficiency. Regulation of utilities to accomplish this end requires men of judgment, men of courage and men of vision. In New York, to a greater degree than elsewhere, such men are needed, for the defects which the courts have found in the regulatory law must be overcome by public education, and no leaders have a greater responsibility for teaching to the public the requirements of justice to utilities than do the members of commissions.

The utility situation in New York State is not of local importance; it has a national bearing. The man who can take up the work where Mr. Straus finds it necessary to stop and can carry it on with success through the coming critical reconstruction period will be serving his country nobly.

Mechanical Engineers Make Plea for Cleaner Coal

NOTABLE among the features of the spring meeting of the American Society of Mechanical Engineers held at Worcester, Mass., June 4 to 7, were the large attendance at the fuel conservation session and the volume of papers and discussion, necessitating a second session in the afternoon. Conspicuous was the emphatic and repeated expression of opinion on the part of fuel consumers that the Fuel Administration should promptly and energetically mete out to the coal producers such sound trouncings as would revive their appreciation of the legitimate longing of coal consumers for coal sufficiently clean to permit the possibility of its burning. The meeting even went to the length of passing a resolution to this effect. Active interest was also aroused in the burning of anthracite screenings mixed with bituminous coal on underfeed stokers, and promising accounts of experience in this line were given. The economic limit was sharply defined as 30 to 35 per cent of anthracite screenings with the greatest possible homogeneity of mixture.

Equally important was the call for engineers to man the forces of the Fuel Administration in its great program of economy in the use of coal. The strong statement was made that every combustion expert in the country will be needed in active service to this end.

Technically there was no feature of the sessions devoted to coal approaching the interest and significance of Henry Kreisinger's address (cut short in presentation as were all others by the inexorably efficient chairman) on the inherent nature of coal combustion. He made the statement that more than 7 lb. of air per pound of coal cannot be made to flow through a fuel bed provided it has an unbroken surface. He remarked that possibly this was news to some of his hearers, and the discussion after the meeting among groups of members showed that this was so. Mr. Kreisinger added to his long list of services to combustion engineers by pointing out the inevitability of large air supply above the fire. This may be provided properly by the furnace designers, or the fire itself will provide it by breaking into holes if the furnace design is such as not to satisfy the fire's thirst for air above its surface. Mr. Kreisinger is an expert in coal combustion of great originality, and the time and place of announcing the latest results of his researches were well chosen.

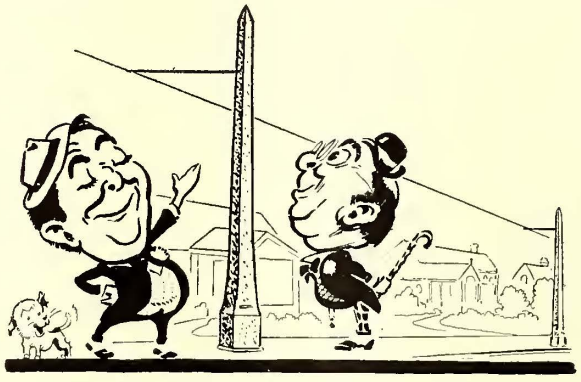
Concrete Poles Are in the Process of Evolution

They Possess Certain Intrinsic Virtues But Should Not Be Designed in Imitation of Wood Poles—The Subject Should Be Thoroughly Investigated to Develop the Most Practical and Durable Concrete Pole

By Charles Rufus Harte
Construction Engineer
The Connecticut Company, New Haven, Conn.

THE possibilities of using concrete as a pole material were first tried out in 1856 in connection with the Panama Railroad, the insects of the Isthmus having proved to be too much for wood. The poles were short and stout, having a length of but 12 ft., tops from 6 to 8 in. in diameter, and butts from 12 to 15 in. across. The iron crossarms were fastened to the poles by means of clamping bands.

The first poles were of plain concrete. It would seem that with the dimensions used they should have served well in a sleet-free section, but they proved not to be satisfactory. Whether the concrete was poor, or monkeys used the wires too freely—a source of serious trouble in the tropics—or from some other cause, the poles were very shortly replaced by others reinforced with a wood core 3 in. square. These behaved but little better than the solid concrete poles, for the core swelled and split the casing of concrete.



"Made It Myself," Said the Overhead Engineer, "Can You Beat It?"

From the relative dimensions of the parts of these poles it is quite certain that both the wood and the concrete were expected to take parts of the load. In the case of the concrete-covered poles used at a much later date in Switzerland the wood was full size and the thin concrete shell served merely for protection. Incidentally there seems to be some difference of opinion as to the success of the scheme.

Steel Reinforcement Made the Concrete Pole Possible

Not until about 1895 was steel used as reinforcement, when concrete poles so reinforced were tried out both here and abroad. Although the experimenters were loud in their praises of the products, it was some time before there were any worth-while results. This was doubtless due to failure to appreciate the faults of the new construction until the poles were made, and a bad attack of "cold feet" on the part of the enthusiasts immediately thereafter.

A few, however, stuck to the problem, and by 1910 the reinforced concrete pole had become a reasonably practicable structure. Credit for this result is due particularly to the Concrete Pole Company of St. Catherines, Ont., which built several hundred for transmission lines in the Welland Canal district; to George A. Cellar, superintendent of telegraph Pennsylvania Lines west of Pittsburgh, one of the earliest in the field; to the United Traction Company, Albany, N. Y.; and to several others. Since 1910 very satisfactory results have been secured, although the development has been chiefly local. A few companies, notably the Cleveland Railway; the Fort Wayne & Wabash Valley Traction Company; the Marseilles Land & Water Company, Marseilles, Ill., the New York State Railways; the Oklahoma Gas & Electric Company and the Welland Canal district companies have used very considerable numbers, while but few other companies seem to have employed concrete poles at all.

The life of a reinforced concrete pole depends on several factors. The concrete itself is practically everlasting as regards decay or corrosion, but it may fail through a mechanical injury. The reinforcement cannot rust so long as it is sealed in the concrete and it is also thus protected from electrolysis. But injury to the covering concrete may expose the metal and permit its destruction by corrosion, while under favorable conditions for such action electrolysis may be set up. The resulting expansion of the steel as it corrodes will split off the protecting material and allow the weather also to take a hand in the destruction.

It was feared by many that moisture would work into the metal and rust it; that frost would spall off the concrete from the reinforcement, leaving it unprotected, and that lightning would shatter the poles, but none of these fears has been realized. Where the concrete has cracked, either from contraction when setting or from mechanical stress, there have been some instances of corrosion as would naturally be expected under the circumstances. Lighting, however, in the rare instances when it has been known to strike, has only slightly chipped the concrete, leaving the pole practically as good as new. In the event of a grass fire, or of a conductor grounding on the pole, there is far less liability to trouble than with wood. A hot fire or a heavy ground may cause spalling of the concrete, but if the injury is not too long neglected the pole can be patched and made as good as new. With a wood pole any loss of material can be made good only by complete replacement, and it is astonishing how small a bunch of dry grass will serve to set a wood pole going.

In case of failure, reinforced concrete poles do not break off. Wood poles have greater flexibility, and this often relieves a severe load by increasing the sag of the pulling span; but when the ultimate strength is

reached they snap, dropping everything. A reinforced concrete pole, because of its greater stiffness, comes more quickly to serious "distress," but although it may be wrecked beyond repair it will only bend. Even if it lets part of the overhead touch the ground it almost invariably holds up part and so keeps the attachments in fairly good shape.

Concrete Poles Can Be Made Attractive in Appearance

Properly treated, a concrete pole is of pleasing appearance, but unfortunately, with a very little neglect in the making it looks very unsightly. Some designs are quite elaborate, as for example the combined light and trolley pole of the Municipal Railway of San Francisco. On the other hand, nothing could be finer than the severe simplicity of the square pole of the same company or that of the Pennsylvania Railroad's Jersey meadows telegraph line, unless it is the standard octagonal pole of the New York State Railways, which latter is not only attractive and substantial but actually costs but little more than the corresponding size in wood.

SPAN WIRE CONSTRUCTION WITH CONCRETE POLES, NEW YORK STATE RAILWAYS, ROCHESTER LINES. THIS COMPANY HAS MANY SUCH POLES IN USE

In several instances where wood poles had been ordered off the streets of certain municipalities the authorities have been so pleased with the appearance of concrete poles that they have permitted their use instead, at a cost much less than that of steel poles, and far less than that of underground construction.

Some Reasons for the Comparative Unpopularity of Concrete Poles

As against these advantages of long life, support of attachments in case of failure of the pole, resistance to fire and good appearance there are several disadvantages inherent in the concrete pole. Good results in making concrete poles require good forms and skilled labor, and unless the number made is large the cost per pole is very apt to be high even for the very simple types. The poles are heavy at best, and require special care and extra labor for handling and erecting, which further adds to the cost, while if molded with holes or gains for attachments, later changes are not readily made and are apt to be costly, and if such provision is not made it is equally difficult to make any attachment at all. These facts, which are particularly evident when a company first begins to make and use concrete poles, are undoubtedly responsible for the dislike by many companies and the consequent failure to use what is quite likely to be one of the important pole materials of the near future.

The theory of the reinforced concrete poles is very simple. Concrete, with permanence, ease of molding and comparative cheapness, lacks only tensile strength to be an excellent pole material. Steel has very high tensile strength and needs only to be properly combined with the concrete to give the desired results.

The practical application, however, is not quite so simple, for if the steel is not properly proportioned to the concrete, and correctly arranged within the concrete body, the strains are not properly distributed between the two and the pole will either be weak or uneconomical. The forms must be sufficiently strong to remain true and yet must allow proper access to the concrete for working so as to secure good surface and freedom from cavities. Furthermore, the reinforcement must be maintained in correct position while the concrete is being placed.

There are many discussions of the theory of pole design. One of the best of these appeared in the 1916 report of the power distribution committee of the American Electric Railway Engineering Association. The

design and practice developed for his company by Carl L. Cadle, chief engineer New York State Railways, Rochester lines, and described in the reports of the same committee for 1915 and 1916, seems easily to be the best of the unpatented methods that have as yet been described.

Hollow as Well as Solid Poles Are Available

Of the patented methods there are several which have had practical test. One of the earliest developed is the "Siegwart," in which the concrete with its reinforcement is plastered on a rotating form. This with the aid of a canvas belt wound spirally outside compresses and forms a hollow round pole. This construction is said to be very satisfactory. Another method, that of Otto and Schlosser, involves the use of centrifugal force. In a hollow form are placed the reinforcement, tied into shape and the concrete form is then closed and rotated at high speed, centrifugal force forcing the concrete firmly against the form. This type of pole is also said to be very satisfactory, but like the Siegwart its use is confined largely if not entirely to Europe.

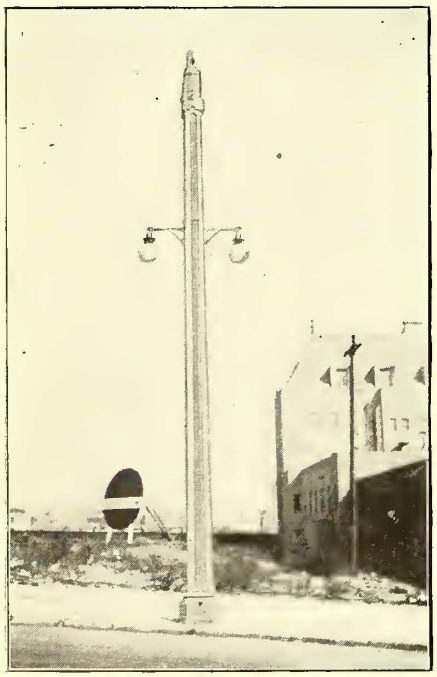
In this country the Jones process employs a series of compression rolls, an inner core and a canvas belt. The reinforcement is woven to shape in a special machine and put over the inner core, and the combination is laid in the canvas belt between the spread rolls. The proper amount of concrete is then dropped in, the rolls are closed to position and the forming is begun. The canvas draws first in one direction, then back, the length being such as to give about two and a half turns to the pole. Whether this pole has been used to any appreciable extent the writer does not know.

Obviously, after completion the hollow pole is superior to solid poles in the smaller quantity of concrete required and the consequent lightness. But the machine-made types require costly apparatus, and for hand forming the complications of a core have seemed to many experimenters too much of a good thing. F. H. Tidnam of the Oklahoma Gas & Electric Company, has, however, developed a very satisfactory hexagonal hollow-type pole, which is the standard of this company for important lines. This pole is formed in a metal mold, and the collapsible core is removed as soon as the concrete has taken its initial set.

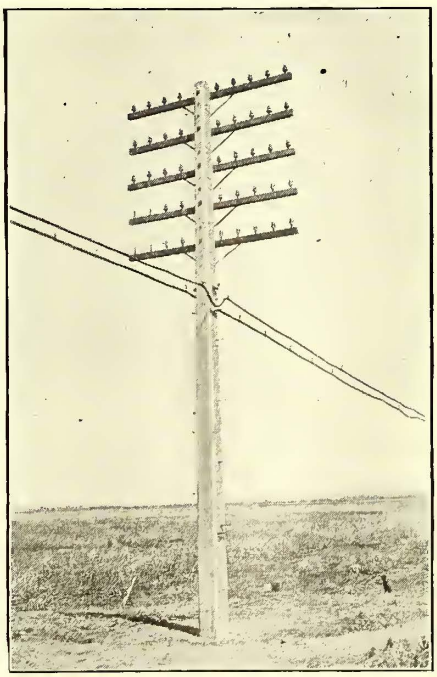
Concrete Poles Cost More Than Wood

The concrete pole to-day is in a very peculiar position. It offers many advantages at any time, but the present shortage of chestnut and the growing importance of other pole woods for purposes which do not allow of substitutes makes its employment particularly attractive. Unfortunately, however, the tendency in regard to its development by the comparatively few who have really gone into the subject in earnest has been to substitute reinforced concrete for wood in substantially the same dimensions rather than to develop a reinforced-concrete support of the most efficient type.

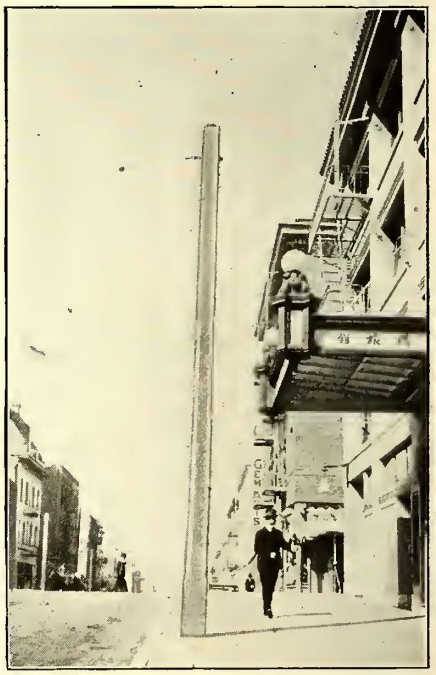
At present, a 30-ft. solid pole, with a breaking strength of about 2500 lb., when it is set 6 ft. in the ground and the load is applied 2 ft. below the top, weighs from 2500 lb. to 3500 lb. The cost ranges from $17.15 in actual cost in quantity, up to $125, the latter figure being a recent bid on a lot of fifty poles exactly like those for which the lower price was paid. Handling, hauling and setting would be about twice as great as for wood poles of equivalent strength. The latter would have to have a ground-line circumference of 43 in. and would be cut down from Class A 35-ft., or Class B 40-ft. poles. Recent quotations on such poles, f. o. b. the same points as the concrete poles



Combined Light and Trolley Pole, Municipal Railway of San Francisco



Pennsylvania Railroad's Telegraph Line Pole on Jersey Meadows



Square Trolley Pole, Municipal Railway of San Francisco

SAMPLES OF SATISFACTORY DESIGNS OF CONCRETE POLES

referred to, were $8 each for chestnut, and $16.35 each for Western red cedar, which would weigh about 1000 lb. and 600 lb. respectively.

Hollow-type concrete poles ought to have a weight and a cost not over two-thirds of the corresponding figures for the solid pole of equal capacity, but while the available information indicates such results the writer has not seen sufficiently definite figures to warrant a specific statement.

Concrete Pole Research Is Greatly Needed Now

The entire subject of concrete pole design, manufacture and use is of the greatest importance. It ought to have a most thorough investigation. For anyone to build one or two concrete poles with the expectation of so solving all the questions out of hand is, however, simply a waste of time and money.

Good reinforced concrete poles were built about 1903, and the number has steadily if not rapidly increased ever since. Moreover, many of these are serving their purpose at least fairly well. But the important question is whether or not the work they are doing could not be done just as well by poles of simpler design.

Mathematics and laboratory experiments will point the way, but the determination of how nearly the perfect design can be approached in every-day practice, and just how far short of the performance of the perfect pole the practical article will fall as a result of that difference, can only be found by full size tests. Some of these must be to destruction, and on a sufficiently large number of specimens to eliminate the effect of unusual conditions which might indicate very high or very low values for a single pole.

It is to be hoped that present conditions, which are demanding every possible measure of efficiency, will lead to such thorough investigation of this subject as will develop the practical and economical concrete pole.

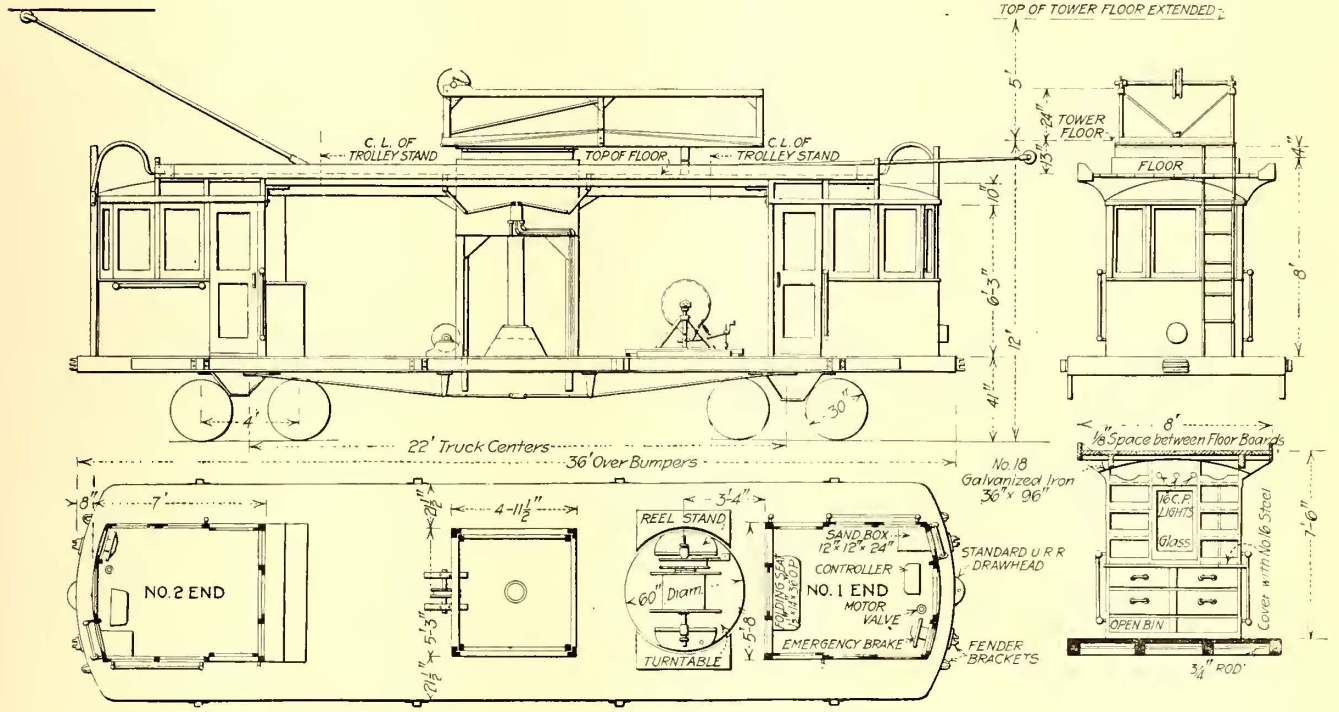
Special Features of San Francisco Tower Car

Pneumatic Hoist Raises Tower Full Length in Eight Seconds and Reel Mount Permits Wire to Be Strung in Either Direction

BY S. L. FOSTER
Chief Electrician, United Railroads of San Francisco

THE United Railroads of San Francisco has developed and for several years has been successfully using a four-motor, high-speed tower car whose equipment involves interesting features for rapid and efficient overhead line work. This car has a closed cab at each end to protect the men in transit from the occasional winds in summer and rains in winter. Otherwise it is open as is permissible in the mild climate prevailing in San Francisco, and so provides ready accessibility.

Besides the varied assortment of equipment usually found on tower cars, the two features most productive of labor saving are the pneumatic hoist for the tower and the turntable-supported, brake-equipped mount for the reel of trolley wire.



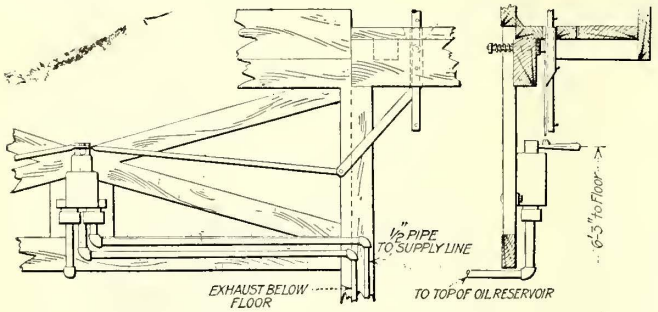
GENERAL ARRANGEMENT OF TOWER CAR, SAN FRANCISCO

The compressed air for the tower hoist is admitted above an oil reservoir communicating with the bottom of a single, central, 7-in. x 6-in. brass-ram cylinder. Any oil leakage occurring around the ram piston is provided for by a supplementary oil reservoir installed so that it may be periodically drained into the main tank. This leakage while appreciable at first soon became practically negligible.

The actuating device for this pneumatic oil hoist is an ordinary engineer's three-way valve situated in the center of one side of the tower frame 6 ft. 3 in. above the floor of the car. The valve is thus readily accessible to anyone on the main platform of the car. When all hands are aloft this air valve may be operated from the top of the tower, as the handle of the valve is connected

by two links to two hinged sockets at either end of the tower. Into either of these sockets a 6-ft. 10-in. cylindrical insulated staff can be inserted from the tower platform and the valve thus moved as desired.

To prevent possible injury to the removable slender staff by being struck with the swinging leaf of the tower



MECHANISM FOR OPERATING AIR VALVE FROM TOWER PLATFORM

these sockets are slotted for their full length and the staff is made adjustable by being provided with studs or pins along its length on one side at 1-ft. intervals thus permitting the staff to be operated or left set in the sockets at any height desired. It can thus be dropped so that its top is below the level of the swinging leaf and hauled up again when needed.

Flat steel springs are included in the arrangement of links between valve and socket so as always to restore the handle of the valve to the exact "holding" position after the man above has secured the action he desires.

in diameter. An adjustable band brake is keyed to the supporting shaft, the whole being readily removable by loosening one bolt.

When changing from an empty to a full reel, the turntable combination is given a quarter turn and the empty reel is lowered by the reel jack screws until its flanges rest on the floor of the turntable when it is rolled off the car to a reel storage platform.

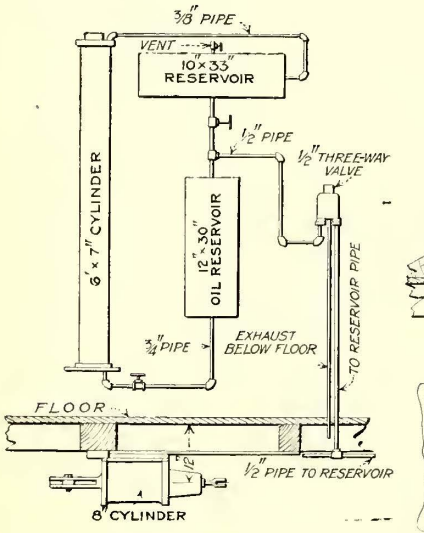
The shaft is then transferred from the empty to a full reel which is rolled into position on the turntable between the reel jacks and raised to its proper location. The combination is then given a quarter turn back and is ready for paying out the trolley wire.

This paying out requires no attention after the brake has once been set to give the exact amount of friction to secure the wire tension desired by the linemen on top.

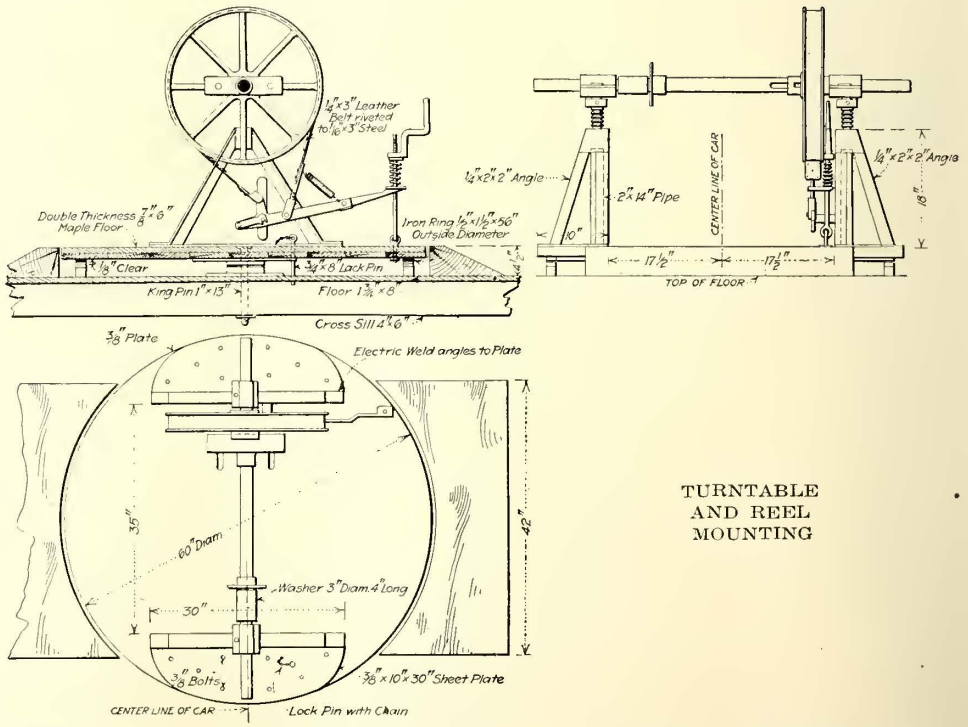
By means of this arrangement and a large wooden sheave just above the floor of the car on the opposite side of the tower, it is possible to string trolley wire out in either direction. The wire passes under the ram cylinder and then upward when being strung out over the reel mount end of the car roof. When being strung out over the opposite end of the car it passes directly upward from the reel to the tower platform.

The reel jacks are bolted permanently to the turntable. The latter is held rigidly to the car floor by its center pin and the reel shaft is prevented from lifting out of the jacks by the bolted top caps of the shaft bearings on top of these jacks.

Permanent outside vertical ladders are provided at each end of the car for climbing to the roof from the



PNEUMATIC HOIST PIPING



TURNTABLE AND REEL MOUNTING

The tower can be raised its full height by this equipment in eight seconds. It remains practically rigid where set without further locking or chaining.

The reel of trolley wire is supported by a 2-in. steel shaft with ends resting in hinged bearings of two standard adjustable reel jacks. The complete apparatus is mounted on a circular ball-bearing turntable 5 ft.

floor. A hinged, collapsible pole jenny and a complete set of hole-digging and pole-raising tools are suspended from heavy hooks out of the way and yet within easy reach along the edge of the roof under the extension ladders. Other working conveniences are a bench vise, charcoal bin and forge on the floor, rows of material bins along and under the roof, drawers, hooks, etc.

Keeping Power Plant Oil in Good Condition

Oil Disintegrates in Service—After Wise Selection the Problem Is So to Treat the Oil that It Will Be Available Without Waste for Reuse

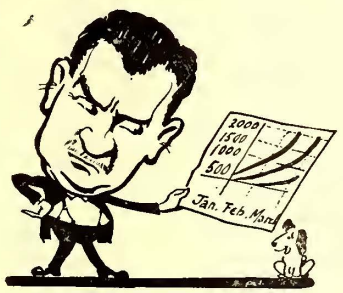
By Hartley LeH. Smith
Chief of Testing Bureau
Brooklyn Rapid Transit System

THE following discussion of oil in steam turbine power stations aims to bring forward for examination some of the aspects of turbine lubrication which among many engineers to-day are regarded as problematical. My hope is that a certain amount of discussion may result which, for myself as for others, will clear up in a measure some of the points on which many of us are seeking further light.

Oil Does Deteriorate in Service

It has become very common of late in the literature of turbine lubrication to find the frankest sort of reference to the formation of oxidation products in turbine oil which has circulated more or less continuously for a considerable time, whatever may be the particular type of circulation and oil filtration.

This frank reference to oil disintegration in continued service is rather recent. Not long ago the writer met oil salesmen who professed never even to have heard of such a thing. While confessing themselves entirely mystified as to the nature and cause of such action these salesmen were yet able to express entire confidence that their own oil would not disintegrate. And it is only a few years ago that some turbine designers were ready to let it appear that they at least looked a little askance at some oils and more favorably on others. Now the basis of their likes and dislikes appears to be that in one plant conditions more favorable to growth of oxidation or polymerization products threw the onus of blame upon the oil in use, rather than upon the local plant-operating conditions.



Careful Analysis Discloses Why So Much Oil Is Necessary

Of a truth all oils in continuous turbine lubrication service will form such oxidation products. What the operating engineers want to know are the facts regarding the specific liability of a given oil so to deteriorate, and the plant equipment and operating features which stimulate or alleviate the inherent tendency of the oil to further such growth within itself.

Oils Become Acid as They Deteriorate

The oxidation or polymerization products always produce an acid condition in the oil, in fact such products are measured quantitatively in terms of some relatively simple organic acid. Perhaps the acid most commonly employed for this reference purpose is oleic acid. And yet oil has sometimes been condemned as improperly refined because after long service it had this distinct acid reaction.

Naturally when the acidity of the oil in service has reached considerable proportions there is danger that the oil will do what any acid circulating in a turbine would do, namely, cause corrosion. Before discussing this matter, however, it is important to mention an accompaniment of this acidity, that is the formation of "muck." One of the live questions of to-day is as to the extent to which the oxidation products and the muck are one and the same thing.

"Muck" Is the Cause of Much Trouble in Oil

In many turbine plants the mere creation of such acidity as that described above seems immediately to cause that most common of chemical actions, the attack of acid upon metal with the production of salts. These salts, which may exist in a turbine oiling system, have quite different properties with respect to different metals. For instance, when these acid products act upon zinc the resulting precipitate seems to be particularly voluminous.

To whatever extent, then, oxidation products essentially form muck the impurities in the oil are greatly increased when it comes into contact with metallic zinc, as for example in galvanized oil piping. Such piping should, therefore, not be used in turbine oil circulating systems.

In any case the muck itself is a detriment to lubrication. If the plant engineers are not watchful or are unsuspicious of the possible presence of muck, actual trouble may result. Some very large turbines in important power plants have had not only "near shutdowns" but have suffered the complete burning out of bearings from this cause. Such accidents, happily, rarely occur more than once.

What Shall Be Done with Run-Down Oil?

Now as to remedies, it is wise not to become discouraged too easily. The writer was informed some time ago that in a very large power station where bearing trouble had been experienced the engineers finally realized that unavoidable leakage and evaporation are not the only causes of oil consumption. They established an old-age limit for oil. When the oil reaches the age limit it is simply relieved from further duty, and the burden put upon new, fresh oil.

Such extreme procedure seems to the writer hardly to be justifiable. I believe that there are two lines of attack for the problem. In the first place, one of the most important facts connected with the whole subject of oil muck and its elimination from a turbine oil circulating system seems to be that certain features of such a system which tend most effectively to rid the

oil of water have a most perverse effect in hindering the elimination of muck from the system.

The subject of water in turbine oil has received much attention of late years. Among the features of importance are the property of the oil by which it forms an emulsion with water, and the relative ease or difficulty with which an emulsion once formed may be broken up and the water separated from the oil. The United States Bureau of Standards has come forward with notable contributions to the subject. In the equipment provided in power plants for cleaning and filtering oil it is very common to find apparatus for heating the oil about to be filtered, thereby rendering the separation of water much more rapid and complete.

Temperature Is an Essential Element in the Precipitation Problem

Unfortuately the deliberate heating of turbine oil in a filtering system interferes with the extremely important function of filtering, barring of course the separation of mere dirt and metallic particles. The acid oxidation products are in fact prevented from being separated by such heating. These products have a solubility in the oil which varies with the oil temperature. At high temperature the muck goes into solution, and as the oil cools the oxidation products are precipitated out as muck.

This variable solubility with changing temperature is the feature which perhaps more than any other makes the oxidation effect a very serious problem in turbine lubrication. While the oil is circulating in the bearings it becomes hot, and the high temperature favors the formation of the oxidation products with the accompanying increasing acidity. So long as the oil remains hot the oxidation products largely remain in solution.

Muck Interferes with the Operation of the Cooler

In the oil circulating system the oil which is bearing the lubrication burden at one moment is a moment later relieved and at rest in the oil cooler. As it is cooled, however, the acid oxidation products are precipitated. They settle out, fouling the cooling surfaces and reducing the heat transmission through the coils or tubes to the cooling water. Now if the oil-cooling process is interfered with, the oil returns to the bearings at a temperature already high, and it becomes hotter there than it otherwise would.

High temperature is without doubt an important factor in the formation of oxidation products, and consequently more muck is precipitated in the cooler. There is thus a vicious cycle of operations. It would be much worse but for the fact that as the oil heats its viscosity decreases and the bearing friction is thus reduced. Therefore the power loss in the bearings is reduced, since this loss in a bearing is proportional to the product of friction force and speed. With reduction of power loss in the bearings the oil is heated at a lower rate. The temperature reached is, however, much higher than it would be if the heat transmission surfaces in the cooler were clean.

The precipitation of oxidation products in the cooler and their separation from the oil after precipitation are by no means so complete as to render the oil leaving the cooler for the bearings practically free from them. These products contaminate the oil entering the bearings and beyond question increase its coefficient of friction. They are, however, taken up again into solution as the oil heats in the bearings, so that there is at least some compensation.

The Oil Reservoir Pockets Are Favorite Retreats for Muck

Nor does all of the precipitation of muck occur in the cooler. Much of it occurs in the pockets of the oil reservoir space, the temperature there being much lower than that of the bearings themselves. In these pockets the precipitate has the best chance of all to settle out, and when considerable time elapses between cleanings the extent and nature of the deposits are sometimes surprising. They are sometimes in the form of soft muck, often gummy and at times even approaching the consistency of pitch.

There is undoubtedly some danger that with such accumulations the distribution of oil to all parts of the bearings needing it may be interfered with. On the other hand, it is easy to exaggerate this danger. In the first place the high temperature of the oil in the bearings keeps the oxidation products very largely in solution where the oil is doing actual lubrication service. Then again the precipitation of these products, where such does occur, is small in relation to the quantity of oil in which it occurs, while the particles of solid matter come down in a state of very fine subdivision. Accumulations occur, therefore, generally only where circulation is very slow and where the oil is losing heat by radiation and conduction.

"Rejuvenating" Oil After Partial Disintegration

The very finely subdivided state of the precipitated matter must be kept in mind in devising means for dealing with the whole matter. As has already been mentioned, the oxidation products, due to their acid nature, may produce salts of metals which are themselves insoluble. These as solids have much to do in determining the quantity and form of the so-called muck. This is notably the case with the zinc salts which are apt to result from the use of galvanized piping. Without zinc, however, the precipitate is far from flocculent and its separation from the oil with reduction of acidity is a problem of importance in many a power plant to-day.

Unfortunately the filtering of power station oil is done largely with apparatus developed fundamentally to meet the requirements of engine oil filtration and modified in no really important and essential features to meet the turbine oil filtration problems of to-day. This lack of adaptation is indeed not strange if I am correct in arguing that only recently has the real nature of turbine oil filtration problems been correctly understood.

Turbine Oil Cannot Be Treated Like Engine Oil

There are two items in the problem which did not exist when the principles and practice of engine oil filtration were developed. The oil in engine circulating systems was contaminated by water and dirt. The water did not generally emulsify with the oil, or at any rate

the emulsions were not particularly tenacious. The separation of the water from the oil was rather easy. The heating coils frequently used in engine oil filters separated the water from the oil even in difficult cases. The separation of dirt from engine oil was, of course, a filtration problem of the simplest sort. So simple was it that many an engine oil filter was merely a crudely improvised collection of canvas bags, with not always the closest attention to eliminating leakage paths.

The separation of water from turbine oil was early recognized as of far greater difficulty. Persistent emulsions were not uncommon and the characteristic behavior of individual turbine oils in this respect began to be closely studied. Much was done in the quantitative measurement of demulsibility, and in this the United States Bureau of Standards took a leading part.

As previously mentioned the two essentials of turbine oil "rejuvenation" for continued lubrication service are (1) the solubility of the acid oxidation products in hot oil, and (2) the finely subdivided nature of these products when precipitated in cool oil. It follows that the filters must not be set to filtering hot oil. It may, however, be necessary to use heat to break up the water-oil emulsions, although even this necessity is questionable. It is quite essential that effective cooling shall be provided previous to filtration.

It may be well to mention in passing that the entire oil contents of a turbine, which is taken out of service for the purpose of cleaning and renewing its oil supply, should be run out of the reservoir as soon as the turbine has come to a standstill, thus insuring the minimum precipitation in the pockets or in the oil grooves and the maximum quantity of acid oxidation products carried out of the turbine in solution in the warm oil. If this is not done the oil will cool in the idle turbine and a certain amount of precipitation will occur.

The Filter Press Might Be Used with Turbine Oil

When provision had been made for cooling the oil in the proper place and thereby bringing the precipitation under intelligent control, there still remains the task of removing the fine precipitate, which cannot be done with bag filters. One hope in this direction is the filter press. For many years this device has been successfully used in many processes of manufacture and refining. Its use in power plants has been practically unknown until very recently. So far as the writer knows, F. R. McLean was the first to propose it for the clarification of turbine oil from precipitated acid oxidation products. For this purpose it is very attractive. It is not expensive, and is very compact. It has great filtering capacity and flexibility. The effectiveness of its filtering may be made anything that is desired. In the numerous manufacturing and refining processes in which it has long been used its place is quite unchallenged. Its future in steam turbine power plant service seems very bright.

The Whole Matter in a Nutshell

Summing up this whole matter, it may be said that the problems of turbine lubrication are problems of the durability of the lubricant. Water emulsions do no permanent harm to the oil but they are highly objectionable until broken up. The tendency of oils to emulsify and the measurement of their demulsibility have been studied extensively. The tendency of turbine oils to form oxidation products in service has been studied also, perhaps most actively by the oil men themselves. The progress so far made is uncertain and the field is unquestionably very difficult. Probably the oil men have learned more than they have told the rest of us. Some progress is also being made in tests which might be called "accelerated acid oxidation product test," but standardization of such tests seems so far a goal quite unapproached.

Short Pennsylvania Meeting

THE annual meeting of the Pennsylvania Street Railway Association was held in the Hotel Adelphia, Philadelphia, Pa., on June 7. About thirty members were present. In opening the meeting the president, Thomas A. Wright, vice-president and general manager Wilkes-Barre Railway, explained that in view of the war and the present abnormal conditions only a short session would be held for the transaction of business and the discussion of certain vital points.

After the report of the treasurer the nominating committee presented the following names for the ensuing year: President, Gordon Campbell, president York Railways; vice-president, T. B. Donnelly, claim agent West Penn Railways; secretary-treasurer, Henry M. Stine; executive committee, the president and the vice-president, and C. L. S. Tingley, second vice-president American Railways; C. B. Fairchild, executive assistant Philadelphia Rapid Transit Company; Thomas A. Wright, vice-president and general manager Wilkes-Barre Railway, and Thomas Cooper, Westinghouse Electric & Manufacturing Company. The nominees were unanimously elected.

After the election the meeting was addressed by Charles E. Morrison, representing the Utilities Mutual Insurance Company of New York. Mr. Morrison briefly traced the work of this company since the compensation act became operative in New York in 1914, and he said that the members are now receiving in dividends, with the approval of the State Insurance Department, 40 per cent of the premiums for the first year's business. In 1917 the company paid less than 10 per cent of the premiums for accidents, and in the last three and a half years the actual cash disbursements for accidents were 14.5 per cent of the premiums paid in. The average operating cost for this period was 18.5 per cent, making a total of 33 per cent. Mr. Morrison said that his company has under consideration the writing of business in Pennsylvania.

A motion was then carried to the effect that the president should appoint a committee to study the question of insurance and report to the association. The remainder of the meeting was devoted to a general discussion of the fuel situation and the need for and means of securing increased revenues. A committee composed of Messrs. Wright, Heindle and Fairchild was appointed to attend a meeting called by the Fuel Administration for June 12 in Philadelphia to discuss the use of coal by utilities. An informal dinner was served in the evening.

Current and Power Curves Show Results to Be Expected of Motors

The Writer Describes How Current and Power Input Graphs Are Derived From the Speed-time and Motor Characteristic Curves

By C. W. Squier
Electrical Engineer

HAVING determined the speed-time curve, as outlined in my article in the May 18 issue, the curves for current and power input are readily obtained. By referring to the characteristic curves of the motor given in connection with the previous article it is seen that with the same voltage the speed is always the same for any definite current value. With the series-parallel method of control, now universally used with direct-current railway motors, the motors are first connected in series and then in parallel when two-motor equipments are used. With four-motor equipments the most common practice is to connect the motors in groups with two motors permanently in parallel. These groups are connected first in series and then in parallel. With the two-motor equipment we are considering, from the start until the motors are connected in parallel the car current is equal to the current per motor, which is 90 amp., the current necessary to give an acceleration of 1½ m.p.h.p.s. With the motors connected in parallel, the car current will be double the current per motor, or 180 amp. This is shown graphically in Fig. 1.

To determine the point in the speed curve at which the transition from series to parallel takes place, we use the relation between speed and terminal voltage

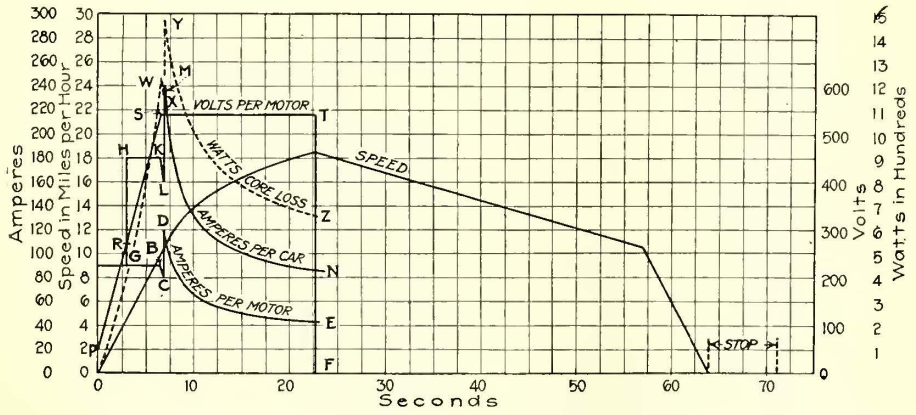


FIG. 1—GRAPHS FOR CURRENT AND CORE LOSS PER MOTOR AND AMPERES PER CAR

as discussed in the article referred to above. This change will be found to take place at a speed of 4½ m.p.h.

In order to plot the part of the current curve after the starting resistance is all cut out, it is only necessary to plot the current value corresponding to any speed at the instant that this speed is reached, as shown by the speed-time curve. In the case we are considering the current per motor is 90 amp. up to a speed of 9.9 m.p.h. At 10.35 m.p.h. the current with full field has fallen to 80 amp. and the change to tapped field is made. This increases the current per motor to 120 amp. From this point on the current values corresponding to the various speeds, as shown in the following table, are plotted. When a speed of 18½ m.p.h. is reached power is shut off and the current falls to zero.

SPEED, CURRENT AND POWER CONSUMPTION

M.p.h.	Seconds	Amperes per Motor	Amperes per Car	(Amperes)² per Motor	Watts per Car at 540 V.
4.5	3.0	90	90	8,100	48,600
9.9	6.6	90	180	8,100	97,200
10.35	6.93	80	160	6,400	86,400
10.35	6.93	120	240	14,400	129,600
11	7.29	106	212	11,236	114.480
12	8.00	88	176	7,744	95,040
13	8.97	74	148	5,476	79,920
14	10.29	64	128	4.096	69,120
15	12.01	57	114	3,249	61,560
16	14.23	52	104	2,704	56,160
17	17.09	47.5	95	2,256	51,300
18	20.70	44.5	89	1,980	48,060
19	25.41	42	84	1,764	45,360
20	31.78	39	78	1,521	42,120

The average current taken by the car is found by dividing the area of the car-current curve in ampere-seconds by the time for the run, including the duration of stop in seconds. In Fig. 1, the graph *OAGHKLMNF* shows the current taken by the car. Each cross-section square with reference to this curve is equal to $20 \times 2\frac{1}{2} = 50$ amp.-sec. When measured with a planimeter this curve was found to have an area of 55.9 squares, hence the average current per car for this run is $(55.9 \times 50) \div 71.2 = 39.25$ amp. The average current per motor, obtained from the graph *OABCDEF* in a similar manner, is 21.5 amp. The heating of railway motors in service is caused by internal copper, iron and brush losses. These losses vary in intensity and in distribution with different types of motors and classes of service. To determine whether a motor has sufficient capacity for a particular service, a curve should be plotted from the squares of the various current values and from this the square-root-of-the-mean-square current should be obtained. This should not exceed the rated continuous current of the motor for the average voltage found. For convenience the motor characteristic curves furnished by manufacturers usually give the continuous rating in amperes at half, three-fourths and full voltages. With modern self-ventilated motors this root-mean-square current practically determines the temperature of the motor, since the increased speed that goes with higher core losses also causes a better circulation of air through the motor and causes the dissipation of more heat.

In Fig. 2 the graph *OPXYZMN* has been plotted from the squares of the instantaneous current values. The area under this graph, which can be conveniently measured with a planimeter, is 11.06 squares, equiva-

lent to 110,600 (ampere)²-seconds. The mean-square current is found by dividing this area in (ampere)²-seconds by the time for the complete run, including the duration of stop in seconds or 110,600 ÷ 71.2 = 1553. Then by taking the square root of this mean-square value we have 39.4 amp. for the square-root-of-the-mean-square current. The continuous current rating of this motor is 40.5 amp., so that we find this motor has sufficient capacity for the given service. The average voltage for each motor is found from the curve *OPRSTF* to be 470. The voltage curve is constructed by drawing a line through *R* (270 volts at 3 seconds and *S* (540 volts at 6.6 seconds) and then using the average line voltage of 540 for the remainder of the time that power is on. The area of this curve is 85.54 squares or 10,692.5 volt-seconds, which divided by 22.75 seconds, the time that power is on, gives 470 volts as the average that is applied to each motor during the run.

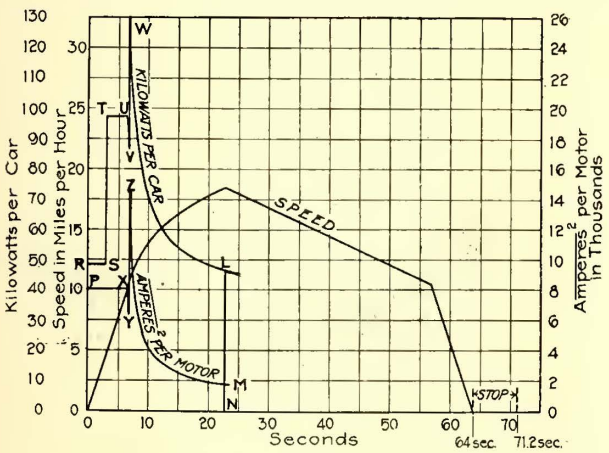
Accurate operating data are essential in choosing motors

Core Losses Are Determined by Tests

Fig. 3 shows graphs for the iron and core losses for this motor. These losses depend on both the current and the voltage. They follow no simple law as do the copper losses, which are proportional to the square of the current.

Owing to the great mass of metal in its frame, a railway motor has considerable heat storage capacity. When the temperature of the windings is rising that of the frame must also be increased, and when cooling the entire mass must cool off nearly simultaneously. The actual temperature of the different parts may, of course, be widely different but due to this action of storing heat, the temperature of the windings does not fluctuate rapidly in accordance with the instantaneous losses, but rises at a fairly uniform rate depending on the average value of these losses. The average core loss for any typical run may be obtained by plotting the curve *OWXYZF* as shown in Fig. 1, giving the core loss in the motor corresponding to the instantaneous values of voltage and current. To illustrate the method of plotting this curve, let us find the point on the core-loss curve at ten seconds after the start of the run. From the curves showing current and volts per motor it is found that at the ten-second point there are 66 amp. and 540 volts per motor. Then from the graphs shown in Fig. 3, we find the core loss corresponding to this current and voltage to be 1020 watts. This value plotted at the ten-second point in Fig. 1 will be the desired point in the core-loss curve. The average core loss for the run is then obtained by dividing the area under this curve in watt-seconds by the total time for the run, including stop, or 71.2 seconds. This gives 245 watts as the average core loss. The power-input curve is constructed from the car-current curve by multiplying the various current values by the average line voltage. In the table preceding, I have tabulated the various power values in watts corresponding to different current values, and in Fig. 2 the curve *ORSTUVWLN* shows this graphically. By measuring the area under this curve and by computing the values as described previously we find that 0.42 kw.-hr. is taken by the car for this run.

In considering various types of motors for operation in the same service with cars of the same weight, a comparison can be made directly from the results shown while performing the various typical runs representing average service requirements. When it is desired to compare equipments on the same cars, or on cars weighing nearly the same but operating at different schedule speeds, such a comparison as the preceding would probably be misleading and unfair to the equipments under consideration, since the above average values are dependent on the speed at which the car travels. A fair basis of comparison in such cases is found in the values expressed in killowatt-hours per car-mile. The present figure of 0.42 kw.hr. was for a



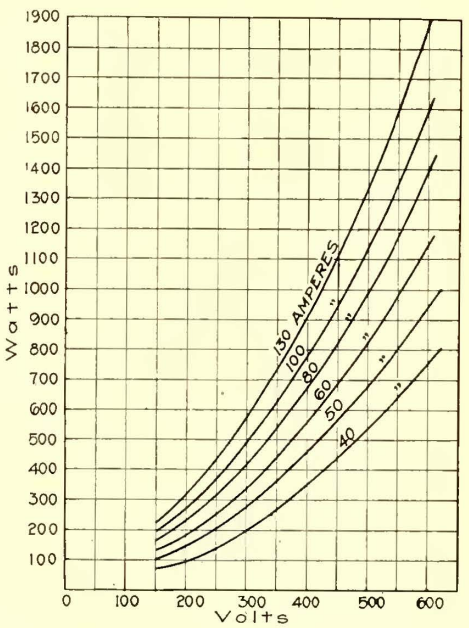


FIG. 2.—GRAPHS SHOWING HEATING CURRENT PER MOTOR AND KILOWATTS PER CAR. FIG. 3.—GRAPHS INDICATING THE CORE LOSSES IN MOTOR

run 1200 ft. long made in 71.2 seconds, hence the energy input is $(0.42 \times 5280) \div 1200 = 1.848$ kw.-hr. per car-mile.

When it is desired to compare the performance of equipments on cars with considerable differences in weight, the units of watt-hours per ton mile should be used as a basis of comparison. This unit takes into consideration the difference in weight as well as any difference in schedule speed. The weight of the car with equipment and load which we are considering is 23.56 tons and $(1.848 \times 1000) \div 23.56$ gives 78.4 watt-hours per ton-mile as the energy consumption.

In making comparisons all the associated conditions and the quantities affecting them should be carefully considered and taken into account and a unit for comparison chosen which will be fair to the equipment being considered and not be misleading as to the results that may be expected.

Changes in New Boston Cars

A NUMBER of changes in detail from previous designs are being made by the Boston Elevated Railway in the 200 new center-entrance motor cars which it is expecting to purchase. At first the company advertised for bids for cars exactly like those now in use in the East Boston tunnel, in which every feasible use was made of fireproof material. A study of these bids from manufacturers has shown, however, that on account of war conditions the work would be considerably expedited by a reduction in the metal used.

The stationary sash on both sides of the car, *i.e.*, the sash next to the center doors and upper stationary sash are to be of the same construction as in the trailer cars now standardized in the company's service, eliminating the fireproof or metal covering. The sash in use in the center-entrance motor cars is at present a wood sash with metal covering. It is the intention of the company to retain the metal covering on movable sashes only. In the new cars no headlining in the upper deck and hoods will be used, so that the construction will be roof sheathing on the ribs with no lining whatever, as in many of the semi-convertible cars now used by the company. The ingot iron covering is to be eliminated from the entire under side of the car, and in place of it, it is planned to install sheet-iron between the car floor and the motors, resistors and other electrical equipment for protection against flashes.

The center-entrance cars now in use in East Boston are now so equipped as to permit operation in trains of two or more cars. The type of car which it is proposed to purchase is intended to operate in trains of not more than two cars.

The new cars are to be built with the floors 1 in. higher above the top of the rail, to allow more space for the installation of motors and other equipment. It is the intention to have the distance from the top of the rail to the center compartment (first step) 15 in. in height as in the present cars. The additional rise will be on the step from the center of the car toward the ends. This step in the present cars is 9½ in. In a letter to the commission asking for authority to purchase the new cars President Brush pointed out that the foregoing modifications in the installation of fireproof metallic work will expedite the completion of the cars.

Reclaiming Car Axles by Welding

BY R. H. PARSONS
General Foreman Third Avenue Railway, New York

AS THE PRICE of car axles has increased about 250 per cent in the last three years and as deliveries are so uncertain, the purchase of new ones to replace those broken or worn in service is a hardship, and a good reason for devising some method of reclaiming them. Some companies have had good results with

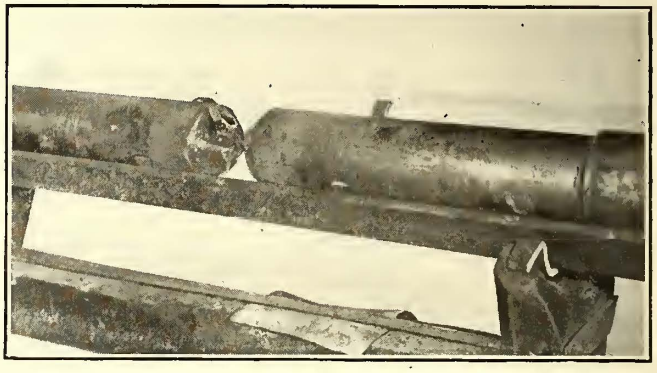


FIG. 1—TWO AXLE ENDS IN POSITION FOR WELDING

blacksmith welding, but the use of the electric arc-welding process is a simpler operation. As a break in an axle occurs usually just outside the wheel, it leaves a piece long enough to work upon and sufficient material so that only the best of the remainder need be used.

The axle is burned off with the electric arc about 5 in. or 6 in. inside the wheel fit so that perfectly "live" metal only is utilized. When the two axles are burned to a V-shape as shown in Fig. 1, they are butted together by laying them in an angle iron resting on a horse. After this they are welded with the carbon electrode, using cold rolled steel as a filler.

The angle keeps the axles straight until welded sufficiently to hold their position, after which the angle

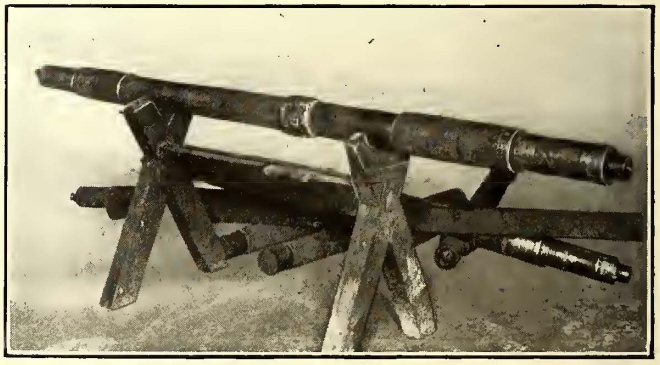


FIG. 2—AXLE WELDED AND READY TO BE TURNED TO SHAPE

is removed and the filling in is completed on the horse, as indicated in Fig. 2.

The shaft is then ready to be sent to the machine shop where it can be sawed or cut in a lathe to length and turned preparatory to mounting. The welded portion is nearly in the center of the axle and is scarcely touched with the tool, and good "live" metal is thus left for the wheel fit and journal. A good welder can prepare and weld two 4-in. axles per day, so the total cost of a finished, reclaimed axle is only about one-third that of a new one.

Keeping the Track Special Work in Repair

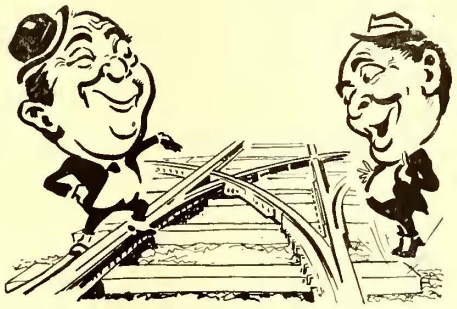
There Is a Field for the Special Work Repair Shop, but in General It Should Be Used Only for Minor Repairs or Emergency Jobs

By R. C. Cram

Assistant Engineer, Department of Way and Structure, Brooklyn Rapid Transit System

THE work of the way department begins to reach its fullest extent at this season of the year. The maintenance program is usually divided into at least three phases, *viz.:* (1) Reconstruction of tangent track; (2) overhaul and rehabilitation of tangent track, and (3) repair and renewal of special work. It is the purpose of this article to discuss the way department shop in its relation to this program.

Inquiry may first be directed toward the question of the need for such shops and it may be stated at the outset that no matter how small the railway may be, its way department has need at times for shop facilities, if only for tool sharpening in connection with the first two items of the program previously mentioned. With respect to the third item there is more chance for a wide divergence of opinion as to what shop facilities may be desirable.



"No, we didn't make this layout, but our little way shop will help us to keep it going another two years."

The majority of the electric railways are comparatively small in individual mileage, as indicated by statistics which show that most of them operate 50 miles or less of single track. Way departments of roads of this size have little need for shop facilities except for tool sharpening. In most cases this need is supplied by such equipment as may be found in their mechanical department shops, the work being done under shop orders originated by the way department. In some instances it is possible that this sort of work is done by outside shops under the purchasing agent's orders.

Small Shops Are All Right for Tool Sharpening, Etc.

The volume of shop work on tools incidental to track maintenance increases greatly when the mileage of single track approaches 100, especially if the road is situated largely in cities. A considerable amount of work is in constant demand, and it will generally be found advisable for the way department to have a shop equipped for tool sharpening for its own use. In making this statement, the advantages gained by having the work done in one general shop under other jurisdiction are not forgotten. These advantages are so often offset by delays due to the fact that the way department work is apt to be considered more as a "side line," if done by other departments, and the general shop will not readily lend itself to the execution of rush orders.

The simpler forms of shops are maintained as a rule for tool sharpening, although they can readily expand their activities to include the manufacture and repair of minor parts and fittings of roadway machinery and track construction. These shops do not require a large outlay for housing, site or equipment. The last named, in its simplest form, includes an anvil and forge, blacksmith tools, drill press, emery grinder, power hacksaw, Cleveland plate upsetting machine, and occasionally other simple machine tools for special purposes.

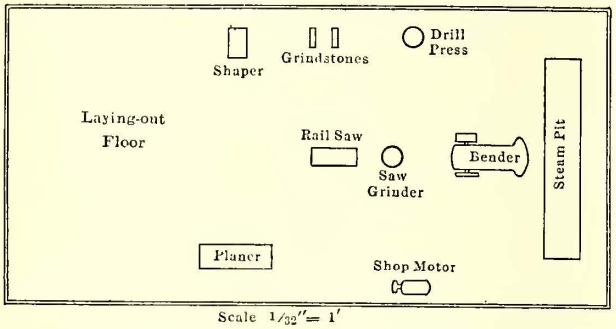
The repair and renewal of special work is a branch of track maintenance which is quite distinct as one of the most important functions of the way department. As the mileage of the system increases it is found that the number of special work layouts increases almost in direct proportion, and the layouts themselves are apt to become more complicated, particularly on city properties. Furthermore, the maintenance of electric railway special work, where confined to city streets, is thought to be somewhat more difficult than similar work on steam roads, not even excepting the renewal of such involved work as double slip switches with interlocking, such as are found in large terminal yards of steam roads. In contrast with steam road practice, the larger electric roads often undertake the manufacture of special work to quite an extent, while the steam roads do little or no work of this nature. The principal reason for this difference in practice probably lies in the characteristic differences in the general type of tracks. That of the steam road is usually of low T-rail and the switches and frogs are of a comparatively simple type, largely standardized as to lengths and angles and other details at least for each railroad system. This permits the purchase of repair parts as stock in advance of needs without unduly burdening the road with a large sum of money tied up in this material. The simplicity of the steam road type of construction also tends to a lessening of the stock needed and, as castings are not required for most of the work in general use, there is a consequent lessening in time required to fabricate parts. These factors not only reduce costs but also assist in securing material in a hurry from manufacturers, in emergencies.

Quick Repairs Must Sometimes Be Made

Tendencies toward failures can be seen more readily in open steam road tracks, and steps may be taken in time to have parts on hand before ultimate failure is reached. In electric railway work in streets, many of the frogs, switches, etc., are special, fitting only one location; they are usually made of deep girder rails and of a type requiring castings which may become defective and fail without giving any visible warning because the defects are apt to be hidden by pavement.

It is practically impossible for any street railway, having a large amount of complicated special work, to keep on hand even one replacement part for every different part to be found in its tracks. There would be too much money carried in idle stock. As a result the electric roads keep but small stocks of repair parts on hand. When sudden breakage occurs they must rely upon the manufacturers for rush service, which is sometimes difficult to secure and which even when obtained is often set at naught by shipping delays.

It is to offset such troubles that many of the larger systems have found it advisable to maintain shop facilities under control of the way department, which may be used to meet emergencies with a minimum of delay. In addition to emergency service these shops are utilized to fabricate various forms of temporary track layouts and special connections which are needed from time to time for rerouting cars during sewer construction or reconstruction of tracks. Such shops also make repairs to portable crossovers; they repair second-hand pieces to render them suitable for further service, and fabricate odd pieces which can be installed for the purpose



LAYOUT OF SMALL SPECIAL WORK REPAIR SHOP

of piecing out the life of some large layout until it becomes time to renew the entire job.

It is not to be assumed from the foregoing statement of work undertaken by way department shops that their operations can always be profitably extended to the work of manufacturing repair parts of special work. There must be a sufficient amount of work in hand at all times to keep the shop busy, if this feature is to be carried on economically.

When Is a Road Justified in Having a Special Work Shop?

The question arises as to what measure of the volume of work may be used as a guide in determining whether the work should be undertaken. In this respect it appears that the number of special work layouts in service is perhaps the best gage. Information as to the average number of layouts per mile of track operated is very meager. In 1911 the committee on way matters of the American Electric Railway Engineering Association gathered some data on this subject, but did not feel justified in publishing an analysis of the statistics because only about 20 per cent of the association membership furnished adequate replies on the data sheets. Nevertheless, taking the information furnished as a guide, it appears that those companies which reported special work shop facilities had an average of 1.3 layouts per mile of single track.

The average number of layouts maintained by those companies reporting shops operated for the repair of special work was 474. The lowest number was 110, while the highest was 1035. At the same time two companies, one having 1600 layouts and one 1400, reported no special work shops. It will thus be seen that there is a great range in practice of the companies in the matter of maintaining way department special work shops, and the data indicate that there is no general tendency to engage in the manufacture of special work in complete layouts.

$400,000 Spent Per Year on Special Work Repairs and Renewals

Minor repairs, as distinct from complete renewals of layouts, comprise the major portion of the work made up in such shops. As a gage in determining the advisability of maintaining them it may be of interest to note that one company which maintains approximately 1050 layouts spends about $400,000 per year on special work repairs and complete renewals, and about 15 per cent of this is for minor repair parts, most of which are fabricated in its own shop.

Aside from the report of the way committee for 1911 there is comparatively little published information available concerning this subject. Even the files of the ELECTRIC RAILWAY JOURNAL fail to show more than one article, which appeared in the issue of May 22, 1915. From these two sources and from data obtained elsewhere it is learned that the following tools, in addition to those previously enumerated as necessary for tool sharpening in a small shop, may be considered as constituting the principal equipment needed in those shops which undertake special work repairs: Rail bender, rail saw, rail saw grinder, switch and frog planer, punch and shear (combined), spring hammer and lathe. These machines are preferably operated by direct-connected electric motors.

In addition to the equipment enumerated, several companies which operate their own shops have found it advisable to install small foundry cupolas which, with proper accessories, are used for the small castings in special work. In two instances at least arrangements are made with outside foundries to make castings for special work which has been fabricated in the company shops. One company utilizes the cupola which it maintains for the cast welding of joints to good advantage in this field.

A Small Shop for $7,500

Practically all of the way department shops which engage in the repair of special work are the outgrowth from comparatively small shops first used only for tool sharpening and other light shop work. There are but few shops which were primarily designed to undertake such work and for this reason it is thought advisable to omit plans of existing shops from this article.

The JOURNAL article previously referred to presented a plan or layout of such a shop designed to carry on a reasonably large amount of work and this plan is reproduced in the accompanying figure. It was stated that a shop of the size indicated (50 ft. x 100 ft.) should not cost more than $7,500, completely equipped with the tools shown and with the necessary small tools, as well as an overhead or telferage system.

Attention was also directed to the possibilities of

lowering the first cost quoted by the purchase of second-hand machinery. The article further stated that such a shop could be operated with one foreman and fifteen men at a cost of $35.50 per day. (It should be remembered that these costs were for 1915.)

Experience Is a Factor in Special Work Repair Costs

Table I presents a set of labor and material costs for work turned out by the force of men referred to, and the following facts should be borne in mind in examining the tables:

"A comparison of the costs of various kinds of work turned out by men of this class over a period of three years is interesting. In this comparison fluctuations in the prices of material are not taken into consideration, it being assumed that the prices do not change. Where the cost is the same a like amount of material has been used, but where it is not the difference is due to using the material to better advantage or changing the construction slightly without sacrifice of strength."

Further, as to the work undertaken, it should be noted that none of these shops attempts to manufacture tongue switches as they have no facilities for so doing. They are, however, equipped to prepare curves, and to fabricate bolted frogs, girder rail mates, split switch points, plain switch tongues, hard center plates and special compromise plates made from bar steel.

TABLE I—SHOWING TENDENCY OF EXPERIENCE TO REDUCE COST IN SPECIAL WORK SHOP OPERATION

Bending 9-In. Rail, per Foot

	Guard	Tram
First year	$0.1281	$0.1106
Second year	.1051	.0962
Third year	.0732	.0654

Bending 7-In. Rail, per Foot

	Guard	Tram
First year	$0.1004	$0.0902
Second year	.092	.084
Third year	.0712	.0621

9-In. Frogs

	Labor	Material	Total
First year	$18.90	$39.07	$57.97
Second year	17.95	39.07	57.02
Third year	17.57	36.45	54.02

9-In. Mates

	Labor	Material	Total
First year	$22.64	$36.52	$59.16
Second year	20.32	36.52	56.84
Third year	16.03	32.98	49.01

9-In. Double-Track Crossings

	Labor	Material	Total
First year	$185.12	$294.35	$479.47
Second year	172.35	294.35	466.70
Third year	165.05	294.35	469.40

9-In. Crossover: Exclusive of Switch Castings

	Labor	Material	Total
First year	$79.96	$428.20	$508.16
Second year	78.25	428.20	506.45
Third year	74.75	431.30	506.05

Arc Welder Comes in Handy in Special Work Shop

Within the last two years or so the arc welder has been added to the shop equipment in several shops to good advantage. It is possible to make up frogs and mates with all parts welded together instead of being assembled with bolts, and the cost of the work is reduced by the welding method of assembly. Welded frogs and mates of this type have been in service sufficiently long to prove that they are as serviceable as those of the bolted type and in some cases they will outlast bolted frogs under similar service. The arc welder is also used to build up floors in welded and bolted frogs, so as to provide a flange bearing surface which in turn tends to prolong the life of the special work.

What One Large Shop Did in a Year

Tables II and III are presented to indicate the labor cost of operating a special work shop on a system which maintains about 1050 layouts. It is interesting to note that the total labor cost was at the rate of a trifle more than $10 per layout per year. This labor expenditure provided for the bending and drilling and cutting of 16,000 lineal feet of curved rail; it included the fabrication of forty-four plain bolted frogs, fourteen mates, six single frame 9-in. bolted crossings, one three-way frog and mate combined, nine sets of split switch points, twenty-nine crossover repair frogs, seventeen repair mates, two 7-in. crossovers complete except tongue switches, and 1364 pairs of compromise and plain joint plates made from bar steel stock.

The Best Shops Have Their Limitations

In considering special work shop undertakings by the railways, it must not be forgotten that these shops owe their existence largely to the need for emergency repairs and for tool work. They are not generally organized to undertake the complete construction of large complicated layouts having heavy castings. For this class of work they cannot hope to compete in cost with a well-organized commercial plant having thoroughly experienced workmen, able supervision and purchasing departments equipped for most careful buying. Careful computation of costs for such shops as are managed by the railways indicates that when all the overhead charges, such as those for light, heat, power, rental of buildings and site, clerical work, engineering and compensation insurance are added to the labor and material costs, together with the necessary investment in facilities for very heavy machine work and for steel, iron and manganese foundry work, the manufacturer still has the best of the argument as the most economical producer of new special work having heavy castings made up in large and intricate layouts. Furthermore, a railway shop organized for this sort of work would hardly prove economical unless it could find a need for complete renewal of several hundred layouts each year.

In conclusion it may be said that where the conditions do warrant the maintenance of a way department

TABLE II—LABOR COSTS FOR 1914 OF A SPECIAL WORK SHOP WHICH CARES FOR ABOUT 1050 LAYOUTS

Labor Costs of Special Work Shop—1914

January	$942.19	July	$956.26
February	908.34	August	921.37
March	915.69	September	945.28
April	968.86	October	965.10
May	1,040.32	November	937.18
June	995.20	December	890.05
Total			$11,385.84

TABLE III—ITEMIZED LIST OF EXPENDITURES FOR LABOR IN SHOP COVERED BY TABLE II.

Cut, bend and drill rail for renewals	$1,436.42
Cut, bend and drill rail for repairs	570.83
Make frogs	973.83
Make mates	518.26
Make crossings and repair parts	295.85
Make combination pieces	46.50
Make crossover repair parts	934.69
Make turnout repair parts	216.81
Make T-rail frogs, switches, etc	56.81
Make hard centers	247.59
Cutting and drilling Bessemer steel plates	1,793.60
Make split switch joints	74.48
Make and repair derailers	28.42
Repair steam switches and crossovers, O. M. S	179.58
Repair portable crossovers	995.98
Make anti-straddlers and parts	105.95
Make and repair slip and expansion joints	202.00
Overhaul and repair O. M. S. special work	612.52
Make guard rail	15.10
Cut, drill and straighten rail	220.03
Make tools	628.34
Make and shape bender blocks	98.78
Overhaul machinery	168.35
Moving and handling material on dock and in shop	695.00
Cleaning up, watchman and miscellaneous work	270.12
Total	$11,385.84

repair shop, the following advantages may be attained. They are enumerated after consideration of advice received from several engineers of roads which have such shops at their command:

1. Built-up work of a really high-grade character can be produced at a cost of about 50 per cent of the ordinary prices of such work when obtained from manufacturers.

2. The manufacture of parts can be undertaken and executed in a very short time, thus providing against emergencies of almost every description.

3. The short time required to turn out work makes it possible to withhold replacement expense until immediate action is necessary.

4. It becomes unnecessary to carry large and expensive stocks of the various repair parts.

5. The remodeling and repair of old special work may be undertaken and valuable material can thus be saved for further service, preventing undue haste toward the scrap heap.

6. The reconstruction work may be executed in accord with a prearranged schedule and without the hold-up so often experienced while waiting for arrival of much-needed special work from a manufacturer.

7. The embargoes and shipping delays now experienced are rendered almost void of their vexing features.

An Unusually Difficult Special Work Job*

A Complicated Layout Installed at a Busy Intersection in Washington, D. C., Involving Only Slight Interference With Traffic

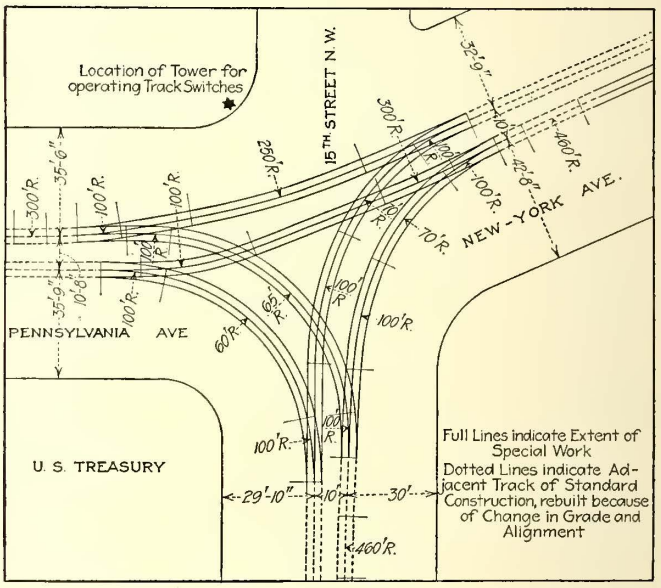
BY H. P. HUNTTING
Engineer of Way Capital Traction Company

THE Capital Traction Company has recently completed the installation of a double-track three-part Y special-work layout on its lines at Fifteenth Street and New York Avenue, N. W., under the most difficult conditions that its engineers have ever encountered in a job of this type. The intersection is at the most congested traffic point in Washington and is the "throat" of the company's system. On account of its prominent location and the seriousness of interruption to the enormous public traffic at this point every effort was exerted to complete the installation as quickly and smoothly as possible.

The work, a plan of which is shown herewith, consisted of installing two new double-track connected branch-offs, to permit the operation of cars direct from Pennsylvania Avenue to New York Avenue; the complete renewal of the double-track branch-off from Fifteenth Street to Pennsylvania Avenue and New York Avenue, and the reconstruction of short lengths of tangent track at the exterior ends of the branch-offs, the latter work being necessary to take care of the change in grade and alignment. The total length of track installed was a little more than one-fifth of a mile. This layout is one of the three most complicated in Washington; the other two being at Delaware Avenue and C Street, N. E., and Ninth and G Streets, N. W.

The entire track layout was of the underground conduit type of construction, in use throughout Washington, which requires much more work and presents more problems than the surface construction used in most cities. Coincident with this work, a system for operating the track switches from a tower on the northwest corner of Fifteenth Street and New York Avenue was installed.

Preceding the actual installation of the layout there were two preliminary surveys. One was made by the special work manufacturers and the other by the company's engineer. From the data obtained in these surveys, a general plan was prepared and submitted to the District Commissioners for approval. The layout was designed to give clearance throughout between cars passing on parallel tracks. In order to obtain this it was necessary to use a long-radius reverse curve on one track at each end before reaching the branch-off. This rather detracts from the general appearance of the layout in the street, but does not affect its easy riding



PLAN OF TRACK LAYOUT INSTALLED AT FIFTEENTH STREET AND NEW YORK AVENUE, WASHINGTON, D. C.

quality appreciably. These reverse curves were used because the centers between tangent tracks on Fifteenth Street and New York Avenue are only 10 ft., whereas the company's standard track center distance is 10 ft. 8 in. Although obstructions at this location were rather numerous, they were fortunately all deep enough to be out of the way with the exception of the old cable-road vault now used as a feeder cable manhole by the company. It was found necessary to lower part of the roof of this vault to permit construction of the new track between Pennsylvania and New York Avenues.

As it was practically impossible to do any staking out on this job except on Sundays on account of the heavy street traffic, this part of the work was started about a month ahead of the completion of the special work layout. In addition to staking out the survey points on the line of track and the location of yokes it was necessary to offset all points, so that after excavation was started it would be possible to obtain the accurate location of the new track. The setting of approximately 550 points, including offsets, was required.

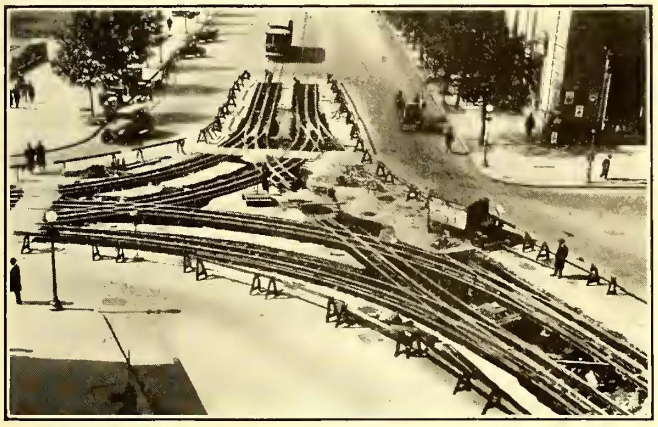
In the meantime, upon completion of the fabrication

*Abstract of paper presented before American Electric Railway Association Company Section No. 8.

of the layout it was set up on the yokes in the yard of the manufacturer, the Lorain Steel Company, exactly as it was to be placed in the street and the correctness of line and dimensions checked by its inspectors, while the company's representative checked the general alignment and gage of surface work, and the workmanship and finish of all castings.

The real difficulties began with the actual work of installation. An attempt was made to do excavation work at night when there was little or no traffic, but the force showed a strong dislike to night work and would not come out regularly. Progress was somewhat facilitated by beginning work at daybreak and working as large a force as could be secured on Sundays. It was at first thought that bridges could be installed for vehicular traffic but this did not prove to be practicable. During the office trips the congestion at this point was considerably increased and it was necessary practically to suspend work during those periods. The work was also retarded to a large extent by inability to secure adequate and competent labor.

The installation work was started on Sept. 10, the excavation and the setting up of the surface work prior to placing it in the street being the first job. The special work had to be assembled near by in order to



SPECIAL WORK LAYOUT AFTER COMPLETION OF WORK REQUIRING CHANGE AT NIGHT

fabricate the conductor rail and to obtain measurements for cutting the existing track to fit the new work. The use of a vacant lot was obtained and the layout was set up there.

The actual installation had to be made when the cars were not in operation and on account of the difference in alignment between the new layout and the old it was necessary to have the first night's work include the installation of the Fifteenth Street branch-offs and the tangent track at the south end and to swing part of the old curves over to meet the new work. Considering the inefficiency of the force, it was a big task to be done in one night.

Cars were rather badly tied up next morning, all lines being delayed until 5.30 o'clock, when the eastbound cars from Georgetown were put through half an hour late. The line was not cleared in all directions until 8.50 when the Fourteenth Street southbound cars were put through, three and one-half hours late. An additional handicap on the work was imposed by inability to bring the surface work from the lot to the job until night, after traffic had died down, and this preliminary work tended to sap the energy of the workmen and created some confusion. On this property all special work has to be moved by hand after it has been hauled to the job, as the small amount of this work which the company has does not warrant the purchase of any expensive hoisting machinery.

The installation of the Pennsylvania Avenue branch-offs, made the following week, involved a full night's work but was finished without any appreciable delay to car service. The New York Avenue branch-offs were installed during two separate nights because of the inability to get the necessary excavation completed in time to make the entire installation on the following Friday night, on which night it is found most advantageous to make track changes. The photograph reproduced on this page shows the condition of the work after the installation of the tracks which it was necessary to change at night.

After the installation of the new steel work it was surfaced and lined, its grade was checked by the District engineers and the lower parts of the yokes were concreted to hold the work in place while the forms for the tube concrete and the tube concrete itself were being installed. The work on forms for the tube concrete was the slowest part of the job as special forms had to be made for all the branch-offs and curve crossings and only workmen possessing experience and skill could be used on this sort of work. Considerable additional excavation was required to make room for the forms, ducts for jumper cables around cutouts and switch-operating cables had to be installed, sumps for track drains had to be dug, manholes for switch-operating mechanisms had to be constructed, the roof of the cable vault had to be lowered, etc. The paving was installed by the District and completed with the exception of the adjacent roadway on Dec. 7, finishing the job practically in three months after starting.

The installation of this work was very expensive, as the following summary of costs will indicate:

Installation of double-track three-part Y (784.28 ft. of single track):	
Labor	$10,537.46
Material	38,511.59
Hauling	916.89
Paving, labor and material	1,516.31
Underground obstructions	170.15
Total	$51,652.40
Renewal of tangent track exterior to special work (303½ ft. of single track):	
Total—labor, material and paving	4,272.62
Installation of switch operating layout:	
Total, excluding cost of switch tower	2,217.83
Gross total	$58,142.85
Credit from steel removed	1,903.66
Net Total	$56,239.19

Transformer Repaired in Record Time

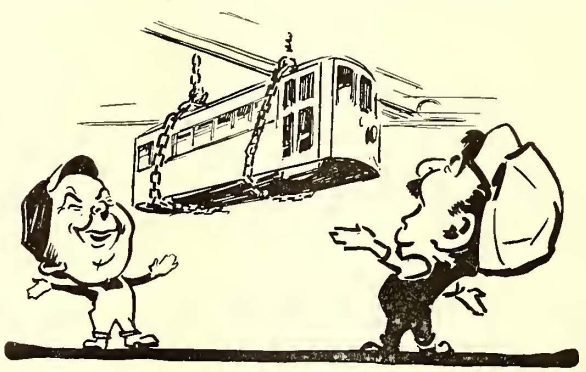
A 1100-kva. transformer in the Quincy Street substation of the United Railways of St. Louis short-circuited during the night time recently and the station was put out of commission. The transformer was dismantled, the coils removed, repaired and again installed in the transformer and the laminations relaid by hand. This work was entirely finished and the transformer returned to service in five days. When it is considered that this transformer weighed 15 tons and there were 50,000 laminations to be taken apart and relaid, the size of the task can be appreciated.

How the Underframe Contributes to the Durability of the Car Body

By Norman Litchfield

Steel Sills, Bolsters, Cross-bearers and Anti-telescoping Buffers All Play Essential Parts in Making the Modern Car Shock and Vibration Proof

WITH the advent of the double-truck car in railroading it became necessary in body design to provide some means of transmitting the loads carried by the series of longitudinal sills forming the floor framing of the ordinary wooden car body to one central point over the center of the truck so that the latter could be able to pivot on its axis when rounding curves. The most convenient and simplest method of accomplishing this was by the use of a cantilever structure composed of two flat iron plates stretched transversely under the sills and separated at the center by castings, the general design being as shown in Fig. 1. As soon as the electric motor began to be applied to passenger car trucks for suburban and rapid transit service the necessity of providing sufficient space for the motor, coupled with the desire to keep the car body as low as possible for ease of access and on account of existing overhead clearances, made it necessary to build the bolster around the sills instead of entirely beneath them (see Fig. 2).



"No Danger of Straining the Body with an Underframe Like That!"

These designs held sway for several years and, in fact, are in general use to-day although they have several disadvantages which will be discussed later in more detail. These disadvantages have led to their being generally superseded by more efficiently designed structures which have become possible through the development of the steel car.

The newer design may be termed the cover-plate-and-diaphragm structure which now is in general use for all kinds of cross-bearers, whether they be the body bolsters or the intermediate transverse members originally known as "needle beams."

The design rests upon the principle that a girder consists in its elements of top and bottom members, properly proportioned to withstand the tensile and compressive stresses, and a connecting web to resist the shear. The web does not need to be continuous and consequently can be built in sections between the sills, while the cover plates pass over and under the sills. In some cases where the stresses are clearly defined the compression-chord cover plate may be omitted, reliance being placed upon the fit of the diaphragms against the sills to transmit the compressive strains. A typical design is shown in Fig. 3.

For the proper design of the bolster structure it is necessary as in all the other structures to make some analysis of the strains set up by the loading. Under ordinary conditions, with the car standing level and having the proper clearance at the side bearings, the body bolster is essentially a true cantilever with an equal load applied at each end through the side sills. This is transmitted through the body bolster structure to the center plate. The moment diagram for this condition is shown in Fig. 4, the loads used being those found in the analysis of the side structure given in the earlier article.

Applying this moment diagram to the style of bolster shown in Fig. 2, it will be seen that while the structure is sufficiently strong at the center it is weak at the ends. This weakness is due to its construction at three points where the plates have been placed flat together to permit the application of the bolts or rivets which tie the plates together and take the longitudinal shear. Where it has been desirable for local reasons, such as maintenance of exact location of side bearings so as to permit interchange of trucks, to perpetuate this general character of bolster design some improvement has been made by the insertion of a filler piece between the upper and lower plates as shown in Fig. 5. As there are many bolsters still in service in which it is not feasible to insert a filler piece as indicated, attention may be called to the fact that resource may be had to a pressing or gusset placed on top of and riveted to the top plate and flanged out sideways against the side sill and bolted or riveted thereto (see Fig. 6).

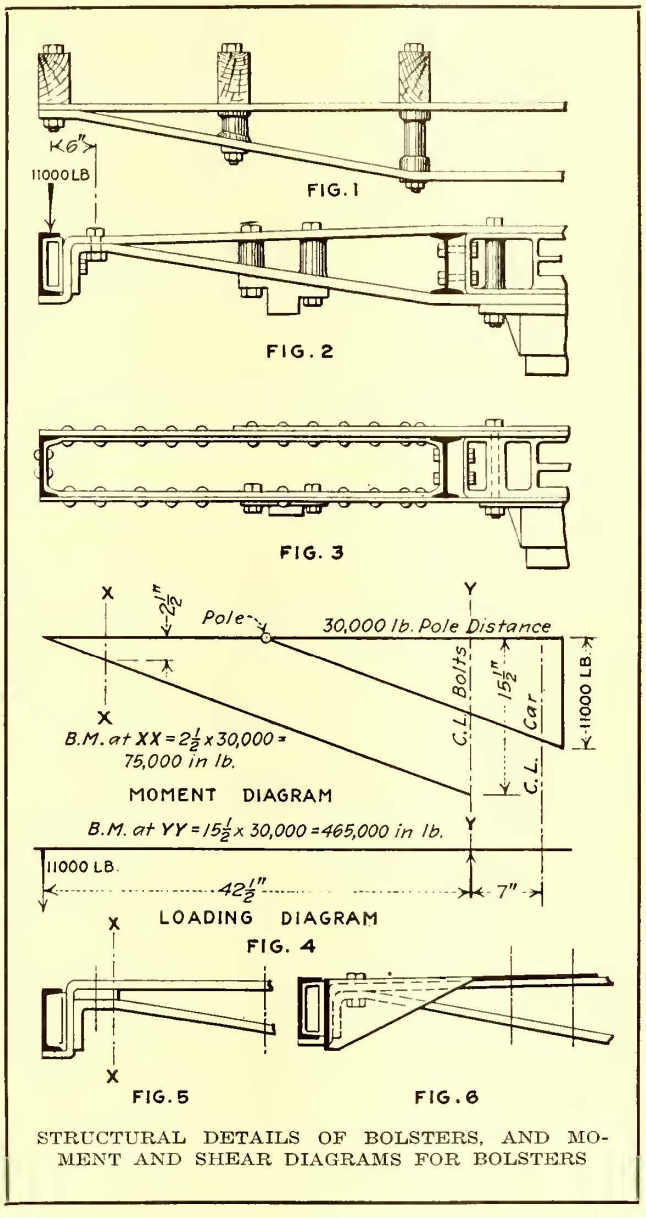
The second condition which must be considered is that which occurs when the car body has tipped so that it rests equally on the center plate and one of the side bearings.

Whenever a car is rounding a curve at high speed the effect of centrifugal force is to take weight off the center plate and to transfer it to one side bearing. The car is at the point of tipping over when all of the weight has been transferred to the outside rail, and proper consideration must be given in the design to cover the condition.

The final case to be considered is one which is more applicable to service cars than to passenger cars, namely that occurring when the car is jacked up under the side sills with the load in the car.

All of the foregoing discussion takes into consideration only the vertical loads coming from the body structure, the passengers and the equipment. In addition to these there is the fore-and-aft thrust caused by the acceleration of the car by the motors and the re-

tardation by the brakes. The effects of both of these are intensified by the fact that the accelerating and retarding forces are applied at the point of contact between the body and the truck center plates. This point is located at a considerable distance below the neutral axis of the bolster structure, thereby causing a twisting action the intensity of which may be estimated by assuming that the car is being retarded up to the slipping point of the wheels on the rails. This retarding force multiplied by the distance between the contact point of the center plates and the neutral axis of the bolster gives the turning or twisting moment which the bolster has to resist. The usual flat plate construction, such as outlined in Fig. 1 is, in general, sufficiently strong in itself not to show any bad effects from this twist. But plate construction, such as narrow that considerable difficulty is experienced in the connections of the bolster to the sills which show wear and a tendency to loosen, and in wooden cars there is a tendency to break the sills. The matter is still further complicated on cars designed for train operation, and in which the drawbar swivels about the king pin, for in this case to the strains already enumerated is added that coming from the pulling and pushing action between different cars. This condition is, of course, most severe when a train of cars is hauled by a locomotive, but is by no means absent in trains consisting of motor cars. Here it is due to different accelerating rates of the motors with varying sizes of wheels, different designs of motors, irregular action of brakes, etc., so that in any event this effect of the buffing strains must be given attention if the design of the bolster is to prove satisfactory.



STRUCTURAL DETAILS OF BOLSTERS, AND MOMENT AND SHEAR DIAGRAMS FOR BOLSTERS

Where the bolster is built around the sills the effect is less pronounced than where the bolster is entirely beneath them, and the cast fillers usually employed can conveniently be extended fore-and-aft along the center sills and fastened securely to them so as to present a broad base to resist the turning moments resulting both from the braking and buffing strains.

It is in the resisting of these secondary twisting and shearing loads that, as a general thing, the old plate type bolster is least efficient due to its loose-jointed construction. On the other hand it is a simple matter to build bolsters of the more modern diaphragm type with sufficient width of cover plates and with diaphragms properly fitted and riveted to the cover plates and sills to overcome any tendency of trouble from this source.

Another feature which cannot be overlooked is that of the deflection of the bolster under load. With the small side-bearing clearances ordinarily used in electric passenger car service it takes but little deflection of the bolster to bring the latter down solid on the side bearing, thus causing difficulty in the swiveling of the truck on curves. Here again the flat-plate bolster has not the desirable qualities of stiffness that the bolster of the diaphragm design possesses. For all of the foregoing reasons, therefore, the latter has come into general favor, and the old style remains only in cases where certain local conditions are controlling. In the design illustrated it will be noted that the webs of the bolster are shown rigidly attached to the side sills. There has been some criticism of this feature by designers who have felt that the twisting action of the body over uneven track is such as to make it desirable to approximate the trunnion joint of a bridge support. They have therefore built the ends of the bolster in the form of a sort of chair on which the side frame rests loosely. This arrangement however is not at present as largely used as the rigid connection. The transverse members of the floor framing have gone through a process of evolution similar to the bolsters. As before pointed out it is customary in cars which depend chiefly on the side structure to carry the load to use center sills of a section which in itself is not strong enough to carry their own portion of the load from bolster to bolster without undue deflection. They therefore have to be propped up by cross-pieces so that the excess load is transmitted to the side frames. This was accomplished at first by the use of wooden beams underneath the wooden center and other sills. These beams also formed the base for the longitudinal truss-rod queen posts, and were generally known as "needle beams." Where a simple beam was not strong enough it was reinforced by transverse truss rods.

The adoption of steel members for underframes permitted a simplification in the design of these cross-bearers just as it did in side frames as bolsters. Some cars were built with cross-bearers of rolled structural shapes running continuous from side sill to side sill. As this necessitated cutting the center sills, if all members were to be kept at the same level, which is desirable for several reasons, this construction soon gave place to the cover plate and diaphragm type similar to the bolster construction already described. The latter is now very generally used throughout steel-car construction, both passenger and freight.

A type of cross-bearer intermediate between the old needle beam and the diaphragm type was an ingenious truss construction utilizing a diagonal brace from the belt rail to the center sill. Thus this member, with the corresponding window post and floor support, virtually formed a cantilever arm from the side girder. As this diagonal member extended well out into the center of the car the construction was available only where cross-seats were used with a narrow aisle between. When the possibilities of the diaphragm construction became evident the truss construction was superseded.

Attention has already been called to the heavy strains that are imposed on the floor framing members by buffing shocks, either by the drawbar through its spring gear or directly by the end sill in collisions. To tie the center and end sills together securely, and so to distribute the end loads more or less equally among all sills, it is quite general to use a flat plate some 20 in. wide riveted to the bottom flanges of the end and longitudinal sills. This plate is known as the anti-telescoping plate, its worth having been shown in many instances in actual service.

For ordinary light or semi-heavy service, where the use of a spring buffing device is not considered necessary or desirable, two opinions have held as to the proper design of end construction of floor frames. One rests on the theory that the bumper should act as a cushion and, therefore, a wooden timber is utilized for this purpose. The other is based on the desirability of as far as possible maintaining the alignment of the sub-frames of the colliding cars by the use of anti-climbing devices on the front faces of the buffers, which are constructed of steel and rigidly connected to the sills. In this case allowance is made for the final absorption of end shock by the crippling locally of the buffer member between the center sills, and in cases of severe shock the crippling of the center sills at a point close to the end construction where this action will do the least damage.

One more feature remains to be considered in the design of floor frame, namely, that of lateral stiffening. As a rule, wooden floor frames were bound together with cross-tie rods running beside the transverse timbers fitted between the sills. They were braced diagonally by tie rods and generally provided with turnbuckles. Steel construction permits the elimination of these various truss rods, the riveting of the cross-pieces to the sills together with suitable gussets tying the main members securely together. The anti-telescoping plates already referred to provide additional side bracing which is still further augmented by steel floor plates at platforms and monolithic floor construction laid on corrugated or special section steel.

The simplification which the use of steel permits in construction is shown by the many points already enumerated, and simple study of the relative strength of given sections will indicate the reduction in weight which its use permits as against all-wood construction.

A Local Symptom of a General Disease

In Describing St. Louis Situation, Engineer Says Electric Railway Industry Throughout the Country Is in a Bad Condition

C. E. SMITH, consulting engineer, in a recent address before the Engineers' Club of St. Louis, Mo., said that during the last six months of 1917 he had received the impression that St. Louis was considerably agitated over its electric railway situation, but that not until his recent trip to Washington did he realize how general is the agitation of this sort. In fact, he said the condition in St. Louis is merely a local symptom of a general disease. On the one hand, electric railway investments are in a bad way, and, on the other, the public is in a bad way for proper service. In his opinion, the situation must be handled in a big way or the trouble will not be overcome and the communities interested will be severely injured. Continuing, Mr. Smith said:

"Unfortunately the public has not yet fully realized the relation between rates and the cost of service, and in the consideration of new franchises it has demanded the right to specify the quality and the quantity of service without making proper provision to meet the expense. Under the theory of service at cost the companies and the public should both realize that their interests are mutual.

"If service of the quality and the quantity demanded by the public costs more than 5 cents, the public should cheerfully pay the proper price. If it costs less than 5 cents, the public should have the benefit of reduced fares. If an arbitrary limit of 5 cents is imposed, however, the public should be satisfied with such a quality and a quantity of service as 5 cents will pay for. If the service is neither sufficient nor satisfactory, the public has the alternative of suffering the unsatisfactory service for the benefit of the lower rate, or of paying the higher rate for satisfactory service."

In the course of his remarks, Mr. Smith presented a résumé of the company's problems and of the negotiations that led up to the present ordinance now awaiting the company's acceptance. He included a summary of the new ordinance and also of the franchises in Chicago, Cleveland and Kansas City.

College Test Car Busy on the Shore Line

The test car belonging to the electric railway department of the Worcester Polytechnic Institute is making a detailed test of track conditions on the Shore Line Electric Railway of Connecticut. The 200 miles of track belonging to this system will be covered thoroughly, and sources of power waste, mechanical defects in track and line, etc., will be investigated. The car is in charge of faculty members of the electrical engineering department of the institute.

Selecting Lightning Arrester Types to Suit Requirements

By Q. A. Brackett

Engineering Department,
Westinghouse Electric & Manufacturing Company

The Author Discusses the Applicability of the Electrolytic, Multipath and Condenser Types to Several Classes of Service and Gives Some Suggestions for Their Installation and Maintenance

IN ELECTRIC RAILWAY work the lightning arrester is often a rather neglected part of the equipment, yet it is one which may prevent expensive repairs. There are various types of railway arresters and these offer varying amounts of protection. There are likewise very different operating conditions in different parts of the country which bear directly on the type of arrester that should be used and the amount of attention that it should receive.

In most large cities where there are many steel buildings and overhead wires, lightning conditions are not very severe, but the number of cars to be protected is very large. In such cases a comparatively cheap type of arrester could be used. On interurban lines, especially those located in mountainous regions or districts in the natural path of storms, a higher grade of arrester with greater protective power will be required, and it will be more important to give the arresters frequent and careful inspection to insure their being in condition to give the best results.

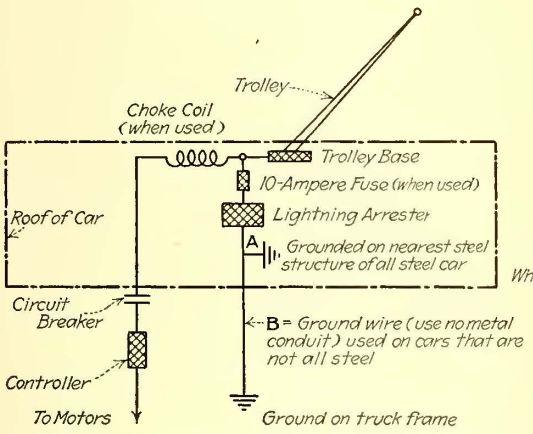


FIG. 1—DIAGRAM OF CONNECTIONS FOR MOUNTING ARRESTER ON CAR ROOF

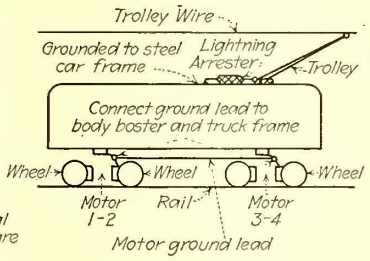


FIG. 2—METHOD OF MOUNTING AND GROUNDING ARRESTER ON ALL-STEEL CAR BODY

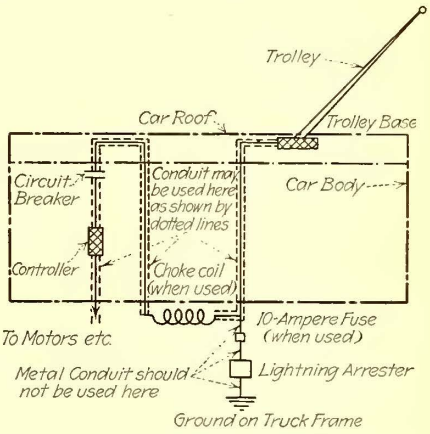


FIG. 3—DIAGRAM OF CONNECTIONS FOR MOUNTING ARRESTER UNDERNEATH CAR

The experience of this company has shown that the electrolytic, multipath and condenser types all have their places in electric railway service. In power houses and substations arresters should be provided for the protection of the generators and rotaries. As the number required is small and the value of the apparatus to be protected is high, only the very best grade of arresters should be used. This means that in general all such equipment should be protected by electrolytic arresters of the same large capacity that are used for the protection of large alternating-current systems. The condenser arrester can also be used with excellent results for the protection of station apparatus, especially where two are used in parallel. The Westinghouse "MP" or multipath type of railway arrester consists of a molded carborundum block in series with a small spark gap, all inclosed in a weatherproof galvanized iron box. The carborundum block has very high resistance up to a certain critical voltage above which it breaks down into a multitude of series and parallel spark gaps having little or no resistance. After the high voltage passes, the discharge is quenched by the subdivision of the current into many minute series and parallel arcs, which individually have insufficient voltage to maintain themselves. The cooling effect of the great mass of the block, in intimate contact with the arcs, also aids greatly in stopping the flow of current. When the discharge has been stopped the block regains its high resistance. The great advantage of this arrester is its rugged simplicity and its corresponding low cost. It is at present limited to 750 volts direct current, but it is particularly suitable to urban railway systems where the number of cars is very large and the lightning troubles small. On account of its rugged nature, with no moving or delicate parts, it requires no maintenance or inspection, except to see that the circuit is complete to and from the arrester. This low maintenance expense also makes it particularly suited to large installations.

For interurban lines and installations that are exposed to severe lightning conditions, it is desirable to use an arrester of greater protective power than the multipath type. Very effective protection can be obtained from the condenser type. This arrester can be mounted in any position on a car or pole and has no liquid to spill or moving parts to get out of order. It is unaffected by heat or cold and requires no attention

or maintenance except to keep the leads to and from the arrester intact. It consists essentially of a high insulation condenser in a molded composition case, inclosed in an iron box of rugged design. The condenser unit is easily renewed although this is rarely necessary. This arrester was originally designed for the higher voltage direct-current lines and it has been very successful where much trouble had been experienced with other types of arresters because of the viciousness of the power arcs that had to be broken. It is equally effective, however, at lower voltages. It is connected between line and ground, either with or without a series spark gap. When no gap is used, the arrester has the advantage of starting to give protection instantly, without the rise of voltage or time lag usually required to break down a spark gap. This makes it particularly valuable for the protection of old or weak insulation. The protective effect depends on the fact that the impedance of a condenser is lower, the higher the frequency. The frequency of lightning is so high that the condenser used offers practically a short-

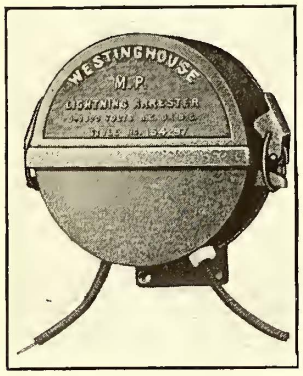


FIG. 4—MULTIPATH TYPE CAR ARRESTER

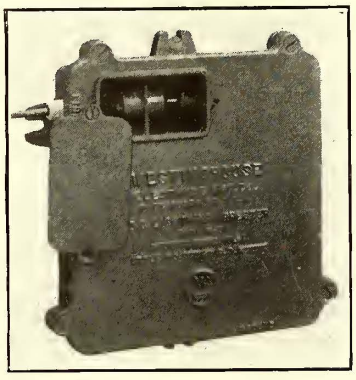


FIG. 5—CONDENSER TYPE ARRESTER

circuit to ground for the surge, yet all the time it allows none of the direct current to escape, and so has no power arc to break following the discharge. It is a valve that automatically selects the lightning only, and passes it freely to ground without permitting the escape of any dynamic power whatever.

Where dependence is placed on low-priced arresters it is very necessary that they should be properly installed. During past years arresters have usually been mounted underneath the car, but recently there has been a growing tendency to locate them on the roof. On all-steel cars with the arrester in this location the ground connection can be made directly to the roof, but unless an absolutely continuous circuit through the body of the car to the trucks is assured it will always be desirable to run a separate copper lead from the ground side of the arrester to the trucks. Even in the case of wooden cars the location of this device close to the trolley base on the roof is preferable from a protection standpoint if it is of a type which can be so mounted. When the arresters are mounted underneath the car the leads to and from them should be as straight as possible and should not be inclosed in metal conduit. Wooden conduit may be used when desired. Excellent recommendations regarding arrester installation on cars are given in the report of the arrester committee of the American Electric Railway Engineering Association.

When a choke coil is used care should always be taken to see that the arrester is connected to the line between the trolley and the choke coil so advantage may be taken of the piling up of voltage that will occur at the trolley end of the choke coil when a surge occurs.

The leads to and from the arrester should be not less than No. 6 B. & S. gage. This is not so much from the standpoint of conductivity as because a small lead may become broken due to continual vibration or corrosion and thus leave the car without protection until the break is discovered. On the other hand, there is always the possibility of a surge that is too heavy for the small arresters used in this class of service and that the arrester will, therefore, burn up. In such a case the heavy leads recommended above will prevent the arrester from burning itself free and the line will remain short-circuited. For this reason a fairly heavy fuse in series with the arrester is sometimes recommended. There is, however, danger of the fuse being open and the arrester disconnected without its being noticed, unless very frequent inspection is carried out. For that reason the majority of operating companies seem to prefer to use no fuse, but instead to compel the car crew, in case of trouble, to pull down the trolley and cut the leads free from the arrester.

In any case frequent inspection of the arresters and their connections should be made. In general, inspection after each storm and at the times of regular car inspection should be ample.

POLE ARRESTERS GIVE ADDITIONAL PROTECTION TO EQUIPMENT AGAINST LIGHTNING

In addition to the car arresters, lightning protection is obtained from arresters distributed along the line. These arresters are mounted on poles spaced approximately five per mile and should also be installed at points where the feeders tap onto the trolley wire. These arresters must be suitable for outdoor mounting on poles where they can withstand all conditions of weather with comparatively infrequent inspection. The same danger of an arrester failing and grounding the line exists in the case of pole-line arresters, but there is not the same possibility of quickly disconnecting it that there is in the case of the car arresters. It is, therefore, very desirable that all pole-line arresters be so arranged that they can burn themselves free in case of failure, as otherwise it may be necessary to send a repair crew over the whole line to search for the ground. A standard outdoor fuse can be used in the circuit, but it is cheaper and generally sufficiently satisfactory to use a short length of small-diameter copper wire somewhere in the line or ground lead which, in case of failure of the arrester, will burn in two and hang down in some conspicuous manner so that the motorman of a passing car will notice it and report it on his return.

The ground connection for pole-line arresters should be made by driving an iron pipe 5 or 6 ft. into the ground and connecting the ground lead to it. Except for the short length of small wire mentioned above for use as a fuse, the ground lead should be of substantial size so as to make sure that it will not corrode or break in two. The ground around the iron pipe when installed and yearly thereafter should be thoroughly saturated with salt water until a resistance of less than 30 ohms is obtained. Where there is no fear

that serious electrolysis will occur it is desirable to connect these grounds also to the rails, thereby providing a more effective ground for both the car and pole-line arresters. Where this might result in objectionable electrolysis this same connection may be made by a small fixed spark gap connected between the rails and the pipe ground. This gap should be made as small as possible.

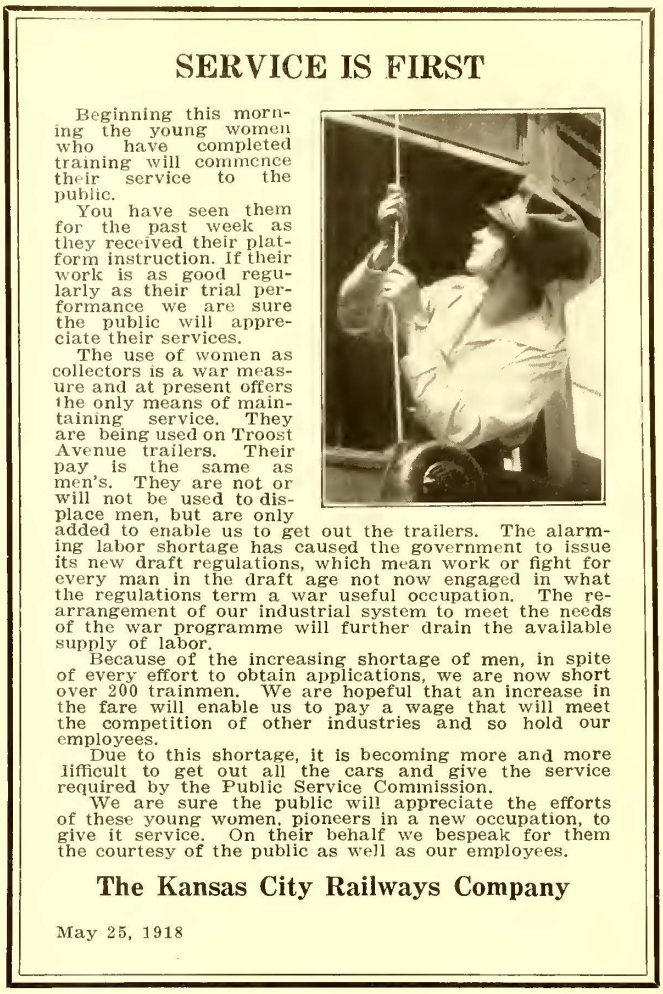
All the arresters described in this article are particularly suited for railway work in their proper applications, the electrolytic for station use, because of its high protective power in large sizes where maintenance questions are unimportant; the condenser and multipath types for car and pole-line use, in accordance with the severity of the conditions and the investment warranted.

Women Conductors in Kansas City, Kenosha and Camden

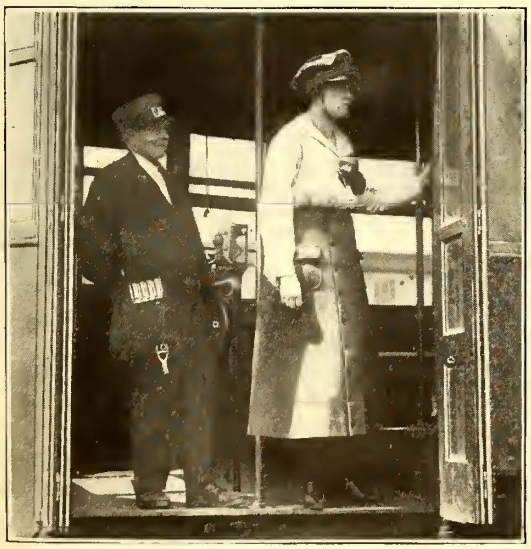
The Kansas City Railways Put on Five Women Conductors on May 21—Kenosha Conductors Strike With Men But Are Now Sorry—Some in New Jersey Also

THE Kansas City Railways Company on the morning of May 21, 1918, introduced women conductors to Kansas City. Eight women were put to work on the cars, each assisted on this first day by experienced older employees, five on the Rockhill and three on the Troost Avenue line. These lines are both comparatively short; they run through the best residence districts and both lines lead into the same division carhouse, at Forty-eighth and Harrison. On Saturday, May 25, the women were sent out alone.

The company does not intend to supplant men with women, except as it is unable to procure the men. These women were employed some three months ago when the service was down about 7 per cent. At that time the unions offered several objections. The women were in most cases retained in the employ of the company, the men having withdrawn their objections on the assurances that the employment of women was to improve service and not to lower wages. The women conductors receive the same wages as the men employed. The company will use them for the present only between the hours of 9 a.m. and 5.30 p.m., thus giving them only daylight runs. Rooms have been provided for the women near the carhouse at Forty-eighth and Harrison with a matron in charge. The women are making excellent conductors, being accurate, rapid, honest, and



ADVERTISEMENT CARRIED IN KANSAS CITY PAPERS ANNOUNCING THE PLAN



WOMAN CONDUCTOR UNDER INSTRUCTION—THE FIVE WOMEN CONDUCTORS EMPLOYED IN KANSAS CITY

having the faculty of tending strictly to business. The patrons seem pleased and the new conductors are meeting with every courtesy from the public.

WOMEN CONDUCTORS IN KENOSHA ON STRIKE

An interesting feature of the use of women conductors in Kenosha is that they are now on strike. The strike was not initiated by the women but they were drawn into it through a request of all of the employees for as high wages as are paid in Milwaukee and Racine where the railway systems are under the same management as in Kenosha. The increase asked was 10 cents an hour. The employing company, Wisconsin Gas & Electric Company, replied that the employees were entitled to the increase asked, but the company was unable to grant the increase because of inadequate revenues. The strike has been most orderly so far and the women seem disappointed that their new jobs have been discontinued. Service has not been resumed, the company waiting for action by the Council and Railroad Commission. The company has forty-four train employees, consisting of twenty-four women conductors and sixteen motormen on regular runs, and an extra board of two each. Eight single-truck cars are run regularly over five lines with a trackage of 7½ miles. On account of high operating costs and jitney competition, the company claims it cannot at this time afford to meet the increases which are suggested by the men and women.

WOMAN CONDUCTOR IN KENOSHA

Women were started as conductors on Dec. 20, 1917. The breaking-in period takes about a week on the car with a brief instruction course from the superintendent. The women range in age from twenty-five to thirty-five years. Twenty of them are married or widows, and six are single. Nine are the wives of employees. No male conductors are employed and no motorwomen by the company.

The motormen work nine hours a day, and on account of the laws of Wisconsin, the women conductors work in six-hour shifts as follows: 6 a.m. to noon, noon to 6 p.m. and 6 p.m. to midnight. Occasionally they get in twenty or thirty minutes overtime. If a woman conductor misses her run and the extras are all working, a regular works three hours on the open run, and as it is a six-hour shift it takes two conductors to finish the run. The rules, regulations, discipline and rate of pay per hour are the same as for the male employees. A bill was introduced in the last Legislature to prohibit the employment of women on street cars except from 8 a.m. to 5 p.m. but it was not passed. The Industrial Commission of Wisconsin has ruled that women conductors shall work only from 7 a.m. to 6 p.m. This will effectively eliminate them if the order remains unchanged, because they cannot be used during the rush-hour periods.

The women have been working without uniforms except a khaki cap with badge and a strap belt which holds the change carrier. They had ordered uniforms of khaki and were to pay $21 for them when the strike came. The women were in charge of a woman assistant superintendent. The cars are of the pay-as-you-enter type with a non-registering fare box of the company's own design and make.

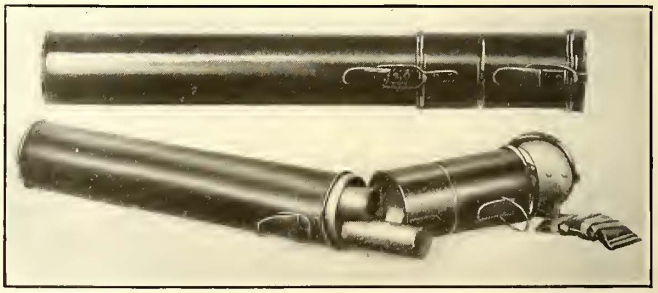
The women conductors report for duty and finish their platform work at the company's office. They are not allowed to go to the carhouse. The motormen run the cars to and from the carhouse which is only three blocks from the office. Public opinion in Kenosha has approved the use of women on the cars.

EXPERIENCE ON PUBLIC SERVICE

The Public Service Railway of New Jersey has had thirty-four women working for some time as conductors on its Southern division, with headquarters at Camden, and eight on its lines at Elizabeth. They have not been extended to other parts of the system yet, although the management sees no reason why they should not serve acceptably, and the company has trained some for use in Newark. There are matrons at each depot from which women conductors run and a minimum age limit of twenty-five years has been established.

Definite Location of Torpedo and Fuse Holder Prevents Delays

TO AVOID the bad practice, unfortunately found to prevail on many interurban lines, of carrying fuses of torpedos under car seats or in some indefinite place where there is likely to be considerable delay in obtaining them for use, a holder specially adapted to the requirements has been invented by M. F. Flatley, now master mechanic of the Lackawanna & Wyoming Valley Railroad, Scranton, Pa. This holder as shown in the accompanying photograph, is a galvanized-iron tube 3 in. in diameter and 23 in. long, made with two compartments hinged together and with a hinged cover over the top. The bottom section is long enough to contain fuses of the standard length and the top section large enough to contain five or six torpedoes. Clip locks hold the two sections and the cover tightly closed and make the holder practically water-tight. Instead of putting the holder under a seat or in some inconvenient place, it is mounted in spring clips in the rear vestibule of the car so that when equipment is needed for the protection of a train, the conductor can grab up the tube and a flag and is then supplied with all the necessities with no loss of time. Patent has been applied for on this combination holder.



FUSE AND TORPEDO HOLDER FOR INTERURBAN CARS

Dipping and Baking Railway Motors Will Decrease Troubles

The Writer Describes the Apparatus Which Is Necessary for the Proper Dipping and Baking of Railway Motors and the Precautions That Should Be Taken to Secure the Best Results

BY J. V. DOBSON
Railway Engineering Department, Westinghouse Electric & Manufacturing Company

INTERRUPTED schedules in last winter's urban and interurban service force us to the question, "How can we best avoid another such epidemic of trouble?" Another winter may not be so severe; snowstorms may not affect the same localities as last year; the experience, however bids us to be alert in guarding against another such trial.

Where the dipping and baking process has been practiced, such precaution has been found to be very effective in eliminating the kind of trouble experienced because of the snow and water of last winter. The cost of rewinding armatures and fields as the result of last winter's severe snow conditions would far exceed the cost of dipping and baking outfits for the railroad shops of the whole country.

The dipping and baking treatment, when properly done, provides the best means for preventing insulation troubles caused by dirt and water in motors in service. This treatment, improperly given, is worse than none.

Applying a dipping and baking treatment after the motors have been in service will give renewed life to the insulation. It will close up cracks and pores, and will present a smooth, clean surface that is not readily harmed by dirt and moisture. Not the coils alone, but the whole piece, either armature or field, should be so treated.

The advantages of dipping and baking the complete piece are:

1. The coils are held in place in the slot securely and, therefore, are less subject to individual vibration.
2. All cracks between the coils are filled up, preventing the deposit of dirt or moisture.
3. Loose laminations are sealed and vibration prevented.
4. A coating which prevents rust is formed over the iron. On motors not so treated, it has been found that rust, which is a good conductor of electricity, is sometimes blown or thrown into the windings.
5. A smooth, dense surface layer is produced on the coils and on creepage surfaces.
6. The insulation of any coil which has been bruised in handling, during winding or assembling, is restored to good condition.
7. Any insulation on the field coils which is cracked by the strain of assembly will be sealed by the treating process.
8. The glossy covering produced will prevent the admission of water where the field coils are connected and taped.

One disadvantage in dipping and baking lies in the fact that it is more difficult to replace a coil. This, on the other hand, involves a counter advantage. The tightness which makes it difficult to remove also makes it proof against vibration, and seals it against moisture. A time-worn saying which holds good in some cases applies here, namely, "Make it difficult to repair and, when so doing, eliminate the need for repair."

Having shown the advantage of dipping and baking, it is my purpose to describe the design and building of a dipping and baking outfit that can readily be installed at any motor repair shop, with comparatively small expense. One outfit, of average size to fit the needs of a usual railway repair shop, will here be described.

How a Baking Oven of Average Size and Capacity May Be Constructed

What constitutes a dipping and baking outfit? It is neither a complicated nor expensive outfit to build. There are, however, certain necessary precautions in its design, and in its operation afterward, that should be observed.

The oven shown has walls of red brick and a roof of concrete slabs. The end doors, hinged and opening outward, are of sheet steel covered with asbestos. Door fasteners are provided. These should be arranged so as to permit opening from both the inside and outside—this is a "safety-first" measure. Tracks, as shown, are provided for running loaded trucks into the oven. These tracks are on a floor directly over the heating pipes, which occupy a chamber across the bottom of the oven. This arrangement gives the best results and insures a more nearly uniform temperature. Ventilating holes are placed at the top and inlet holes at the bottom. The size of the holes should be such as to give frequent changes of air in the oven. This is an important consideration, for vapor and volatile gases are driven off from the apparatus during heating, and unless these escape the heated air becomes wet and the baking process is rendered ineffective. Although not essential, a recording thermometer is advisable, because by its use a very close check can be made of the temperature of the oven at all times. In any case, when the oven is installed and before it is placed in service, very careful temperature readings should be taken at various heights to make sure that the temperature throughout the oven is uniform. Successful results can only be obtained by baking at a uniform temperature.

In more detail the steam coil shown consists of eighteen 1½-in. standard steel pipes, welded at each end into a 4-in. steel pipe. This method of construction has been found to be most satisfactory because it eliminates the use of threaded joints. There is always a risk of leakage of

steam at each threaded joint. Considerable precaution should be taken to prevent any steam leaks whatever in the oven. The pipes are set to drain at the inclination of 1 in. in 10 feet. The steam intake and outlet pipe is placed eccentrically in the 4-in. pipes to prevent the trapping of condensation. Electric heaters may be installed on the walls of the oven. These are to be used as auxiliaries, or at times when the steam is not available, and are not absolutely necessary.

Other ovens, of a less permanent nature, can be constructed. For example: I have seen a boxcar removed from its wheels, doors made at each end, walls lined with asbestos and pipes installed along the side near the bottom. It made a very satisfactory baking oven. A rectangular box of wood 2 in. thick, lined with asbestos and provided with heating elements can be well utilized. It is, however, quite evident that a well-designed oven of sufficient capacity and with adequate means of handling the apparatus will give the best results, but at a little higher first cost of installation.

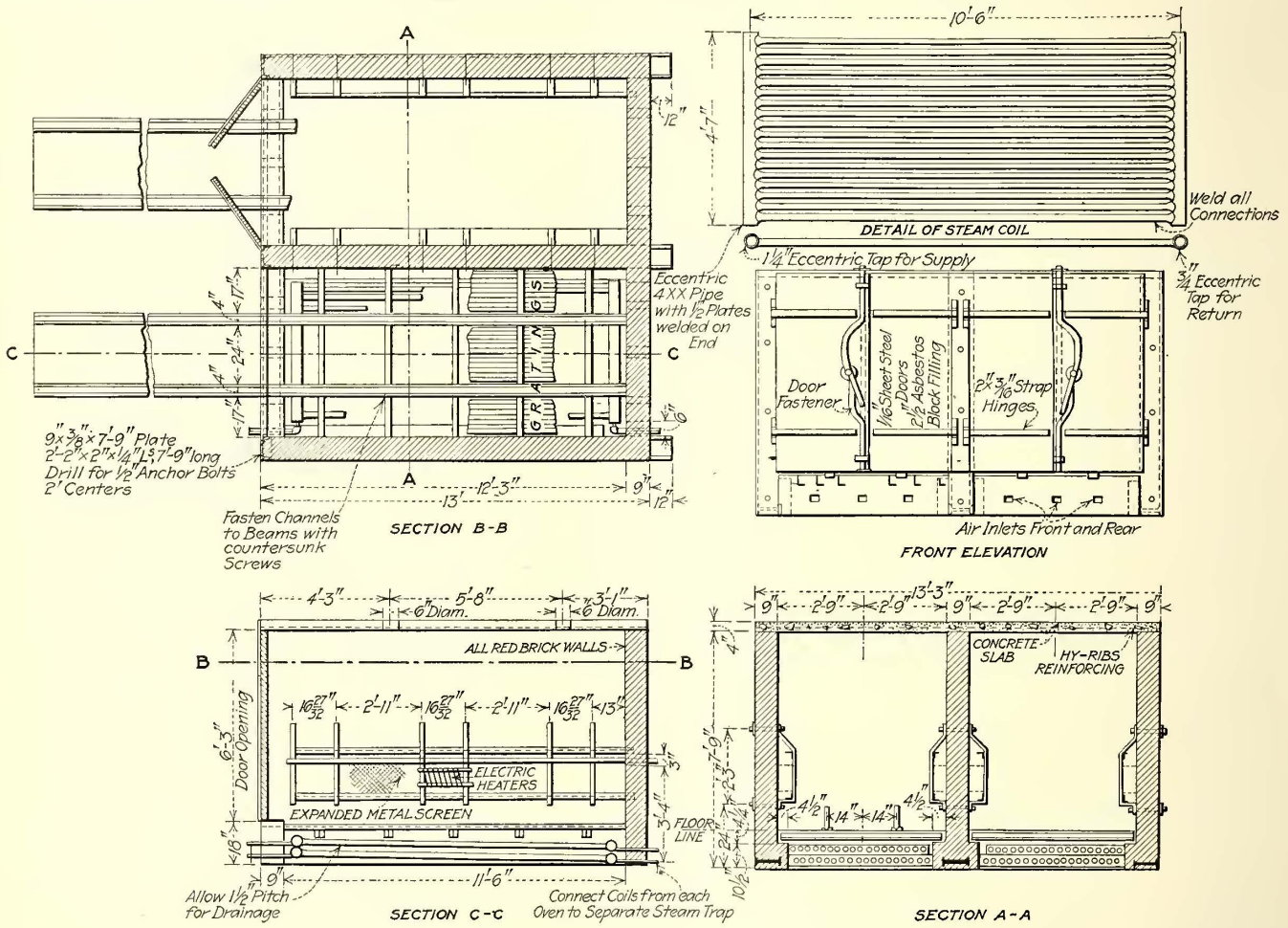
For some installations electric heaters may be cheaper and more convenient than steam heating. Discarded car heaters have been found to work quite satisfactorily. When such heaters are used they should be placed on the bottom of the oven, as in the manner herein described for steam heaters.

Most dipping and baking compounds require benzine to dilute them. It is therefore advisable to place the dipping tank in a shed or outhouse, apart from the main shop, where fires or sparks may be excluded, and where, should a fire occur, it is so remote from the main shop that the main building is not endangered. The size of the dipping tank, of course, is dependent on the size of the motors that are to be dipped.

The tank can very easily be made of sheet metal of a thickness sufficient to retain the dipping compound without buckling. It should be made water-tight by welding the edges. Some tanks have been equipped with covers that are released in case of fire by the melting of a fusible wire, thus releasing a latch and dropping the cover, which quickly smothers the flame. Where large tanks are used with heavy covers, it is somewhat more convenient to make the cover removable altogether. Should a fire occur, a valve is immediately opened, and in a very short time the dipping compound is emptied into the cistern.

It is necessary, of course, to provide means for handling the apparatus. This, however, can be modified to fit the conditions of the particular shop. It should be pointed out that an electric hoist is not as safe as an air or chain hoist in the vicinity of the dipping tank. Whatever vaporization of the benzine takes place ascends above the tank and produces an explosive mixture. A slight spark from the motor may be the means of igniting such a mixture. An approximate cost of this dipping and baking outfit, equipped, would be $1,200.

All oil, grease and dirt should be removed from the apparatus before it is dipped. This can best be done



DETAILS OF A BAKING OVEN

by blowing it with clean, dry compressed air. In the event of an accumulation of grease or oil in large quantities, this can easily be removed by scrubbing the surface of the apparatus with a cloth wet with benzine or gasoline.

The piece should then be heated for approximately six to eight hours in the oven in order to drive off all moisture, and to open up the pores in the insulation. This heating should be continued until the apparatus has reached a temperature of about 100 deg. C. It is then removed from the oven and taken to the dipping tank. If by that time its temperature has not dropped to between 40 deg. and 60 deg. C. it should be allowed to stand until that temperature is reached. If dipped at a temperature above this, quick evaporation of the benzine occurs. It will be realized that benzine is very volatile and that it has a lower boiling point than water.

An oil-proof and moisture-proof baking and insulating varnish should be used, and care should be exercised to use it at the following specific gravity: 0.850, at 15 deg. C.; 0.846, at 20 deg. C.; 0.840, at 25 deg. C.; 0.840, at 30 deg. C. Use benzine to thin the liquid.

The dipping should not be done with the temperature of the liquid below 15 deg. C., as varnish at that temperature becomes too hard and is not homogeneous.

Dip both the armatures and fields in a vertical position. Armatures should be dipped with commutator end down, so that all of the windings are totally immersed. They should remain in this position for twenty or thirty minutes, or until all signs of bubbling cease. Dip the fields and frame with pinion end down, so that the varnish will not cover the brush-holder pads.

Entire Motor Frame Should Be Dipped

In connection with the dipping of the fields, very much better results are obtained if the whole piece is dipped, rather than by treating the coils individually. The reason for this is that the connections to the coils are made after the coils have been bolted in place in the frame. This bolting has a tendency to distort the insulation and may cause cracks, so that if the whole piece is dipped these cracks are filled up and a smooth surface is obtained. Then, too, the joints themselves are covered with a glossy, smooth surface which prevents water from getting in at this point and creeping down between the insulation and the copper, thereby making the insulation "spongy." It will, of course, be necessary to clean the frame, both inside and outside, before such dipping is done. Some may prefer to dip the field coils separately, which is much better than not treating them at all, but it is not so good as dipping the whole field.

Another reason in favor of dipping the whole field is that the painting of the inside of the frame can thereby be eliminated. This painting, which is done to prevent rust and condensation, has become the regular practice in some repair shops. Dipping is very much quicker and more effective than the painting. The secret of effective dipping is to get the insulation well saturated with the varnish and to fill up all the air pockets and cracks. The apparatus should remain in the tank until it is certain that all bubbling has ceased. If this is not done, baking will cause the gases and the air to expand in the air pockets, breaking through the insulation and leaving small pin holes through which moisture can easily enter.

Drain both the armatures and the fields in a vertical position. This is in order that all of the surplus varnish may drip off and may not settle in pockets where, during the baking process, it will not bake out properly. This draining is an important consideration in dipping armatures, because if it is not done properly very serious unbalancing may occur. It is essential that the balance of the armatures should be just as good after dipping as before. After the apparatus has drained for some time the varnish should be removed from all polished or wearing surfaces. This can easily be done by rubbing with a rag, wet with benzine.

Baking Should Not Be Hurried

Place the armatures and fields in a vertical position in the oven and bake at 95 deg. C. between the limits of a minimum temperature of 90 deg. and a maximum of 105 deg. C. Baking vertically, as in draining, is to prevent the deposit of varnish in pockets which would cause improper drying and unbalancing.

Bake until dry. This is one of the first essentials for successful treatment and one that is most likely to be slighted because of the time involved in the baking oven. Too many are prone to rush the baking period. This is accompanied by unsatisfactory results. The best way to determine if the baking is sufficient is to break off the strings that form at the bottom of the apparatus. If these are baked through then it is a good indication that the baking has progressed far enough. An approximate baking period for armatures and fields of 15-in. to 20-in. diameter will be sixty hours at 90 deg. C. The result of the baking should be a smooth and glossy surface without cracks and with all openings sealed up.

It is possible to reduce the baking period by increasing the temperature. If this is done, extreme precaution should be observed to see that the temperature does not go above 130 deg. C., since injury to the insulation may otherwise occur. If steam heat is used in temperatures above the boiling point of water, saturated or superheated steam is necessary. For a general application, a longer baking period at a lower temperature is to be recommended.

Proper Precautions Insure Efficient Results

In building the oven:

1. Place heating elements at the bottom of oven.
2. If steam is used provide against any possible leak in the oven.
3. Arrange the heating pipes so that the condensation will drain away.
4. Provide for the ventilation of the oven.
5. Provide a thermometer, a recording thermometer preferably, so that the temperature of the oven may be known.
6. Safety first.

In building the tank:

1. Avoid having the tank near sparks or fires.
2. Do not use an electric hoist above the tank because a spark is liable to ignite the gases.
3. Provide a cover to prevent the evaporation of the solvent and to keep out dirt at such times when the tank is not in use.
4. Provide for drainage; a rack directly above the tank and draining into it is very satisfactory.

In dipping and baking:

1. Improper treatment is worse than no treatment.
2. Cleanliness is necessary. Remove dirt and grease.
3. Use a dipping and baking insulating varnish; in other words, use good varnish in the treatment.
4. Observe the specific gravity and temperature of the varnish.
5. Dip until thoroughly saturated.
6. Bake until dry.
7. Make sure that the temperature is uniform in the oven and that it is the correct temperature.
8. Do not exceed 130 deg. C. at any time, else injury to the insulation may result.
9. Do not interrupt the baking period.
10. Remove the varnish from all polished or wearing surfaces, armature bearings, commutator, brush-holder pads, or housing seats.
11. Do not smoke.

Specifications for Cedar Poles

AT ITS last convention the Western Red Cedar Association adopted standard specifications for Western red cedar poles 4 in. and 20 ft., and larger. One of the principal changes made is the fact that the association now grants a minimum measurement at the extreme butt on poles 35 ft. in length and longer. The complete specifications as revised on April 30, 1918, follow:

1. *Live Timber:* All poles must be manufactured from live growing cedar timber.
2. *Manufacture:* All poles must be peeled, knots trimmed close and butts and tops sawed square.
3. *Variation in Length:* Poles may be 6 in. longer or 3 in. shorter than length specified.
4. *Knots:* Knots are not a defect, if sound, trimmed smoothly and do not plainly impair the strength of the pole.
5. *Discoloration:* Discoloration is not a defect.
6. *Miscellaneous Defects:* No poles shall contain sap rot, woodpecker holes, plugged holes or evidence of having been eaten by ants.
7. *Rot:* Tops of poles must be free from rot. Butt rot in center, including small ring rot, shall not exceed 10 per cent of the area of the butt. Butt rot of a character which impairs the strength of the pole above the ground line is a defect.
8. *Cat Faces:* Sound cat faces are not a defect if no part of the cat face shows on the upper one-fifth of the length of the pole or within 2 ft. above or 1 ft. below the ground line.
9. *Dead or Dry Streaks:* A sound dead or dry streak is not a defect if it does not cover more than 25 per cent of the surface of the pole at any one point.
10. *Minimum Measurements:* (a) The tops of all poles shall have a minimum circumference measurement as shown in table No. 1. (b) The extreme butt of all poles shall have a minimum measurement as shown in table No. 2. (c) Poles having a decided swell or flare at the butt shall have a sufficiently larger measurement at butt to insure a reasonable measurement at the ground line.
11. *Short Kinks:* Short kinks are not permitted.
12. *Reverse Sweep:* Reverse sweep and two-way sweep, meaning a sweep in two planes, is permitted, provided a straight line drawn from the center of pole at top to center of pole at ground line does not leave the pole at any point.
13. *One-Way Sweep:* One-way sweep is permitted provided it does not exceed maximum shown in table No. 3.
14. *Method of Measuring Sweep:* That part of the pole below the ground line not to be taken into consideration. Tightly stretch a tape line from point at the ground line (see paragraph 15) on the side of the pole where the sweep is greatest to the upper surface at the top of the pole, and, having so done, measure widest point from tape to surface of pole and if, for illustration, upon a 30-ft. pole the widest point does not exceed 4 in., this pole shall be accepted.

TABLE I. MINIMUM TOP MEASUREMENT

Top Designation, In	Circumference, In.	Top Designation In.	Circumference In.
4	12	8	25
5	15	9	28
6	18½	10	31
7	22		

TABLE II.

Poles 35 ft. and longer shall have a minimum circumference measurement at extreme butt as follows:

Length, Ft.	7-In. Top, In.	8-In. Top, In.	9-In. Top, In.	10-In. Top, In.	Length, Ft.	8-In. Top, In.	9-In. Top, In.	10-In. Top, In.
35	33	36	39	42	65	45	48	51
40	34	37	40	44	70	47	50	53
45	..	39	42	45	75	48	51	54
50	..	41	44	47	80	50	53	56
55	..	42	45	48	85	51	54	57
60	..	44	47	50	90	52	55	58

TABLE III.

Length of Pole, Ft.	Maximum Sweep Between Top and Ground Line, In.	Length of Pole, Ft.	Maximum Sweep Between Top and Ground Line, In.
20	3	60	9
25	3½	65	10
30	4	70	10½
35	5	75	11
40	5½	80	12
45	6	85	13
50	7	90	14
55	8		

15. *Explanation of Term "Ground Line":* The term "ground line" as used in these specifications shall mean a point on the pole a distance of 4 ft. on 20-ft., 5 ft. on 25-ft. and 30-ft., and 6 ft. on 35-ft. and longer poles from the extreme butt.

Connecticut Company's Power-Saving Campaign Produces Results

IN COMMON with many other electric railways the Connecticut Company, has had in operation for some time an energetic campaign for reducing power consumption on its cars. The platform men are carefully instructed as to proper handling of controllers and brakes and their work is systematically checked. The Arthur "power-saving recorder" is generally used on the system in checking the performance of the men. Through the courtesy of L. S. Storrs, president of the Connecticut Company, it is possible to give the comparative figures of energy consumption on all divisions of the property for the month of April in 1917 and 1918. These are as follows:

RESULTS OF CAMPAIGN FOR ENERGY-SAVING (TRACTION ONLY) CONNECTICUT COMPANY

Division	Kilowatt-Hours per Car-Mile 1917	1918	Per Cent. Decrease
New Haven	3.240	2.876	11.23
Waterbury	4.378	4.093	6.51
Hartford	3.831	3.167	17.33
New Britain	3.305	3.114	5.78
Bridgeport	4.024	3.186	20.83
Meriden	3.157	2.575	18.44
Middletown	4.542	3.524	22.41
Stamford	3.844	3.266	15.04
Norwalk	3.140	2.499	20.41
Torrington	2.008	1.688	15.94
Derby	3.933	3.711	5.64

The company credits the above very creditable showing to the energy-saving campaign as a whole, the use of the checking device being one element, but an important element, of this campaign.

To protect the health of workers and others in this country at a time when the labor of every man possible is needed, Secretary McAdoo has directed that the United States Public Health Service give anti-typhoid inoculations without charge to all who apply to any of its hospitals or field offices.

Interurban Car Built for Hospital Service at Chicago

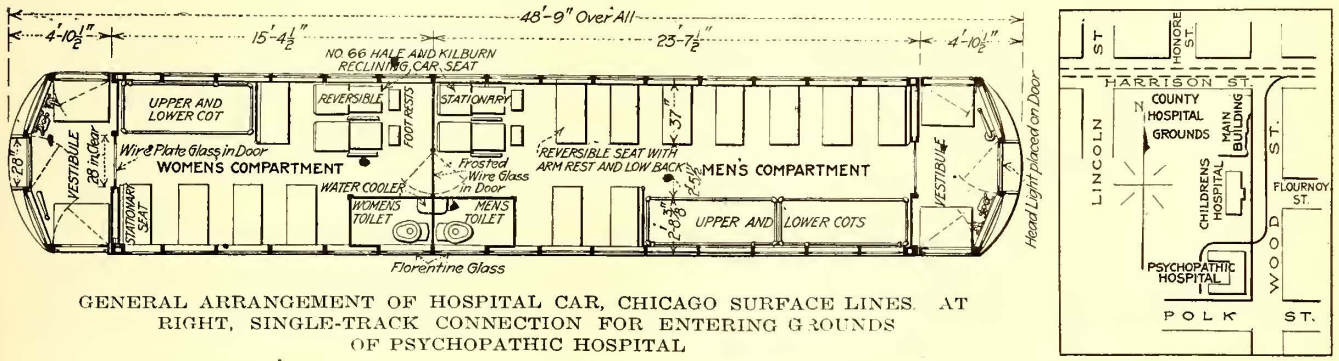
Separate Compartments Are Provided for Men and Women With All Conveniences for Comfort While in Transit

A HOSPITAL car, built for Cook County, has just been turned out of the West Shops of the Chicago Surface Lines. This car will be used in transporting patients from the Psychopathic Hospital in Chicago to the State institutions at Dunning and near Kankakee, Ill., and will be operated by the street railway companies. It was built for the purpose of giving patients as much comfort as possible while in transit, as well as allowing them more privacy than the ordinary cars afford. It also does away with unnecessary transferring from one vehicle to another. It is likely that arrangements will be made later to operate the car over the tracks of the Aurora, Elgin & Chicago road to the State institution at Elgin. A single-track connection has been built recently from the line on Harrison Street into the grounds of the Psychopathic Hospital. This permits operating the car directly to the hospital and facilitates the loading and unloading of patients.

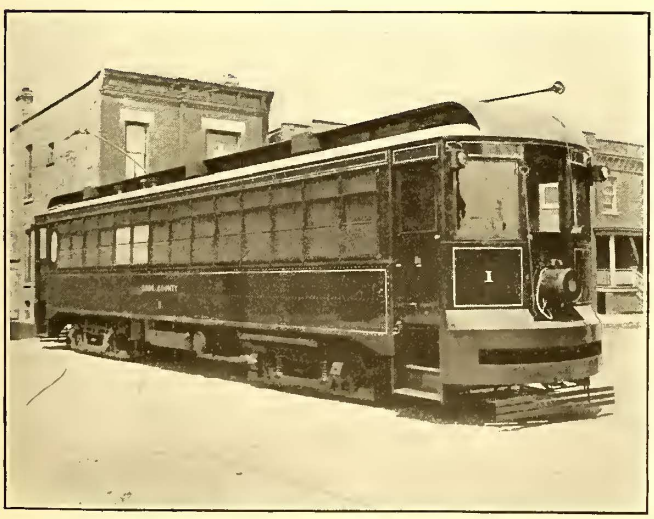
The car has the general appearance of the standard cars of the Chicago Surface Lines. It also resembles an interurban car in equipment and has Pullman type trapdoors and platform. It is divided into two compartments, one for men and one for women. The former seats twenty persons and includes two reclining chairs for semi-invalid patients, while two upper and lower level folding berths are provided for other patients. Regulation Pullman curtains inclose these berths. The women's compartment has ten regular seats, two reclining chairs and one double berth. There is a Duner flush toilet in each compartment.

The supporting framework for the folding berths is constructed of white enameled pipe. This gives a very clean and sanitary appearance to the berths and at the same time provides a construction that is strong and easy to install. The details of this framework are shown in an accompanying illustration.

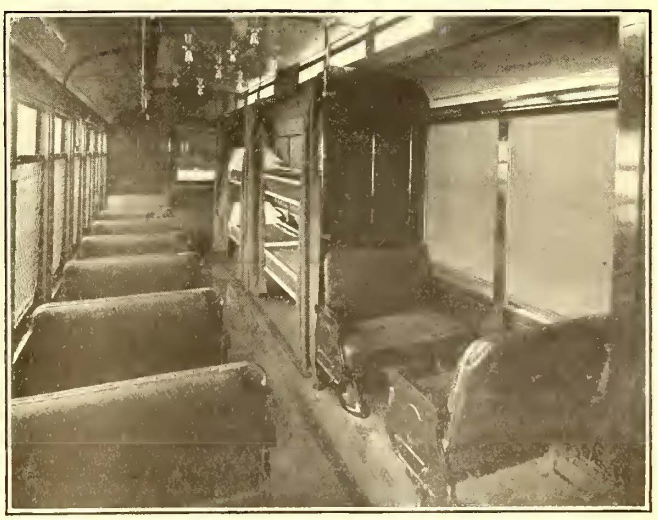
The windows have heavy screens inside, as well as the usual screens outside, and the doors and upper sash of each window are glazed with wired plate glass. These precautions were taken to safeguard the patients against broken glass. The seats, furnished by the Hale & Kilburn Company, are covered with dark-green leather.



GENERAL ARRANGEMENT OF HOSPITAL CAR, CHICAGO SURFACE LINES. AT RIGHT, SINGLE-TRACK CONNECTION FOR ENTERING GROUNDS OF PSYCHOPATHIC HOSPITAL



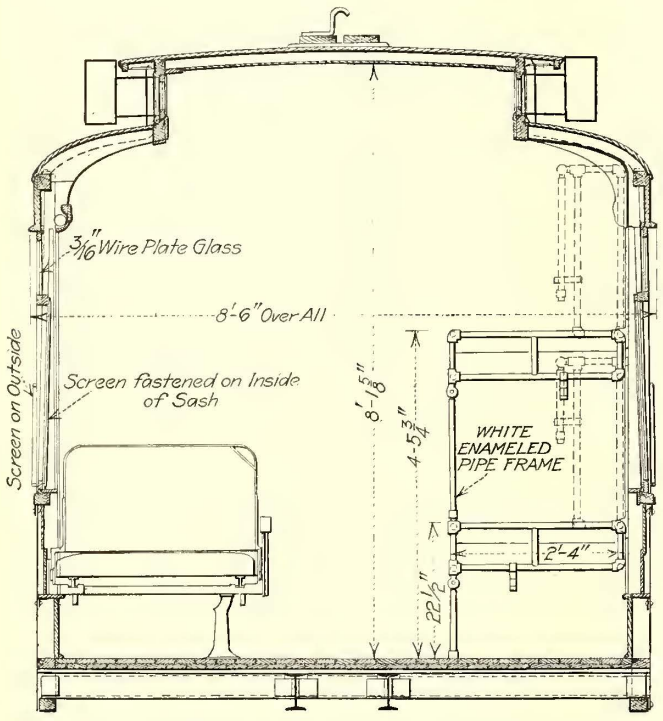
EXTERIOR OF CAR WITH WIRED-GLASS WINDOWS AND PROTECTING SCREENS



INTERIOR OF CAR SHOWING POSITION OF BERTHS AND RECLINING SEATS

The Ohio Brass Company furnished a lighting system so arranged that the marker lights and an emergency light in each compartment will burn when the trolley leaves the wire. These markers and emergency lights are operated from a storage battery.

The car has an arc headlight provided with dimmers for city use. The Pantasote curtains and fixtures were furnished by the Railway Supply & Curtain Company. The Consolidated Car Heating Company provided the heaters, which have sufficient capacity to raise the temperature of the car to 65 deg. with an outside temperature of 10 deg. Railway Utility Company's thermo-



SECTION OF CAR SHOWING FRAMEWORK FOR SUPPORTING BERTHS

static control is provided. The ventilating system is of the exhaust type, also provided by the Railway Utility Company. O. M. Edwards trapdoors are used on each end of the car, and both vestibules are arranged with end doors so that invalid patients can be carried in or out on a stretcher. Water tanks for the toilet can be filled from a hose connection at the side of the car under the sill, an overflow being provided at the roof.

The wheels have a 3-in. tread with a ¾-in. flange. They are of the A.E.R.A. interurban standard and may be used on the city tracks as well as those of the Chicago & Interurban Traction Company on trips to and from Kankakee. The trucks are of the M.C.B. type furnished by the McGuire-Cummings Manufacturing Company. The car is equipped with four GE-210 motors, with a gear ratio of 24: 63. This is the same as the motor equipment and gear ratio of the Kankakee interurban cars. It has General Electric P.C. control, and a G.E. CP-27 air compressor.

The car is painted with the Surface Lines standard green, trimmed with red on the outside, while the interior is finished in cherry with headlining of birch veneer and sheet steel grained to match the birch. The floor is of maple, varnished. The car has a steel underframe and sides, and a double bumper at each end to meet the different levels of city and interurban cars. H.B. fenders are used. The plan and section give the principal dimensions. The complete weight of the car is 61,000 lb.

Increased Car Mileage Per Packing Results from Efficient Saturation of Waste

A FURTHER development has been made in the journal waste saturation equipment of the Milwaukee Tank Works so that mileages of 10,000 and even 15,000 between packings are said to be by no means uncommon. It is reported that one large railway has arranged to run its cars 20,000 miles between refillings of the journal boxes.

The new equipment is shown in the accompanying cut. The oil is kept in the lower compartment and the waste to be saturated is placed on the screen *D*. The oil is then drawn from the lower compartment by means of the pump and the waste is completely submerged. After the waste has remained in this condition for from eighteen to twenty-four hours, the handle *B* is turned and the oil drains down through the screen and back to the lower compartment through the valve *C*. After the waste has drained for about twenty-four hours it is said to be perfectly saturated but free from surplus oil. The

EQUIPMENT TO PROVIDE PROPER SATURATION OF JOURNAL WASTE

gage stick *A* shows the quantity of oil in the lower compartment, and the opening *E* is for cleaning or inspection.

These tanks are of the Milwaukee "Kant-Leek" construction, of heavy metal, closely riveted and hard soldered. All upper compartments have removable screens, dustproof covers and improved train valves. The two compartments shown at the left are for the saturation of new waste, while that shown at the right is for resaturation of old waste. Thus the oil from the old waste is kept separate from that used with the new, which has been found of great advantage.

LETTERS TO THE EDITORS

E. H. McHenry's Contribution to Single-Phase Development

WATERBURY, CONN., June 5, 1918.

To The Editors:

As I opened the June 1 issue of the ELECTRIC RAILWAY JOURNAL and on page 1043 noted the portal view of the southern end of Little Hell Gate bridge, with its overhead catenary construction, and the caption at the head of the article, "11,000-Volt Overhead on the New York Connecting Railroad," a flood of memories came over me. Notwithstanding the intensely interesting nature of the problems of hydroelectric development and power conservation here in Connecticut which occupy me now, my twelve years with the New Haven Railroad left an eradicable impress.

The fundamentals of the single-phase system and its single contact wire etched themselves deeply into my mind as I studied their constructive applicability. It was clear to me in the early days that a single contact line with 25-cycle power provided the most flexible and economical means of producing traction in any form of speed-torque arrangement that the exigencies of the case demanded. From this single wire could be produced the split-phase power of constant-speed characteristics, the single phase offering the variable speed movement, and a rectifier or motor-generator furnishing direct current if a case for this could be made out. As developments have gone on I have found no reason to change my conclusion relative to the superiority of the single-phase system over that of the direct-current system, notwithstanding the later higher reaches in voltage that have been secured with the direct current.

However, my purpose in writing is not to review the arguments in favor of single-phase traction but rather to point out how the pictures of the New York Connecting Railroad electrification reflect the genius of E. H. McHenry, both as to imagination and practical applications, for as in so many of the other standards, the designers here have adopted his scheme of contact wire in the use of a clip-suspended wire hung from and parallel to the conductor immediately above it.

I have in my possession five mussy little sheets of yellow paper which contain memoranda and sketches prepared by Mr. McHenry probably in the latter part of 1907. This was just prior to the authorization of the board of directors of the New Haven road which granted us $50,000 for an experimental line of four-track catenary construction, there having been granted also at the same time an appropriation to cover an experimental electric freight engine. I recall that it was with these little yellow sheets in hand that I discussed with my chief draftsman the catenary drawings later developed in connection with the New Haven electrification. The final plans worked out and applied on the New Haven conformed very closely to those covered by the original memoranda.

Among the advantages noted by Mr. McHenry at the time with regard to this form of construction were these: Lateral stability of catenary at center spans; lateral stability of conductor and running wire at bents; elimination of strain and pin insulators; grounding of main catenary system; removal of main cables and insulators from position over track centers; elimination of pull-offs on light curves; reduction of weight and cost; increased flexibility and adjustability; substitution of cross catenary for fixed spans, and lightning protection.

To him belongs the credit of the elimination of pull-offs on curved catenary construction, for it was he who suggested the graceful catenary support by means of which the contact wire has been made to conform closely to the curvature of the track while still maintaining a constant vertical distance from it. In these memoranda Mr. McHenry suggested the substitution of cross catenary for fixed spans. We originally intended to use this plan but for certain reasons later decided against it.

In connection with the application of the catenary supports to curved track came the problem of designing a hanger to keep the two closely adjacent and parallel wires in a plane vertical with each other. I was fortunate enough to apply the whiffletree scheme of support in this case. This support, by the way, was the only device patented by me out of the large number produced in connection with the New Haven electrification. I was gratified to note in this same article that the New York Connecting Railroad's consulting engineers, Gibbs & Hill, used Mr. McHenry's form of catenary support on curves and the hanger above mentioned.

One of the traits pronouncedly developed in Mr. McHenry is to give rather than to take credit. While his partner I would have hesitated to write the above, but the case is different now as Philadelphia, where Mr. McHenry resides, is a long way from Waterbury and should he hear about this I shall still have a fighting chance.

W. S. MURRAY.

There Is a Great Opportunity Now to Stimulate Standardization

INDIANAPOLIS TRACTION & TERMINAL COMPANY

INDIANAPOLIS, IND., May 29, 1918.

To the Editors:

I have been greatly interested in the discussion on track spiral standardization which has been going on recently in the columns of the ELECTRIC RAILWAY JOURNAL. Aside from the technical aspects of the question there is one which might well be emphasized at the present time. This is that now is an excellent time to get rid of certain faulty engineering habits. Part at least of the bad habits in designing that have become rather prevalent are due to the desire of the engineer to impress his personality on his designs. The result has been a lot of individuality in these designs, tending away from standardization and involving unnecessary expense. The exigencies of war time have forced us to consider every imaginable economy, and the cheapening of special work is a possibility in this line. Let us therefore, give up some of our pet hobbies, if necessary, and join in the movement for simplification.

It ought to be possible to order a track spiral, for example, from any manufacturer by the same number, and a few standard sizes should suffice.

THOMAS B. MCMATH, Chief Engineer.

Simplicity in Track Spiral Standards Is Desirable

BOARD OF SUPERVISING ENGINEERS,
CHICAGO TRACTION

CHICAGO, ILL., May 29, 1918.

To the Editors:

In connection with the discussion which has been going on for some weeks in the columns of the ELECTRIC RAILWAY JOURNAL on the subject of track spiral standardization, there are several points which I believe should have due consideration. The principle of standardization is the correct one wherever conditions are such as to make it practicable. For example, a few rail sections which could be rolled at a lower price per ton due to the use of acceptable standard sections, would certainly be preferable to the present multiplicity of sections.

A reduction in the number of standard spirals, or more properly, easement curves, should conduce to economy in the manufacture of special work and hence to a decrease in selling price.

At the same time it must be remembered that simplicity is a very desirable feature in any standards that may be proposed. The number of circular arcs making up the easement curves should be as small as possible. It is not necessary or possible to have a theoretically true spiral which changes its curvature at every point. The fact is that any curve which looks smooth to the eye, one free from "kinks" or sudden changes in curvature, will guide a car with comfort to the passengers and little jar to the equipment.

Mr. Angerer's views on this subject appeal to me as reasonable. While he writes from the standpoint of the manufacturer, he has the welfare of the railway in mind also. He would be the last man in this field to recommend anything but what he believes to coincide with the best practice from the operating side. Hence his suggestion that fewer and longer arcs be used than those listed in Mr. Ryder's article should be given great weight.

In Chicago we use Pennsylvania Steel Company's spirals on ordinary curves and standard switch spirals of the general character illustrated in the accompanying drawings. Fig. 1 shows standard easement spirals Nos. 4, 5 and 6. These are used on inside curves with track centers or 10 ft. 2 in. or more and are, in fact, the most generally used by us. Table I contains the elements for the curves of Fig. 1. Fig. 2 is a typical branch-off used by us for inside clearance curves with

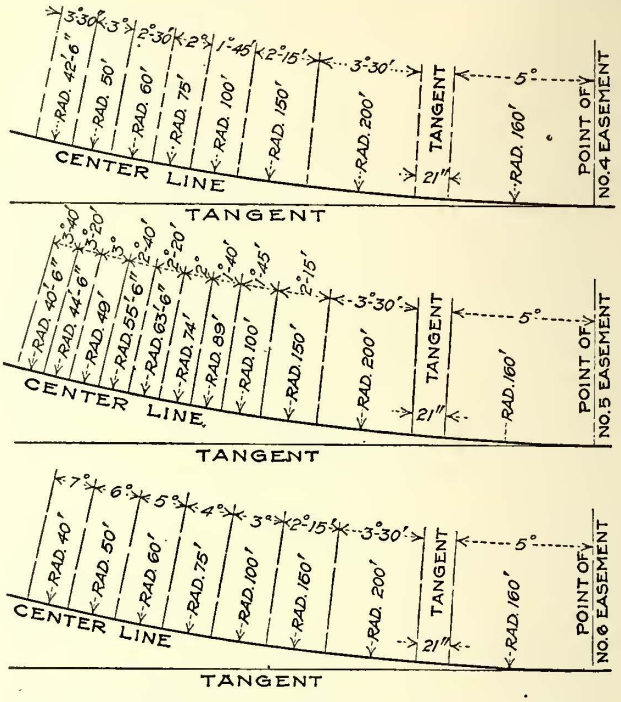


FIG. 1—STANDARD EASEMENT CURVES, CHICAGO SURFACE LINES

TABLE I—STANDARD EASEMENTS, CHICAGO SURFACE LINES
(See Fig. 1)

(For significance of Symbols, See Fig. 2)

Elements of Easement No. 4

Radius	Total Angle	X	Y	O G	G S
160 ft., 0 in.	5° 00′	0.600	13.740	.....	.....
.....	.....	0.752	15.483	.....	.....
200 ft., 0 in.	8° 30′	2.171	27.471	197.646	—1.743
150 ft., 0 in.	10° 45′	3.140	33.187	148.195	5.647
100 ft., 0 in.	12° 30′	3.741	36.108	99.073	14.974
75 ft., 0 in.	14° 30′	4.333	38.574	74.665	20.385
60 ft., 0 in.	17° 00′	5.016	40.994	60.143	24.140
50 ft., 0 in.	20° 00′	5.808	43.360	50.580	27.064
42 ft., 6 in.	23° 30′	6.716	45.637	43.533	29.629

Elements of Easement No. 5

Radius	Total Angle	X	V	O G	G S
160 ft., 0 in.	5° 00′	0.600	13.740	.....	.....
.....	.....	0.752	15.483	.....	.....
200 ft., 0 in.	8° 30′	2.171	27.471	197.646	—1.743
150 ft., 0 in.	10° 45′	3.140	33.187	148.195	5.647
100 ft., 0 in.	12° 30′	3.741	36.108	99.073	14.974
89 ft., 0 in.	14° 10′	4.323	38.559	88.334	17.354
74 ft., 0 in.	16° 10′	4.977	40.974	73.790	21.025
63 ft., 6 in.	18° 30′	5.719	43.351	63.705	23.949
55 ft., 6 in.	21° 10′	6.558	45.678	56.118	26.487
49 ft., 0 in.	24° 10′	7.499	47.931	50.057	28.834
44 ft., 6 in.	27° 30′	8.567	50.138	45.951	30.677
40 ft., 6 in.	31° 10′	9.763	52.265	42.403	32.524

Elements of Easement No. 6

Radius	Total Angle	X	Y	O G	G S
160 ft., 0 in.	5° 00′	0.600	13.740	.....	.....
.....	.....	0.752	15.483	.....	.....
200 ft., 0 in.	8° 30′	2.171	27.471	197.646	—1.743
150 ft., 0 in.	10° 45′	3.140	33.187	148.195	5.647
100 ft., 0 in.	13° 45′	4.225	38.183	99.073	14.974
75 ft., 0 in.	17° 45′	5.601	43.063	74.789	20.916
60 ft., 0 in.	22° 45′	7.342	47.781	60.503	25.489
50 ft., 0 in.	28° 45′	9.509	52.273	51.281	29.356
40 ft., 0 in.	35° 45′	11.962	56.160	42.514	34.166

TABLE II. STANDARD SPIRALS, CHICAGO SURFACE LINES
(Used in making up the branch-off shown in Fig. 2)

Elements of Spiral No. 2

Inside Radius	Total Angle	X	Y	O G	G S
297.646	0° 30′	0.011	2.597	.....	.....
147.646	1° 30′	0.056	5.173	147.652	1.309
97.646	3° 0′	0.157	7.728	97.669	2.618
72.646	5° 0′	0.333	10.258	72.703	3.926
57.646	7° 30′	0.607	12.758	57.760	5.234
47.646	10° 30′	0.997	15.222	47.845	6.539
40.146	14° 0′	1.517	17.618	40.471	7.906
35.146	18° 0′	2.194	19.976	35.619	9.115

Elements of Spiral No. 2½

Inside Radius	Total Angle	X	Y	O G	G S
441.646	0° 20′	0.007	2.569	.....	.....
219.645	1° 0′	0.038	5.125	219.649	1.292
145.646	2° 0′	0.104	7.666	145.661	2.583
108.646	3° 20′	0.222	10.191	108.683	3.874
86.646	5° 0′	0.405	12.705	86.722	5.154
71.646	7° 0′	0.666	15.191	71.778	6.461
61.146	9° 20′	1.020	17.656	61.356	7.740
53.146	12° 0′	1.478	20.087	53.462	9.038
46.646	15° 0′	2.048	22.461	47.105	10.389
42.146	18° 20′	2.751	24.810	42.757	11.554
38.146	22° 0′	3.592	27.101	38.960	12.812

Elements of Spiral No. 3

Inside Radius	Total Angle	X	Y	O G	G S
297.646	1° 0′	0.046	5.195	.....	.....
147.646	3° 0′	0.226	10.345	147.669	2.618
97.646	6° 0′	0.626	15.442	97.737	5.235
72.646	10° 0′	1.332	20.462	72.874	7.848
57.646	15° 0′	2.421	25.373	58.102	10.452
47.646	21° 0′	3.962	30.115	48.443	13.041
37.646	28° 0′	5.867	34.298	39.107	16.624

9-ft. 8½-in. track centers. This curve is made up to use Pennsylvania standard spirals Nos. 2, 2½ and 3, the elements of which are given in table II. It may be interesting to note that between the 5 deg. of 160-ft. radius curve and the spiral we use a stretch of tangent track. This, we think, gives us a more durable switch point and mate and there is no discomfort in

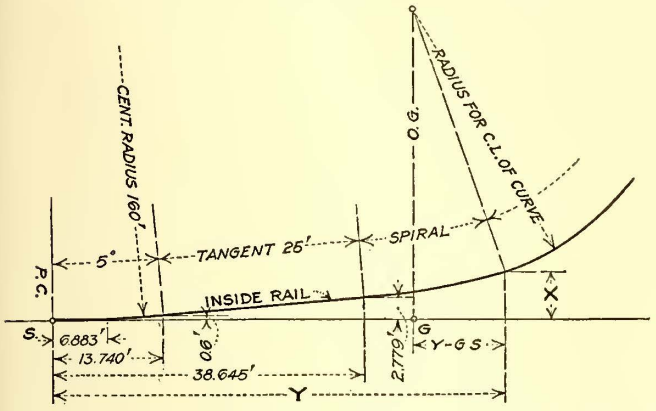


FIG. 2—TYPICAL BRANCH-OFF, CHICAGO SURFACE LINES

taking the curve over such a piece of special work. We make all double-track curves in Chicago clearance curves as we feel that the saving in time of the cars in rounding curves more than compensates for any extra expense of installation. In some cases it has been necessary to cut a little off from the sidewalk at the corner, but never enough seriously to narrow the walk. GEORGE WESTON, Engineer for Board.

AMERICAN ASSOCIATION NEWS

War Board Holds Busy Session

Interurban Rates, Transportation of Draft Men to Cantonments and Other Topics Discussed

AT a meeting of the American Electric Railway War Board held in Washington on June 7 considerable progress in a number of matters of interest to electric railways was reported. The full board was in attendance with the exception of Chairman McCarter, who was detained in Newark. Secretary Burritt and Messrs. Faber and Hill were also present.

Mr. Faber reported in detail upon the increase in steam railroad rates which had recently been announced and upon the effect which this increase would probably have upon the electric roads. He described the reasons for the letter sent by the War Board on May 31 to the interurban railways, mentioned on page 1100 of the issue of this paper for last week, and explained that the United States Railroad Administration hoped that the electric railways would take immediate steps to bring their rates to a parity with the new government rates and to make the new rates effective simultaneously therewith, although he explained that it was realized that there might be cases where local conditions made such an increase undesirable. Mr. Faber also spoke of correspondence which the board had had with the Railroad Administration on the subject of commutation rates, on which the advance on the steam railroads has been less in proportion than on other passenger rates. He reported that the Electric Railway War Board was working in close touch with the Railroad Administration and that pleasant relations existed between the staffs of both organizations. The War Board adopted a resolution thanking Mr. Faber for his work in this matter.

The results were also reported of the conference recently held in Washington between the traffic representatives of a number of the principal interurban electric railway lines in Ohio, Indiana, Illinois, Michigan and Wisconsin and the government to determine what proportion of the transportation required to cantonments by the men concerned in the present draft could be handled in those states by the interurban electric railways. On account of the congestion on the steam railroads, the government had indicated that it would be glad to have the electric lines take over all of this traffic which they are able to handle. If no through electric routes are available, the governnent's suggestion is that the electric lines will be used to convenient junction points with steam railroads, provided the facilities of the electric lines are adequate to afford the services required for the entire movements and provided the steam trains later used do not originate at the same points as the electric trains.

The War Board has been requested by the official in charge of draftees for information pertaining to the ability of electric lines to handle movements, prior to the issuance of government orders. Preliminary reports of this kind from the roads affected are now in the hands of the War Board and are being checked up for final submission to the government, F. W. Shappert, traffic and industrial agent Chicago, North Shore & Milwaukee Electric Railroad, who had been in attendance at the conference, explained to the War Board how the estimate by the different roads had been made up. In all cases the estimates were based on the use of the most natural routes for traffic.

Mr. Faber reported to the board that he had called the attention of Provost Marshal General Crowder to the waste of man power through the operation of jitneys. With jitneys twelve men are required to transport the same number of passengers whom two men on an electric car can transport seated.

Mr. Gadsden reported on conferences which he had had with Addis M. Whitney, of the Public Utility Conservation Division of the War Industries Board, in the interests of further coöperation. He also reported on correspondence with the Railroad Administration in regard to the suspension of operation of the Kenosha Electric Line. The stoppage in that city had been reported to the Railroad Administration by the mayor of Kenosha, but the War Board had pointed out to the administration that the fundamental cause was that the company had not received permission to increase its rates.

Mr. Faber reported conferences with the Fuel Administration on the subject of the skip stop and other fuel conservation matters.

The board is sending out a call for subscriptions to those companies which did not subscribe at the first call. It is hoped that there will be a prompt response.

The offices of the board on the ninth floor of the Munsey Building have been changed to other rooms better adapted to the purposes of the board, but on the same floor of the same building. The next meeting of the board is scheduled for Friday, July 12.

News of the Electric Railways

TRAFFIC AND TRANSPORTATION

FINANCIAL AND CORPORATE • PERSONAL MENTION • CONSTRUCTION NEWS

New Jersey Strike Settled

Men and Company Agree to Abide by the Findings of the War Labor Board

The strike of motormen and conductors of the Public Service Railway, Newark, N. J., which for two days practically tied up the system of the company in northern New Jersey, was called off on the afternoon of June 7. The Federal Labor Board will arbitrate the differences between the men and the company.

The action of the men followed a report of their committee which earlier in the day had conferred with city, federal and company officials, at which it was suggested that their differences be submitted to the War Labor Board at Washington and that the men return to work at the wage scale offered by the company pending a settlement by the board.

The company, through President Thomas N. McCarter, agreed to stand by the board's award, and the men, through their decision, likewise agree to abide by the board's finding.

Representatives of the company and of the trainmen appeared on June 9 before former President William H. Taft of the National War Labor Board in Newark for the purpose of discussing the grievances of the men. B. L. Worden of the Submarine Boat Company, a member of the War Labor Board, and John J. S. Rogers, federal mediator for the Department of Labor, sat with former President Taft. Thomas N. McCarter, president of the Public Service Railway, with the vice-president and counsel of the company, spoke for the corporation.

Mr. Taft said that there were two ways by which the grievances might be heard. One was to submit the case to the full board, and the second was to submit it directly to the railway section. The latter method, he said, would save time. The employees were willing to take the short cut. President McCarter said that he would have to consult his board of directors before accepting either plan. The two sides were told that the board would sit at Washington on June 24.

The trainmen, in their complaint to the board, make these stipulations:

"A wage of 45 cents an hour, with 60 cents an hour for overtime, the question of pay for the men during the probationary period to be left to the Labor Board. Ten hours to be considered a day and the day's work to be finished during eleven consecutive hours. The start of the day to be reckoned from the time the men are ordered to report for work.

"A minimum wage of $20 a week for all extra men regularly answering roll-calls. No mandatory call to duty for men engaged on the cars after 10 p.m. until a twelve hours' rest period has elapsed."

Chicago Men Appeal to Washington

Employees of the Chicago Elevated Railways and the Chicago Surface Lines who recently were refused a wage increase of 15 cents an hour, have taken an appeal to the National War Labor Board at Washington. It is understood that the board has asked the companies whether they care to join in submitting the case to arbitration, but no announcement has been made as to their position on this point. Both companies are operating under agreements with the men, which do not expire until June, 1920.

Letting Down the Bars

The Interborough Rapid Transit Company and the New York Railways have raised the age limit of employees from forty-five to fifty-five years, in an effort to fill the gaps caused by the draft and the inducement of higher pay offered by the federal government and munition manufacturers. If this fails then women will be employed on the subway and elevated lines of the Interborough as ticket sellers and ticket choppers, and the men now filling these places will serve as guards. The selecting of younger men now serving as ticket sellers and choppers and fitting them for train service is now going on and their places are being filled with men of more advanced age.

The Detroit (Mich.) United Railway also has many positions for motorman or conductor open at the present time. That company has announced that it is ready to employ as conductors men as old as fifty-five or sixty years, providing they are alert, of good hearing and good eyesight. They must, of course, be able to speak English. In an announcement which it has just made the Detroit United Railway says:

"The position of conductor is one that a man of middle age can handle very nicely. The duties are comparatively light, in fact so much so that the work could be done by women.

"Many men from fifty to sixty years of age possibly consider that they are too old to apply for work on the street cars, that they would not be accepted because of their age. We wish to make it as plain as possible that this is a mistaken idea.

"Men of this age, as well as younger men, are desired."

Boston Men Ask Sixty Cents

Seek a Conference With Officers of Boston Elevated Over Question of Adequate Wages

The trainmen in the employ of the Boston (Mass.) Elevated Railway have asked for 60 cents an hour for blue uniformed men and for proportionate increases for employees in other branches of service. In a communication to Matthew C. Brush, president of the company, the men said in part:

"We have an agreement with your company which we intend to keep as far as it is humanly possible. Unfortunately, circumstances have arisen over which neither our members nor ourselves have any control. We neither want nor are threatening a strike. It is borne in upon us, however, every day that our members can no longer live upon the wage which they are now receiving, nor can they be kept at their present employment with the very attractive wages that are offered for less difficult, arduous and responsible work.

"A tremendous feeling of unrest is abroad among our people, with the result that unless something is done immediately, and of a very substantial character, you will not be able to keep these men in your employ.

"In view of the fact that the Legislature of the State has recently passed for your company a 'service at cost' plan, we do not believe that either the government or any other set of persons has a right to ask our men to make any greater sacrifices than they have already made.

"We therefore respectfully suggest under all the circumstances that the men engaged in transportation service should receive an increase to 60 cents an hour, and that the wages of all other employees who are members of our organization should be increased.

"We would like to have you arrange a conference so that we can deal with this emergency."

Subway Construction Work Stops

All work on the new subways stopped on June 10 when between 5000 and 6000 men engaged in all kinds of construction work on the new rapid transit lines in New York went on strike because they were unable to get the increased scale of wages which they demanded from the contractors, many of whom say they are on the verge of bankruptcy. Both James B. Walker, secretary of the Public Service Commission, and Matthew A. McConville, of the Allied Subway Workers' Union, laid the blame for the strike at the door of the Board of Estimate.

A Distinction with a Difference

There is no connection between the functions of the new Labor Policies Board and the National War Labor Board, of which William H. Taft and Frank P. Walsh are joint chairmen. The latter was created by an executive order of the President, and is in a sense the last court of appeal in labor disputes even when one of the parties in disagreement in some other branch or board of the federal government itself.

In all cases where the enunciated principles of the War Labor Board are involved it has authority to take jurisdiction. Its work is sometimes judicial and sometimes legislative, chiefly the former. It acts in effect as a legislative body when the enunciation of a new principle to govern industrial relations is in contemplation. Its findings are final and binding in all disputes between employers and employees where its principles of adjustments are in any way involved.

The Labor Policies Board will devote itself to administrative work. It will determine and develop policies for a unified labor administration. It will bring together and co-ordinate into one consistent policy the various and frequently inconsistent methods of important governmental departments in dealing with labor problems that affect production, always excepting disagreements between employers and employees, as the government departments represented on the Labor Policies Board are themselves among the large employers of labor.

Resolutions on Captain Bullock

Details of the death in France of Capt. Harry A. Bullock, formerly of the Brooklyn Rapid Transit System, have been received. Captain Bullock, who was an assistant divisional quartermaster, had conceived the idea of utilizing empty and thoroughly cleansed gasoline tanks for transporting drinking water to the men in the front line trenches. While working out the details of this plan with several American and French army officers four of the party, including Captain Bullock, were killed by a bomb dropped from a German aeroplane.

Resolutions of regret on Captain Bullock's death were adopted on June 10 by the Brooklyn Institution of Safety, of which he was secretary and executive manager from the time of its organization to that of his enlistment. These resolutions said, in part:

"Captain Bullock's engaging personality and unselfish devotion to the purpose for which the institution was formed endeared him to all who came into contact with him and we feel that his loss is that of a personal friend. He was patriotic to the core. Anticipating the present conflict, he prepared himself at Plattsburg before it came upon us, to serve his country if it should need his assistance, and when this occurred, he promptly abandoned his life work to enlist in defense of our liberties, a cause in which his experience and ability enabled him to render valuable service.

"In doing this he gave his life nobly and ungrudgingly. The people of this city, and particularly those of Brooklyn, will cherish and revere his memory, and his example will prove an inspiration to our youth who will emulate it and who will demonstrate that he did not die in vain."

Pacific Electric Raises Wages

Despite its difficult financial position, the Pacific Electric Railway, Los Angeles, Cal., as of June 1, has put into effect wage increases up to 43 per cent as compared with the wage scale of December, 1915. In making these increases the company has followed the recommendations of the National Railway Wage Commission as modified by Director-General McAdoo, whereby the largest percentage of increase goes to the lowest paid men. Thus men who received 25 cents an hour in December, 1915, are now getting 35½ cents.

In discussing this subject on June 4 at a meeting of the Pacific Club, Paul Shoup, president of the Pacific Electric Railway, said to 1500 of his men in humorous vein that "personally, I hardly know whether I would rather be a freight motorman or president of the company." Mr. Shoup said the railway would need $60,000 more a month in revenue to offset the increase in wages.

In discussing the question of the attempt to have Pacific Electric employees enter the Brotherhood of Railway Trainmen, Mr. Shoup declared his belief that during the war all matters affecting organization should be laid aside.

There is a belief in many quarters that the present attempt to unionize the Pacific Electric Railway is fostered by steam railroad men who have been displaced or demoted because of the government's elimination of duplicate service. These men prefer to stay in California rather than accept the government's offer to work East.

Short Strike in East St. Louis

Three hundred and seventy-five motormen and conductors of the East St. Louis & Suburban Railway, East St. Louis, Ill., struck for higher wages on June 4.

The conductors and motormen on the local lines of the company have been receiving 31 cents an hour, and the men on interurban runs 33 cents an hour, under an agreement into which the employees' union entered with the company on May 1, 1917, and which was to continue until May 1, 1919. They are now demanding 38 cents for city men, and 43 cents for interurban men, the increase to go into effect immediately. Before the agreement of May 1, 1917, was made the men were getting 27 and 28 cents an hour.

The day following the strike an agreement was reached under which the differences will be submitted to the National War Labor Board. The finding of the board is to be effective from June 1, 1918.

News Notes

Ohio Men Strike.—Thirty motormen and conductors on the Youngstown & Ohio River Railroad, Leetonia, Ohio, on June 6 struck for an increase of 5 cents an hour in wages. It is claimed they violated their contract in taking this step. They were receiving from 35 cents to 40 cents an hour, depending upon the length of time they had been in service.

Increase in Wages in Bloomington.—The Bloomington & Normal Railway & Light Company, Bloomington, Ill., has increased the wages of its employees approximately 3½ cents an hour. A nine-hour day has been placed into effect as far as possible. An arbitration clause has been placed in the contract which carried the increase. An open-shop policy will be maintained by the company.

Increase in Wages in Des Moines.—At the time that the fare increase was announced by the Des Moines (Iowa) City Railway, referred to elsewhere in this issue, Emil G. Schmidt, president of the company, also announced an increase in wages to the trainmen effective from June 1. The new scale is 30 cents an hour the first six months instead of 28 cents; 33 cents the second six months and 36 cents thereafter.

Labor Hearing in Washington on June 24—Press dispatches from Washington appearing in the daily papers on June 14 too late to be confirmed from official sources by this paper said that June 24 had been set by the War Labor Board for hearing in Washington wage controversies between electric railways and their employees, about a dozen of which are pending. The dispatches indicated that Messrs. Taft and Walsh will preside at the hearing and that from it a definite policy will probably be formulated to govern the relations between the men and the companies.

Bay State Men Accept Increase.—The trainmen in the employ of the Bay State Street Railway, Boston, Mass., have voted to accept the voluntary increase of 5 cents an hour granted to them by the management. The original demand was for an increase of 10 cents an hour over the existing maximum of 35½ cents an hour. In accepting the increase the members reserve the right to request higher wages as soon as the new board of control takes charge of the affairs of the company. The advance of 5 cents an hour brings the maximum of the Bay State carmen to 40½ cents a hour.

New Members of Engineering Foundation Board.—At the regular meeting of the trustees of United Engineering Society held on May 23, the following men were elected to the Engineering

Foundation Board: Calvert Townley of Westinghouse Electric & Manufacturing Company, New York, N. Y., succeeding Gano Dunn. The following are additional members: Silas H. Woodard, consulting engineer, M. Am. Soc. C. E.; Dr. Joseph W. Richards, professor of metallurgy, Lehigh University, South Bethlehem, Pa.; Dr. David S. Jacobus, advisory engineer, Babcock & Wilcox Company, New York; H. Hobart Porter of Sanderson & Porter, consulting engineers, New York.

Abortive Attempt at Strike.—About fifty employees of the Union Railway, one of the companies of the Third Avenue System, operating in the Borough of the Bronx, New York, went on strike on June 7, alleging that forty men had been discharged by the company for attempting to organize the men. The company regarded the matter as merely a disaffection involving a very small percentage of its employees. The men who went out, however, were prompt to take advantage of the present war labor situation to advance their own ends and appealed to the Department of Labor at Washington in the hope of obtaining some degree of recognition from the company. In this they were unsuccessful. Only recently an increase of 2 cents an hour as well as a bonus of $1 for first-year men working six days a week was authorized to become effective on July 1.

Federal Power to Regulate Rates.—In an opinion dated June 1, William L. Ransom, counsel Public Service Commission for the First District of New York, expresses the conviction that the national power exercised for the attainment of National objects in wartime emergency is paramount. He believes, however, that under the recent federal railroad act the Interstate Commerce Commission has no general power over interstate rates and that the regulation, review and revision of intrastate rate initiated by the Director General for ordinary intrastate commerce rest still with the state tribunals. If the rate provisions of the new law were to be upheld as a measure of taxation, the fixation of rates by the government would not be confined to those applicable to interstate commerce but could extend to intrastate transportation. Mr. Ransom, however, does not believe that Congress intended to delegate a taxing power in the form of a rate-fixing power.

Another Wage Increase in Camden.—The Public Service Railway has announced another increase for motormen and conductors employed on the Camden divisions. This is the second advance within a very short time. The new rates, which will prevail while the war conditions last, are 30 cents an hour for the first six months, covering period of learning; 35 cents an hour after first six months, and 40 cents an hour after five years. On June 1 of this year the company granted an increase of 2 cents to its conductors and motormen. Thomas N. McCarter, president of the company, announced that the company had decided to put into effect as of June 15 special rates of compensation to motormen and conductors, including women conductors. A minimum wage of $17.50 is assured every trainman who answers all rollcalls and performs such duties as may be assigned. To all persons entering the employ of the company for the first time an extra payment of $10 will be made upon completion of thirty days actual service. The Camden men were not involved in the recent strike.

Strike Threatens in Trenton.—The motormen and conductors in the employ of the Trenton & Mercer County Traction Corporation, Trenton, N. J., held a special meeting on June 10 and adopted a resolution demanding a flat rate of 40 cents an hour. The men also want time and a half for all overtime for all employees who do platform work. The company had previously offered the men a sliding scale to become effective July 1, calling for 30 cents an hour for conductors and motormen in the employ of the company six months; 35 cents an hour for those in the service four and one-half years, and 40 cents an hour for those employed five years and over. At the present time the wage scale is 31 cents an hour. The union has notified the company that unless the flat rate of 40 cents an hour is put into effect by June 14 the men will walk out. Rankin Johnson, president of the company, says that the flat rate of 40 cents an hour would mean an increase of $80,000 a year, and he does not see how the request can be granted. The company recently guaranteed a flat wage of $17.50 a week to "extra" trainmen, providing they make all the rollcalls.

New Common User Suits in San Francisco.—The United Railroads will enter suit against the city and county of San Francisco, Cal., for an amount aggregating several million dollars for damages that will ensue from the building of four tracks on Market Street. Suit for $865,250 damages already has been filed as compensation for the loss of value that the company says that it has sustained due to the construction of tracks on Market Street from Church Street to Van Ness Avenue. A claim has been filed with the Board of Supervisors for $288,500 damages the company says it suffered through the blanketing of its lower Market Street lines by the Municipal Railroad and by interference with its service caused by excavations made when the municipal tracks were installed. The new suit will be for damages due to depreciation of franchise value, loss by reason of interference with its service during the construction period and loss of revenue from the time the new line is operated until 1929, the date that the franchise expires. The contention of the United Railroads in all these suits is that the city has no right either to grant a franchise to another company or to build tracks and operate a competing line for more than five blocks on Market Street.

Franchise Relief Proposal Submitted.—A definite proposition has been made by the city of Seattle, Wash., to the Puget Sound Traction, Light & Power Company, stating terms under which the city might be willing to grant a suspension of certain franchise obligations during the period of the war. The city stipulates interchange of transfers with municipal lines, common user privilege on Third Avenue from Pine Street to Yesler Way; interchange of cars with the municipal railway in time of emergency; exchange of electric power up to 10,000 kw. in cases of emergency; and improved service on the city lines. The company has also been asked to increase its service by at least seventy cars. The company will consider the matter carefully and submit a definite proposition upon the return of President A. W. Leonard from Boston, where he has gone to confer with Stone & Webster, operators of the property. The Public Service Commission on May 22 dismissed the application of the company for an order relieving it of its franchise obligations, stating that the points of law involved had been decided favorable to the city's contention in the Tacoma 6-cent fare case, decided by the Supreme Court on April 27. The action before the commission was begun by the company on July 24, 1915.

Programs of Meetings

Central Electric Railway Association

The summer meeting of the Central Electric Railway Association will be held at The Breakers, Cedar Point, Ohio, on July 10 and 11.

Southwestern Electrical & Gas Association

At a meeting of the quarterly conference committee of the Southwestern Electric & Gas Association, held at the office of the Houston Lighting & Power Company, Houston, Tex., July 19 was selected for the first quarterly conference and Dallas was named as the city in which it was to be held.

It was determined to devote the morning of July 19 to separate meetings of the street and interurban railway, light and power and the gas sections under the chairmen, at which matters particularly pertaining to the business of each section will be discussed, the matters for discussion being outlined in an address by each one of the chairmen. The afternoon will be devoted to a joint meeting of all the sections to discuss matters generally affecting the three sections. These matters will be brought before the meeting in a report from the secretary. The principal subjects of this report are to be fuel, labor, increase of rates and fares and legislation, municipal, state and national.

All meetings will be executive meetings and no reports will be made of the meetings unless specially ordered by the association.

Financial and Corporate

Northern Electric Finance

Properties Transferred After Sale to Bondholders Organized as Northern Electric Railroad

On May 27 the California Railroad Commission announced that the corporation to be organized for the purpose of acquiring the Northern Electric Railway properties had the authority of the commission to issue $5,500,000 of bonds and $5,200,000 of stock. The authorization permitted the new corporation to proceed with the new reorganization plans for the several lines operating electric railroads between Sacramento and Chico, Sacramento and Colusa, Sacramento and Woodland, and also the branch line from Vacaville to Suisun. These companies include the following, which will be consolidated into a single owning company: Northern Electric Railway (main line), Sacramento to Chico via Marysville; Sacramento & Woodland Railroad, branch Sacramento to Woodland; Northern Electric Railway, Marysville and Colusa branch, Marysville to Colusa; Sacramento Terminal Company, belt line around Sacramento.

The Railroad Commission announces that the new corporation is to have an authorized stock issue of $5,200,000, divided into $1,902,200 of 6 per cent non-cumulative first preferred, $957,800 of 6 per cent non-cumulative second preferred and $2,340,000 of common. In addition, the new corporation is to have an authorized 5 per cent twenty-year bond issue of $5,500,000, divided into $2,012,400 of Class "A," $951,200 of Class "B," $1,268,200 of Class "C" and $1,268,200 of Class "D" bonds. The interest on Class "A" bonds is to be a fixed charge on and after July 1, 1917; on Class "B" bonds on and after July 1, 1919; on Class "C" on and after July 1, 1922, and on Class "D" on and after July 1, 1927. Because of the delay in putting the amended reorganization plan into effect, Class "A" bonds will bear interest from July 1, 1918. Interest on money paid in for Class "A" bonds prior to July 1, 1918, will be paid by interest checks. All classes of bonds are to be on an equal footing as to lien and security.

The commission concluded that reorganization expense should be amortized so as to be paid over a number of years and not become a permanent capital expenditure. The plan of reorganization to be followed up under the authority of the commission provides for a board of fifteen directors of which twelve will be selected by the bondholders and three by the stockholders.

On the day following this announcement by the commission the Northern Electric Railway was sold under foreclosure proceedings by United States Commissioner Francis Krull for $1,750,000, which was fixed by the United States District Court as a minimum upset price. The only bidders were the bondholders represented by attorneys for the reorganization committee.

In the course of a hearing before the Railroad Commission on this case, A. S. Kibbe, an expert for the reorganization committee, testified that during the incumbency of Receiver Coghlan, and up to March 3, 1918, $377,497 had been expended in new construction, extensions and improvements. He gave the operating revenue of the company in 1917 as $1,100,000. After deducting operating expenses and taxes, the net earnings for 1917 available for bond interest, etc., were $200,252.

P. E. Deficit Passes $6,000,000

According to the report of the Pacific Electric Railway, Los Angeles, Cal., for the calendar year 1917, just filed with the California Railroad Commission, the net deficit from operation, after some depreciation allowance, was $855,116. This brings the total deficit up to $6,170,453, or double the deficit of 1915.

The funded debt is $67,717,962, including a $9,000,000 long-term loan from the Southern Pacific Company. The company places the value of its road and equipment at $81,375,592 and its investments at $9,621,393.

The income statement for 1917 follows:

Operating revenue	$9,267,130
Operating expenses	6,257,982
Net operating revenue	$3,009,148
Non-operating income	65,730
Gross income	$3,074,879
Deductions:	
Rentals	$ 44,562
Taxes on railway operation	518,836
Interest on funded debt	2,830,787
Interest on unfunded debt	468,610
Miscellaneous deductions	97,200
Total deductions	$3,959,995
Deficit for year	$ 885,116
Debit balance on Dec. 31, 1916	5,122,430
Miscellaneous additions, 1917	151,714
Miscellaneous deductions, 1917	314,711
Deficit, Dec. 31, 1917	$6,170,543

Short-term Notes at 8 Per Cent

Both Bonbright & Company, Inc., New York, N. Y., and H. M. Byllesby & Company, Inc., Chicago, Ill., are offering a new issue of $200,000 of Ottumwa Railway & Light Company bond-secured 7 per cent gold notes dated June 1, 1918, due Dec. 1, 1920, at 97¾ to yield 8 per cent. The proceeds are to reimburse the company for outlays on additions and improvements. The notes are secured by deposit of 150 per cent of general mortgage 6 per cent bonds.

Providing for Shipbuilders

Shipping Board to Finance New $20,000 Oakland Electric Line—Railroad to Furnish Materials

The Emergency Transportation Company has been formed to construct and operate an electric railway in Oakland, Cal., connecting the plant of the Moore & Scott Iron Works shipbuilding plant with the San Francisco-Oakland Terminal Railways on Eighth Street, eight blocks away. W. R. Alberger, vice-president and general manager of the Key Route electric system, is president of the new corporation.

The new line will be a single-track one, for the use of the 6000 men employed in the shipyards. Under the plan agreed upon, the United States Shipping Board will furnish the funds and will control the line, while the materials will be furnished by the local electric railway. According to the application filed with the California Railroad Commission, the total cost of construction will be $20,000.

The City of Oakland has authorized the construction of the line and the commission has approved the scheme of financing. This provides for the issuance of 5 per cent promissory notes from time to time to the Shipping Board. These notes will become payable ninety days after the termination of the war. They will be secured by deposit of the company's stock.

The San Francisco-Oakland Terminal Railways will purchase at $100 (par) 101 shares of stock in the Emergency Transportation Company. This stock will be paid for chiefly in materials. For example, steel rails now valued at $100 a ton can be delivered under this agreement to the Emergency Transportation Company by the traction company for about $30 a ton.

American Power & Light Gross Rises 10 Per Cent

The gross earnings of the operating subsidiaries of the American Power & Light Company, New York, N. Y., for 1917 aggregated $11,389,659, as compared with $10,344,895 for 1916, an increase of $1,044,764 or 10 per cent. The net earnings at $4,762,414 represented an increase of $44,660, or a little less than 1 per cent. The small net, of course, reflected the heavy increase in operating costs and taxes. The gross earnings of the Pacific Power & Light Company, which supplies electric railway service to two communities and interurban service to three communities in Washington and Oregon, totaled $1,647,401 in 1917, as compared to $1,461,821 in the year preceding. Of the 1917 amount $155,966, or 9 per cent, represented railway earnings.

In the case of the Southwestern Power & Light Company, which furnishes electric railway service to one community in Texas, the railway earnings at $43,251 represented 1 per cent of the total gross, which increased from $4,193,265 in 1916 to $4,677,378 in 1917.

New York Bankers Balk at Utility Loans

Allege that Requirement for Bank Indorsement of These Loans is Unsound—Rate Need is Crux of Situation—Private Offering of Notes at 7¾ Per Cent

More than a dozen of the most prominent financiers in New York City at an informal conference at the Sub-Treasury on June 12 informed the War Finance Corporation that they do not purpose to lend their indorsement to the obligations of public utilities desiring loans from the War Finance Corporation until the earning power of such companies has been substantially increased. The bankers asserted that the provision of the act calling for virtual bank indorsements of loans is objectionable on the ground of unsound banking, for it calls on the banks to carry contingent liabilities which it is not proper for them to assume.

In brief, the bankers suggested that unless the war finance corporation act is amended the usefulness of the corporation will probably be limited to the making of direct advances to utilities as provided for in Section 9, which authorizes such direct loans "in exceptional cases." Another suggestion was that the public utility companies take steps to obtain permission to increase their rates so that their revenue may be increased and their credit standing bettered to the point where bankers will be more likely to undertake to finance them.

The Bankers Present

The meeting was called to learn the views of bankers on the subject of carrying out the provisions of the act relative to the indirect financing of war industries through banks. The bankers who attended the conference formed a most representative group. Those present were: J. P. Morgan; Francis L. Hine, president First National Bank; James N. Wallace, president Central Trust Company; Jerome J. Hanauer of Kuhn, Loeb & Company; Walter E. Frew, president Corn Exchange Bank; Gates W. McGarrah, president Mechanics & Metals National Bank; Charles E. Mitchell, president National City Company; Charles H. Sabin, president Guaranty Trust Company; Albert H. Wiggin, chairman Chase National Bank; Thomas W. Lamont of J. P. Morgan & Company; Frederick Strauss of J. & W. Seligman & Company, and Seward Prosser, president Bankers Trust Company.

The War Finance Corporation was represented by W. P. G. Harding, governor of the Federal Reserve Board and managing director of the corporation, and by other directors, including Clifford M. Leonard, Angus McLean and Eugene Meyer, Jr.

No Definite Conclusion Reached

At the conclusion of the meeting Mr. Harding gave out the following statement:

"A meeting of the board of directors of the War Finance Corporation has been held at the Sub-Treasury. A number of prominent bankers were present for the purpose of discussing the operations of the corporation in connection with the financial institutions of the country. The discussion of any specific cases was merely incidental to the discussion of the general principles involved. No definite conclusions were reached, and the board of directors of the corporation has no announcement to make at this time."

Mr. Harding stated that the meeting had not been called primarily to discuss the public utility situation, for which reason utility investment bankers had not been allowed a chance to participate in the discussion. He added, however, that the recent 7-per cent direct loan to the United Railways of St. Louis was really made to test what rate of interest would be proper for loans. In the case of the St. Louis company the character of the securities offered for collateral was excellent and the board realized that there would be no risk in making the six-months' loan. The collateral included $800,000 of Liberty Bonds.

Relative to proposals to amend the war finance corporation act, Mr. Harding said:

"No definite steps have been taken so far to amend the act. We thought it better to get more acquainted with the provisions of the act and learn the attitude of the bankers before making recommendations to Congress for any radical amendments."

Mr. Harding stated that the board still has under advisement the application of the Brooklyn Rapid Transit Company for a loan because of the maturity of $57,735,000 of notes on July 1. He added that the board has many applications before it, but that the volume has been reduced by the elimination of many which the board does not believe come within the terms of the act. It has been stated from other sources that applications numbering about 196 and aggregating $200,000,000 had been filed with the board.

Other Banks Are Considering Aid for Utilities

Since the announcement of the War Finance Corporation on May 28 that its resources are intended to be loaned directly to war industries only in exceptional cases and upon adequate security, bankers throughout the country have had put before them the question of providing financial aid for utilities. Meetings have been held in Boston, Philadelphia, Chicago and other cities.

One outgrowth of these meetings is a proposal to get all financial institutions of the country into an organization to finance the utilities and to secure for them such an increase in revenues as is necessary to stabilize their credit. While no definite plan has yet been outlined, such an organization might be along the lines of the memorable gold and cotton pools of 1914, when financial institutions acted in unity to supply gold to stabilize the exchange situation and to provide for the financial relief of Southern cotton growers.

Two other plans under discussion by banks are: (1) amendment of the war finance corporation act to provide, in unquestioned terms, for the relief of utilities, and (2) government control during the period of the war. There is a difference of opinion among bankers, it is said, as to the expediency of government control. One effect of such control, as illustrated in the case of the railroads, would undoubtedly be a sweeping increase in rates commensurate with the increased cost of operation. The crux of the public-utility problem is the rate situation. With a proper rate structure, the credit basis of utilities would be such that they could dispose of new securities to take care of maturing obligations.

Warburg Emphisizes Need

The pressing need of utilities was emphasized by another man of national importance when Paul M. Warburg, vice-governor Federal Reserve Board, spoke before the National Conference on War Economy in New York on June 6 as follows:

"The drastic shrinkage in the value of public utility investments and the impairment of the credit of these corporations is a source of grave danger to the general financial situation at this time. It would be a serious menace to the ability of the government to finance the war if public service corporations should be forced to go into receivers' hands because of conditions for which they are not responsible.

"The President, in his letter to Secretary McAdoo on Feb. 19, 1918, expressed his profound concern over the situation, stating at the same time that he hoped state and municipal administrations would make every effort to deal with these corporations in a spirit of liberality.

"All that it is proper for me to do, therefore, is to emphasize the public interest in the protection of the credit of these corporations and in the preservation of their ability to perform their important functions.

"It is gratifying to note that a number of leading municipalties, after a careful study of this problem, have since decided to make such equitable adjustments as to enable their public service companies to weather the storm. It is hoped that their example will be emulated throughout the entire country."

Seattle Offerings at 7¾ Per Cent

An offering by private bankers which is of especial interest at this time is announced by Harris, Forbes & Company for a large group of representative dealers and bankers in the case of the Puget Sound Traction, Light &

Power Company, Seattle, Wash. For the purpose of providing funds for the retirement at par and interest on Aug. 1, 1918, of its 6 per cent bonds maturing on Feb. 1, 1919, and covering the cost of additions recently made to the property, this company has authorized a new issue of $12,250,000 of 7 per cent mortgage gold notes due on June 1, 1921.

These notes are secured by a first mortgage on part, and a direct mortgage on most of the balance of the property, subject to various underlying bonds, no more of which can be issued. They are followed by more than $34,900,000 of preferred and common stocks, and additional notes can be issued for only 75 per cent of the cost of construction and improvements, if net earnings are at least one and three-fourth times the interest charges on all bonds and notes outstanding and proposed. Provision is made for an annual sinking fund, which with the sinking funds on underlying bonds will amount to at least $560,000 each year in 1919 and 1920.

The issue is being offered at 98 and interest to yield 7¾ per cent. The company agrees to pay any normal federal income tax to an amount not exceeding 2 per cent. The notes are in coupon form, registerable as to principal, and of $500 and $1000 denominations. They are callable in whole or in part, upon thirty days' notice, at 102 in 1918, 101 in 1919 and 100 in 1920.

War Business Helps Long Island

A large additional passenger business during the calendar year 1917 was created by the location of army camps along the lines of the Long Island Railroad, New York, N. Y. The total number of soldiers handled was 751,215, requiring 1557 train movements, to say nothing of the traffic of visitors to and from the camps. The total operating revenues at $17,286,178 represented an increase of $2,314,340 or 15.56 per cent over 1916. The number of passengers increased 4,993,306 or 10.90 per cent. The commutation travel showed an increase of 7.3 per cent notwithstanding a small loss on the North Shore and Atlantic divisions, where certain extensions of the city rapid transit system have drawn traffic from the company's lines.

The operating expenses for 1917 totaled $11,960,534, an increase of $2,033,327 or 20.4 per cent. The increase was due to the increased cost of labor and materials, and the increased service to army camps. The taxes amounted to $944,293, an increase of $65,246 or 7.42 per cent. After the deduction of interest, the result for the year was a surplus of $869,300. This was an increase of $627,829 for the last year.

Upon the army cantonment at Yaphank the company expended $219,063 for facilities within the camp, besides about $60,000 at other points for passing tracks, telephone and signal systems and the like.

Electric Railway Relief Urged

Mr. Gadsden Tells the Ways and Means Committee of the House of Representatives That In Six Months the Net Income of the Railway Industry Will Vanish

That the financial condition of electric railways is such as to warrant their being placed in a segregated class under any new revenue legislation was the opinion expressed on June 11 by P. H. Gadsden, resident Washington member Electric Railway War Board, before the committee on ways and means of the House of Representatives. Mr. Gadsden averred that within six months the net income of the industry will reach the vanishing point unless relief comes.

Net Income Loss 59 Per Cent

Two phases of the utility situation, the speaker said, must constantly be borne in mind: The decrease in net revenue, and the necessity of financing maturing obligations. Without adequate revenue the refinancing cannot be accomplished. Mr. Gadsden presented the accompanying income statement of 103 electric railways for the three months ended Mar. 31, 1918, as compared with the similar period in 1917. This shows a gain of 2.1 per cent in operating revenues, but a loss of 59.7 per cent in net income. The data were secured by the Electric Railway War Board.

INCOME STATEMENT OF 103 ELECTRIC RAILWAYS FOR THREE MONTHS ENDED MARCH 31, 1917 AND 1918

	1918	1917	Increase Amount	Increase Per cent
Total operating revenues	$61,734,670	$60,456,333	$1,278,337	2.1
Total operating expenses	43,799,663	39,691,302	4,180,361	10.6
Net operating revenue	$17,935,007	$20,837,031	*$2,902,024	*13.9
Net revenue from auxiliary operations	$ 2,508,086	$ 2,271,199	$ 236,887	10.4
Taxes	4,637,648	4,267,641	370,007	8.7
Nonoperating income	1,136,499	956,071	180,428	18.9
Gross income	$16,941,947	$19,796,660	*$2,854,713	*14 4
Deductions from gross income	14,713,512	14,269,320	444,192	3.1
Net income	$ 2,228,435	$5,527,340	*$3,298,905	*59.7

*Decrease

The relief which the revenue authorities can grant Mr. Gadsden asserted, is to put electric railways and other utilities in a segregated class on the basis of reduced taxation. The point made was that it would not be so wise to impose a 6 per cent or larger income tax as it would to leave the little remaining net income in the hands of the companies in order to keep the breath of solvency in them and help provide the additional facilities now demanded. The electric railways have shown the worst revenue decreases of all utility groups and are on the brink of bankruptcy. Relief from the present excessive taxation burdens would show the sympathy of Congress and would help the companies to secure adequate rates.

The Financing Problem

In regard to the second fundamental point in the present situation, Mr. Gadsden said that utility representatives had been disappointed in the recent direct-loan rulings of the War Finance Corporation, for they had hoped that the public utilities would have the same rights before the corporation as the steam railroads. But relief must be sought in the first instance through banking channels. Utilities are now trying to work out their salvation in this way.

Representative Rainey raised the question of a moratorium for maturing indebtedness, but Mr. Gadsden expressed his views on this subject as follows:

"We have given this, naturally, the most serious consideration. A general moratorium for all securities in the market is one thing, but a special moratorium would involve discrimination and cause people to think that public utility securities are worthless. To our mind that would mean death, not only now but hereafter. It would permanently impress upon the securities of public utilities the fact that when a great crisis of national emergency arose they broke down."

Should the Nation Take Over the Utilities?

When asked whether the situation would not be better if the electric railways had been included under the federal steam railroad act, Mr. Gadsden said:

"We are very much inclined to think so now. We made no effort to be included at that time. We believed that we could get our rates increased and work out our own salvation, and that it was better to try to help ourselves than to lie down. The situation is getting worse, and the most effective way to meet it would be for the government to take us over. Of course, there are a great many companies not in need of any such assistance. The electric railway industry undoubtedly is.

"There will have to be some drastic treatment, but as to whether or not the situation should be presented to the Director of Railroads of the committee on interstate and foreign commerce, which could frame an amendment

placing electric railway properties within the purview of the railroad legislation, we doubt the propriety of our making such representations. It is well enough for us to discuss this subject before a committee, but we question whether the other plan would put us in the proper light before the people of the country. We are attacking each phase of the problem as it comes up. Each committee has a problem for consideration, and we are appearing before some committee or tribunal and spending our days and months trying to bring this problem home to the people of the United States, because it has got to be handled in a serious, statesmanlike way. Otherwise this great industry is going by the board."

Financial News Notes

Hearing on June 20 on Abandonment.—Acting on the petition of the Cincinnati, Milford & Loveland Traction Company, Cincinnati, Ohio, for permission to abandon its road, the Ohio Utilities Commission has announced that it will hold a hearing on the petition in Cincinnati on June 20.

Business Men May Save Line.—To prevent the junking of the Consolidated Street Railway, which connects Cottonwood Falls and Strong City, Kan., business men of Cottonwood Falls are considering a plan to buy the line. The company recently asked permission of the Public Utilities Commission to discontinue the line.

Another Offer of Sale Made.—The Board of Control of London, Ont., on May 23 received from George B. Wood, Toronto, president of the London & Lake Erie Traction Company, an offer to sell to the city for $300,000 the line from London to the top of the hill in the city of St. Thomas, together with two-thirds of the rolling stock. The company had previously asked $450,000 for the whole road to Port Stanley. A summary of the valuation and report by Sir Adam Beck, chairman of the Hydroelectric Power Commission of Ontario, to the City Council was published in the ELECTRIC RAILWAY JOURNAL of May 25, page 1021.

May Ask for Railway Merger at Dayton.—There are rumors that the special committee appointed to investigate the electric railway situation at Dayton, Ohio, will recommend the amalgamation of the six railways as a means of improving transportation facilities. The roads operating in Dayton are the City Railway, the Peoples' Railway, the Oakwood Street Railway, the Dayton Street Railway, the Ohio Electric Railway and the Dayton, Springfield & Xenia Railway. The committee consists of J. F. Ohmer, representing the manufacturers; J. L. McKitrick, of the Central Labor Union, and Frank Wright, representing the business interests generally.

$2,151,000 of Refunding Bonds Authorized.—Permission has been granted by the Public Service Commission of the Second District of New York to the Albany Southern Railroad, Hudson, N. Y., to issue $2,151,000 of first refunding mortgage thirty-year 6 per cent bonds. Of the bonds $1,451,000 are to be used to exchange a like amount of first mortgage thirty-year 5 per cent bonds now outstanding. The company also is empowered to pledge $700,000 of 6 per cent bonds as security for $550,000 of three-year notes, which are to be sold at not less than 96 and the proceeds used to reimburse the treasury, to discharge floating liabilities outstanding on June 30 last and to pay for proposed new construction work amounting to $190,683.

New Stock Issue for Des Moines.—Shareholders of the Des Moines (Iowa) City Railway have voted to amend the articles of incorporation so that the authorized capital stock, now consisting of $3,000,000 of common and $250,000 of 6 per cent non-cumulative preferred (all the preferred and $1,055,000 of common being outstanding), shall be increased to $4,500,000, to include $3,000,000 of common as at present; $1,500,000 of 7 per cent preferred stock in $100 shares. These new preferred shares will be cumulative from May 1, 1918, with preference also as to assets in case of liquidation and will carry the same voting powers as the common. They will be callable, all or any part, on any dividend date at 107½ and dividends, at the option of the company.

Twin City Common Dividend Passed.—The directors of the Twin City Rapid Transit Company, Minneapolis, Minn., on June 3 passed the dividend on the common stock for the second quarter of 1918. The company had paid 6 per cent on the common stock from 1909 to 1918. At the former quarterly meeting the dividend was reduced and the payment for the first quarter made at the rate of 1 per cent for the period, or 4 per cent annually. Horace Lowry, president of the company, issued a brief statement to the effect that, in consequence of the continued decrease in the company's earnings, the steadily increased cost of operation and greatly lessened net returns, the company finds it impossible to continue paying dividends on its common stock.

Kewanee Deficit Increases.—The total operating revenues of the Galesburg & Kewanee Electric Railway, Kewanee, Ill., for the fiscal year ended April 30, 1918, amounting to $82,142, show an increase of $4,466 or 5.8 per cent compared with those of the preceding year. City revenue increased $3,782 or 9.4 per cent, and interurban revenue $701 or 1.9 per cent. The operating expenses at $71,960 increased $9,406 or 15.0 per cent, more than offsetting the increase in revenue. In connection with higher interest charges the increased expense resulted in a deficit of $16,358, as compared with a deficit of $10,551 for the preceding year. Application to the Illinois Public Utilities Commission for authority to charge higher rates of fare was made on July 31, 1917, but although the commission held two hearings on the matter in November, no decision has yet been rendered.

Merger Offers a Way Out.—Richard Sachse, chief engineer of the California State Railroad Commission, recommended the consolidation of the transbay interurban system on May 24 when he took the witness stand to make a statement on the consolidation scheme worked out by the commission's engineers in the transbay ferry rate case which was on trial before the commission. In reviewing the transbay transportation situation Mr. Sachse stated that he believed that if the San Francisco-Oakland Terminal Railways and Southern Pacific Company did not favor the consolidation plan the commission could recommend it to the railroad administration as the best solution of the transbay transportation problem. In determining the rates Mr. Sachse recommended that the commission adopt as the rate base the valuation for the lines necessary to serve the territory, which his department has fixed at $22,065,000 as a fair basis for computing the rates.

Electric Railway Monthly Earnings

AURORA, ELGIN & CHICAGO RAILROAD, AURORA, ILL.

Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
1m., Mar., '18	$168,693	*$138,511	$30,182	$36,093	†$5,911
1m., Mar., '17	163,197	*123,232	39,965	36,036	3,929
3m., Mar., '18	439,408	*410,158	29,250	107,399	†78,149
3m., Mar., '17	469,516	*352,564	116,952	107,447	9,505

NEW YORK (N. Y.) RAILWAYS

1m., Apr., '18	$983,452	*$751,509	$231,943	$284,487	‡$15,393
1m., Apr., '17	1,033,608	*784,799	248,809	283,808	‡12,740
10m., Apr., '18	9,967,978	*7,649,583	2,318,395	2,832,702	‡9,055
10m., Apr., '17	9,389,814	*7,547,977	1,841,837	2,820,195	‡451,531

NORTHERN OHIO TRACTION & LIGHT COMPANY, AKRON, OHIO

Period	Operating Revenue	Operating Expenses	Operating Income	Fixed Charges	Net Income
12m., Apr., '18	$6,610,538	$4,230,471	$2,380,117	$1,021,657	$1,358,460
12m., Apr., '17	5,672,188	3,168,587	2,508,601	928,034	1,580,567

NASHVILLE RAILWAY & LIGHT COMPANY, NASHVILLE, TENN.

1m., Apr., '18	$218,862	*$134,603	$84,259	$40,490	$43,769
1m., Apr., '17	201,591	* 130,576	71,015	40,714	30,301
12m., Apr., '18	2,488,835	*1,604,642	884,193	489,375	394,818
12m., Apr., '17	2,423,840	*1,511,622	912,218	501,198	411,020

* Includes taxes. † Deficit. ‡ Includes non-operating income.

Traffic and Transportation

Commission Sees Fare Need

It Cannot Act, However, on Account of Court Decisions—City Line in Serious Straits

The Public Service Commission for the Second District of New York has sent to patrons of the Buffalo & Lake Erie Traction Company a review of conditions revealed in the investigation of the petition of George Bullock, as receiver of the company, for permission to increase the rate of fare.

Commissioner Barhite conducted several hearings, and then followed the decision of the Court of Appeals holding that the Public Service Commission has no jurisdiction to determine rates where such rates are fixed by franchises granted by a city, town or village. The road is restricted by franchise rates in some of the cities, villages and townships through which the line passes. Thus the decision of the Court of Appeals takes away from the Public Service Commission jurisdiction to increase or decrease the fare in all of the places where the railroad has entered into an agreement not to charge more than a certain amount. On portions of the road where there is no such agreement the commission still has jurisdiction.

Why the Commission Can't Act

Under the conditions it is obviously impossible for the commission to make a rate which will be equitable as between patrons of different portions of the road. If the commission finds that the condition of the finances of the road are such that a raise in rates as asked will be necessary and is favored by the commission, it is impossible to make a just and fair rate or one which will not be discriminatory.

Steps taken by the receiver to abandon certain parts of the road were followed by a request that the commission make a report stating the condition of the road's finances and for such facts and figures as might be necessary for a determination whether or not the road is entitled to an increased fare.

The commission says in part:

"An examination of the annual reports of the road for several years past shows that the income of the road has not been sufficient to pay expenses of operation. From July 1, 1912, to June 30, 1912, the net deficit was $257,037; July 1, 1913, to June 30, 1914, the net deficit was $269,802; July 1, 1914, to June 30, 1915, the net deficit was $278,613; July 1, 1915, to June 30, 1916, the net deficit was $178,767; Jan. 1, 1917, to Dec. 31, 1917 the net deficit was $153,014.

"The receiver in his application for an increase of rates does not ask for anything with which to pay dividends. If the railroad is able financially to pay dividends it should not be in the hands of a receiver. The receiver has expressed himself as willing to use any excess in fare over the present rate solely for the payment of such interest as must be paid on bonds and receiver's certificates and to better the equipment and service of the road. The employees of the road are demanding more pay and are very patiently awaiting the outcome of the proceedings.

Dunkirk Line in Serious Shape

"In the opinion of the commission the receiver must have more income if he is to continue to operate the road and give proper service. The commission is also of the opinion that the only source from which additional revenue may be had is from increased rates. In view of the limitations upon its power made by the Court of Appeals the commission cannot make the decision to which it thinks the receiver is entitled. That can be done only in case the various cities, villages, and townships shall remove the restrictions as to rate of fare in the franchise granted by them. Whether the restrictions are to be removed rests solely with the local authorities. The Public Service Commission has no authority over this matter and expresses no opinion as to the proper course to be taken.

"With regard to the Dunkirk Street Railway the figures show that the road is operated at a great loss. The net loss from the figures available appear to be at least $25,000 a year. It is a serious question whether the receiver should not be permitted to abandon the road.

"This opinion has no legal effect and is given solely at the request of the patrons of the road to be used by them in forming their judgment as to what shall be done."

Cut-Rate Tickets Eliminated

Partial emergency relief has already been granted the Aurora, Elgin & Chicago Railroad, Wheaton, Ill., through the efforts of the city officials and local chambers of commerce of Aurora and Elgin, who made a trip to Springfield, Ill., and entreated the commission in behalf of the railway. The commission was so impressed with this unusual procedure that without waiting to take action on the application of the company for increased fares, it issued an order for the withdrawal of six-for-a-quarter tickets in Aurora, and of six-for-a-quarter and seven-for-a-quarter tickets in Elgin, effective on June 10. A straight 5-cent fare is now in effect in these cities. A hearing on the application of the railway for increased fares will be held before the commission during the week ending June 22.

Cleveland Fears Fare Raise

City Greatly Concerned Over Failure of Model Franchise to Work Successfully in War Time

Mayor Harry L. Davis has advised the City Council of Cleveland, Ohio, to confer with the Cleveland Railway in an effort to secure its consent to one or more of four propositions which he has formulated to prevent an increase in the rate of fare as a result of the expected increase in the wages of motormen and conductors. Mayor Davis argued that something should be done to obviate the necessity of amending the Tayler franchise, if a material wage increase is granted, as the maximum rate of fare provided for the franchise will not cover the additional amount required for operating expenses. The Mayor's proposals follow:

Outline of Mayor's Proposal

Agree to a stock dividend reduction from 6 per cent, as guaranteed by the Tayler franchise, to 4 per cent.

Co-operate with the city in securing federal action to regulate opening and closing hours of factories and stores in order to distribute the rush-hour congestion over a longer period.

Restrict extensions and improvements and make every effort to have the present equipment suffice during the war.

Postpone for the period of the war charging off suspense accounts—deficits in maintenance and operating accounts now payable to the company at the rate of $100,000 per month.

Mayor Davis argues that conditions are unusual at the present time and that the public should not be asked to stand the entire weight thrown upon the road by the increase in expenses brought about by the war.

J. J. Stanley, president of the Cleveland Railway, presented a letter to the City Council on the evening of June 10, in which he refused to accede to Mayor Harry L. Davis' request that the dividends be reduced during the war period in order that the rate of fare may not be increased. He said that the rate of return on the investment was so low that he could not ask stockholders to consent to a reduction.

Mr. Stanley in Partial Agreement

Neither was he willing to waive payments on the suspense accounts accumulated from the deficits of other years. The other two suggestions made by the Mayor were acceptable. They were that hours for closing stores and factories be regulated in such a way as to distribute the rush-hour load and that improvements be restricted to absolute necessities during the war.

It is said that the Mayor will reply to the letter and urge that his suggestions be accepted for the period of the war. President Stanley said in his letter that the guarantee by the city of a return of 6 per cent on the investment was the only thing that made this possible. It would not be right now to reduce it.

Experience of Others Helpful

Dallas Officials Tour Cities of the Middle West in Quest of Operating Kinks Applicable in Texas City

Much information that will be valuable in assisting in the solution of the traction problems of Dallas, Tex., was gathered by M. N. Baker, Supervisor of Public Utilities of that city, and Richard Meriwether, general manager of the Dallas Railway, who have returned from a tour of a number of cities of the Middle West that have electric railway systems of recognized efficiency. Questions particularly studied by Messrs. Baker and Meriwether related to elimination of belt lines and the installation of a radial system of car lines, safety zones and traffic regulations in general that may be made to apply to conditions in Dallas.

The information gathered will be placed before John A. Beeler, traffic expert, who is now making a survey of traffic conditions in Dallas with a view to recommending changes that will solve the many perplexing transportation problems and give the maximum of service at a minimum of cost.

On his return to Dallas Mr. Baker made a statement in part as follows:

"While the cities we visited exhibited a marked variance in the standards of efficiency maintained by their railway systems, we were able in nearly every instance to trace these variations to one cause, namely, the presence or the absence, as the case might be, of a spirit of co-operation between the municipality and the utility. We find that it has been the experience of these cities that where the relation between the city and the traction company has been one of co-operation and mutual support, the best results have always been obtained in the upbuilding of both the city and the street railway system, while on the other hand a spirit of antagonism and strife between the two (which was noticeable in two of the cities we visited) has invariably resulted in retarding the progress of both.

Kansas City an Ace

"This is strikingly illustrated at Kansas City, where, through a policy of close co-operation, that city has built up one of the best railways in the entire country. Municipal participation in the earnings of the company, through 'partnership franchise,' has everywhere been a notable factor in the promotion of this co-operative spirit, which has contributed so much to the high state of development and efficiency of the railway services in Kansas City, Chicago and Cleveland.

"Among the interesting features of the street railway systems we investigated are the following:

"*Safety Zones.*—It is a universal practice in Northern cities to set aside certain spaces near the downtown street intersections known as safety zones, where the loading and unloading of cars can be accomplished with safety and dispatch, free from any interference by vehicular traffic. These zones are marked by conspicuous upright iron signs, placed near the tracks and connected by iron chains.

"*Skip Stops.*—The skip-stop system is rapidly being adopted throughout the country, at the request of the government as a fuel conservation measure. It benefits the public by speeding up the running time of cars; it reduces the service cost to the utility, and it contributes directly to the cause of winning the war by the enormous saving in fuel which it accomplishes, it being estimated that each stop eliminated means an equivalent saving of three-fourths of a pound of coal.

"*Employment of Traffic Specialists.*—The employment of a traffic engineer to help solve the traffic problems in Dallas is fully in line with the latest practices of other cities, and is vindicated by the results they have obtained, especially in the cities of Washington, Kansas City, Cleveland, Milwaukee, Chicago and Toledo.

Milwaukee Points the Way

"*Milwaukee's Profit-Sharing Plan.*—One of the most interesting features of railway organization that came under our observation—a new departure of much significance as showing the trend of the times—was the profit-sharing plan operated by the Milwaukee Electric Railway & Light Company. The company first established a table of normal operating expense per car-mile and the normal operating revenue per car-mile. Then, as an inducement to the trainmen to develop themselves as 'salesmen of service,' the company voluntarily agreed to pay them a bonus of 25 per cent of all profits received by the company over and above these fixed standards of expense and revenue. The trainmen have organized an employees' savings and loan association, into which they deposit their savings derived from their share of the company's profits, and they have been able to save many thousands of dollars in this way. The result has been to improve the service to the public, increase the schedule speed of the cars, and to make both the company and the employees more prosperous and also more interested in each other's welfare.

Good Public Relations Essential

"As a result of my observations in the North, I am more than ever convinced that the success and efficiency of any traction system is ultimately determined by the character of the relations existing between the utility and the city, their mutual regard for each other's interests, and their willingness to co-operate each with the other. The people of Dallas now have a proprietary interest in the local traction system under the new franchise, and there is no reason or incentive lacking for making our transportation system the best there is in the country, through a policy of proper supervision, liberal co-operation and unstinted support."

The knowledge of some of these innovations, gained at first hand in the cities visited by Messrs. Baker and Meriwether, is expected to prove an invaluable aid in helping the local Dallas management put into effect with a minimum of opposition such changes as may be decided upon as advantageous for adoption in that city.

Newspaper Fare Referendum

The Railroad Commission of Wisconsin, in its fare order of June 1, 1918, evidently intended that the city lines of the Milwaukee Electric Railway & Light Company should not continue making up losses on the nine suburban lines. The city lines are by that order, reviewed in the ELECTRIC RAILWAY JOURNAL for June 8, limited to a bare 7½ per cent interest return on their value as fixed by the commission.

The suburban lines are operating at a heavy and steadily increasing loss. For the year ended March 31, 1918, this loss was as follows:

7½ per cent interest on investment	$118,500
Operating expenses over gross revenue	12,950
Total loss for twelve months	$131,450

The company says that with the higher wage scale effective on May 1, 1918, the loss for the next twelve months will be $25,000 more, or $156,450, unless fares are raised or service heavily cut—or abandoned—to reduce expenses.

In order to learn what the railway patrons of Milwaukee city and suburbs think ought to be done in this matter the company has decided to conduct a referendum and is asking its patrons through paid ads in the newspapers to cross out one of the two propositions below which they do not indorse, and send the clipping on the back of a post card or inclosed in an envelope to the commission.

1.—We believe Milwaukee's city car lines should be allowed to earn enough to make up losses on suburban lines.

2.—We believe fares on Milwaukee's suburban car lines should be high enough to pay the whole cost of operating these lines, including a 7½ per cent rate of interest on their value fixed by the commission.

Six Cents Now in St. Louis

The 6-cent fare was put into effect on June 1 on the lines of the United Railways, St. Louis, Mo. The advance from 5 cents was made in accordance with the decision rendered by the Public Service Commission of Missouri, to which reference has been made at length previously in the ELECTRIC RAILWAY JOURNAL. Other cities, towns and villages have gone over to a 6-cent fare, but they have not measured up to St. Louis in size. There about 1,000,000 people changed their habits over night, for paying 5 cents on the cars is often all more or less of a habit.

There was some confusion, but con-

sidering the magnitude of the change things went pretty well. The cars carried placards warning everybody to get ready for the change. The women were especially forgetful. Some of them were even so far out of touch with the times that they wanted the whole thing explained to them. There were many funny incidents, some grotesque and a few bordering on the serious. It was a field day for the newspaper humorists and cartoonists, and the history of the change is writ large in the local papers. The company fortified itself in advance with eleven tons of pennies for making change.

On June 2, Bruce Cameron, superintendent of transportation of the company, said:

"We were very much surprised at the smoothness with which the new system was introduced. Most of the passengers had the correct change. When they did not have it, we supplied it. Everybody was cheerful and paid the increased fare without murmuring, except a few, who remonstrated, but paid it anyway. A good many used tickets, and we anticipate that the use of tickets will greatly increase. We had a little trouble with the boxes choking up, due to the conductors failing to empty them often enough, but we do not think that will occur again. There was no delay in the operation of the cars."

St. Louis County residents continued to ride for a nickel, because the increase allowed by the commission does not extend to the county lines, but an extra fare inside the limits costs the regulation 6 cents.

Columbus Would Charge Five Cents

The Columbus Railway, Power & Light Company, Columbus, Ohio, made formal application to the City Council on June 3 for an increase in the rate of fare from eight tickets for a quarter to straight 5 cents, with free transfers, as in the past. In return the company agrees to raise the wages of employees and make such extensions and improvements as are warranted by the decisions of the War Finance Corporation, when application is made for the loan of funds for such purposes.

The motormen and conductors are now receiving from 24 to 31 cents an hour, according to the length of time they have been in the company's service, and it is proposed to make an increase of 6 cents an hour. This would bring the schedule up to a basis of 30 cents to 37 cents an hour. The communication to the Council indicates that the men should have more money for their work and states that many of them have gone to other industries.

Application had already been made to the War Finance Corporation for a loan, but since that time conditions have been made that renders it uncertain as to what amount can be secured, if any.

Following the presentation of this communication Councilman Nailor introduced a resolution providing for a hearing on the matter.

Transfer Charge Refused in New York

Commission Rules That Under Law It Could Grant Only Fragmentary Relief—Advises Companies to Seek Municipal Aid

The Public Service Commission for the First District of New York on June 6 announced that the several electric railways in New York City which a year ago applied for permission to charge 2 cents for transfers should apply to the municipal authorities for changes in their franchise grants. The opinion states that under the recent Rochester decision of the Court of Appeals the commission cannot legally grant a transfer charge on any other than a fragmentary basis and that under the circumstances the results would probably be disastrous to the companies.

The decision was rendered in the case of the Third Avenue Railway, but according to the commission's remarks it is in part plainly applicable to the cases of the New York Railways and the Brooklyn Rapid Transit Company. The commission feels that the revenue needs of the companies should be carefully examined, but it commends the whole matter of the most advisable procedure for relief to the consideration of the companies and the municipal authorities. For the present the hearings in the several cases are held subject to call, until the companies announce their future course.

Partial Transfer Charge is No Relief

The commission's finding follows in part:

"It is evident that the law of the proceeding, as now confirmed and clarified by the Rochester decision, leaves the commission with only a fractional and fragmentary power to deal with the revenue situation of this system through the expedient of a charge for transfers. At a multitude of the most pivotal points where passengers transfer, the commission could not, if it would, in the absence of municipal consent, empower the company to do otherwise than accord a transfer privilege without additional charge. At some points—a number of them important points—the commission would evidently be in position to make a 2-cent charge for transfers effective, in its discretion, upon an adequate showing of facts and probable operating consequences.

"The result, if the commission were to exercise its full discretion and permit a charge for transfers wherever legally possible, would be a disjointed and confusing situation—free transfers given at many points, 2 cents demanded at many others, with always the possibility that payment would be exacted or attempted at many points where none should be, and with the traveling public never certain whether at a given point it had a right to a transfer without additional payment.

"Surface railroad traffic would be diverted from its normal and most direct routes to longer hauls over routes for which transfers could be had without payment, and a large degree of confusion to the public and loss to the companies would be the almost inevitable result. Granted that the establishment of a universal charge of 2 cents for transfers would serve in large measure to solve the acute financial situation of which the Third Avenue System now complains, it is by no means sure that there would be favorable financial results from the hit-and-miss promulgation of such a charge.

"It does not seem that there is any way of dealing with this fare, transfer and revenue situation on the Third Avenue surface lines, without the consent and co-operative action of the municipal authorities, which would not have the effect of driving away traffic and decreasing revenues. The surface lines of this and the other systems of the city are destined to face increasing difficulties in holding their business and commanding their share of the traffic; the installation of such a piecemeal charge as the existent legal limitations leave within the commission's power would bring disaster.

Must Deal With the City

"By these companies' own choice, the local municipality has both a power and a responsibility, and no resort to a fragmentary plan of charging for transfers should avail to enable these companies now to avoid dealing with the municipality as to the terms and conditions on which a modification as to fares will be permitted. The city may be unqualifiedly willing that an increased fare on all surface and rapid transit lines shall be temporarily charged; it may be willing to consent to such an increase in return for terms and concessions of present or future public advantage, or it may not be willing to release the companies from their contract obligations at all. The matter of terms rests with the municipality, because the companies wanted the franchise so much that they bargained on the subject of fares and agreed to be ever bound by a 5-cent limitation, at the city's option. When the franchise limitations no longer stand in the way, the companies may come to the commission for the fixation of a reasonable and adequate rate, notwithstanding statutory barriers.

"The petitioners and any other transportation companies which feel now the 'pinch' of rising costs, ought to consider whether, instead of coming forward at this time with an application for a radical and lasting readjustment in existing transfer systems and bases of fares, they ought not to confine themselves to frank, direct requests for emergency relief, carefully limited to the duration of the war.

"If transportation service is to be continued on any efficient or endurable basis, during the war and afterwards, the proper public authorities must squarely face and act upon their responsibility for conserving the corpor-

ate income of essential utilities, even through the granting, where necessary, of proper applications for emergency relief during the war period.

"An application for a temporary increase in rates for the purpose only of eliminating present deficits in operating revenue and restoring an obviously moderate return commonly earned in recent normal times, could ordinarily be determined without resort to property appraisals at a time when unit prices are unprecedently high and the cost of the requisite appraisal alone might approximate the yearly increase in revenue requested."

Objections to Zones Heard

A hearing was held at Pittsburgh on June 8 before W. D. B. Ainey, Chairman Public Service Commission of Pennsylvania, on the protest filed by the city against the fare schedule of the Pittsburgh Railways effective on June 20 which provides for an initial 5-cent zone in the business district of Pittsburgh with 2 cents in zones within restricted limits outside of that district.

Fred L. Franks, engineer of the City Transit Commission and witness for the city, suggested an alternative to the zone plan as proposed by the railway, but this was characterized by the attorney for the receivers as highly impracticable. The proposed zone system was also opposed by E. K. Morse, City Transit Commissioner. He said that, for one thing, the 5-cent zone as planned to be established by the company would stop two blocks short of practically the most important transfer point in the city. He was not opposed to the zone system as a system, but considered that the proposal of the company contained glaring inequalities.

After the company announced that it had closed its case, Commissioner Ainey addressed himself to the attorneys of the company saying that they had not made out a good case for the reintroduction of a double fare at night. This statement was generally construed as a notice to the railway that the commission would not allow it to re-establish the 10-cent night fare.

As an alternative to the 5 and 2-cent zones, it has been proposed that the fare be made 6¾ cents for all passengers through the sale of fifteen tickets for $1.

Trenton Service Case Concluded

Attack, defense and counter attack with the Trenton & Mercer County Traction Corporation, Trenton, N. J., the battle ground, featured the oral argument before the State Board of Public Utility Commissioners on June 11 in the application of the city of Trenton for improved railway service. Frank S. Katzenbach, Jr., who appeared for the company, in his review of the testimony submitted in the long-drawn-out case, declared that the company could not be charged with failure to give safe, adequate and reasonable service, while George L. Record, who as special counsel for the city, appeared with City Counsel Charles E. Bird, argued that the evidence had shown a breaking down in the system in the way of service. Martin P. Devlin, representing the labor unions, declared that the company has failed in its duty towards the people. The utility commissioners reserved decision.

Mr. Katzenbach raised a legal question relating to the commission's power in the present application to issue an order binding the leased lines making up the system controlled by the Trenton & Mercer County Traction Corporation. He argued that as the leased companies had not been made parties to the proceedings any order for improvements could not be carried out by the corporation without the consent of the leased companies. Another point he made was that if the city would meet the company's proposition as to street pavement the extension of the West State Street line to Trenton Junction would in all likelihood be agreed to by the company. He thought the company should be met by the city entirely in a spirit of fairness.

Transportation News Notes

Even in Sunny California.—The Stockton (Cal.) Electric Railroad has filed with the State Railroad Commission of California an application for permission to charge a 6-cent fare in Stockton.

Portland Case Set for June 18.—Arthur S. Benson, clerk of the Supreme Court of Oregon, announced on May 22 that the case of the city of Portland against the Public Service Commission of Oregon, known as the 6-cent fare case, has been set for hearing on June 18.

Kansas City Decision Expected by July 1.—David E. Blair, a member of the Public Service Commission of Missouri, is reported to have said that it is probable the commission will report before July 1 its findings on the Kansas City Railways application for an increase in fares.

Would Increase San Diego Fare.—The San Diego (Cal.) Electric Railway has applied to the State Railroad Commission for permission to raise fares. The application says that the company has paid no dividends since 1914 and that its surplus is rapidly being absorbed by expenses.

W. B. & A. Wants Three Cents a Mile.—The Washington, Baltimore & Annapolis Railroad applied to the Interstate Commerce Commission on June 15 for permission to raise its fares to 3 cents a mile, in conformity with the rate on steam roads, and to cancel all special and excursion rates.

Canadian Fare Cases Reviewed.—The *Canadian Railway & Marine World* for June, 1918, contains a review of sixteen cases in which increased fares are an issue on Canadian electric railways. Some of the more important of these cases have already been reviewed in the ELECTRIC RAILWAY JOURNAL.

Experiment with One-Man Cars Postponed.—The Public Utilities Commission of Utah at the request of the employees of the Utah Light & Traction Company suggested that the experiment with one-man operation be postponed until after the hearing on June 11 on the application of the company to charge 1 cent each for transfers.

Automobile Versus the Street Car.—Owing to the increasing number of accidents between automobiles and the cars of the Rhode Island Company, Providence, R. I., this company has issued an eleven-page circular asking the cooperation of drivers of gasoline-propelled vehicles. The material and illustrations in the pamphlet make it very clear that careless driving is the great automobile crime.

Fare Increase Proposed for Des Moines.—The Des Moines (Iowa) City Railway without waiting for permission from the City Council to increase fares will refuse to sell six tickets for a quarter. According to an announcement which has just been made the company will refuse to supply further orders of tickets and will await the injunction suit rather than placing the matter before the City Council.

Many Advanced Tariffs Filed.—There are fifty-nine utility companies in Pennsylvania which have filed with the Public Service Commission tariffs showing increases in their rates and fares on or about July 1. Among these are nineteen electric companies, ten electric railways, nine natural gas, six artificial gas, seven telephone, three water and one ferry, steam, sewage, baggage transfer and pipe line companies.

Municipal Line Would Increase Freight Rates.—Thomas F. Murphine, superintendent of Public Utilities of Seattle, Wash., has presented to the City Council a communication requesting that freight rates on the municipal railway to Lake Burien be increased. The rate schedule now in use was adopted three years ago. It had as its basis a schedule that had been in effect for ten years.

Men Join in Fare Plea.—Hearings have begun on the appeal of the Stark Electric Railroad, Alliance, Ohio, to the City Council for permission to increase its fares in that city. The union of employees has addressed the City Council in behalf of the company. The men "respectfully ask and implore you favorably to consider an ordinance allowing the Stark Electric Railway the privilege of increasing fares on city lines."

Would Increase Fares to Eight Cents.—The Northern Cambria Street Railway, Patton, Pa., has filed notice with

the Public Service Commission of Pennsylvania of its intention to increase fares from 5 cents to 8 cents. The property of the company was sold under foreclosure recently to the representatives of the bondholders. An account of the sale of the road under foreclosure was published in the ELECTRIC RAILWAY JOURNAL for May 11, page 933.

Skip Stops in San Diego.—By order of the United States Fuel Administration the skip-stop system has been placed in effect on route 1 of the San Diego (Cal.) Electric Railway between Fir Street and Mission Cliff Gardens, and between Twelfth and Market and Sixteenth and N Streets. On route No. 11 the plan is in operation between Park Boulevard Junction and Kensington Park. In as short a time as possible the system will also be placed in operation on routes numbers 5, 6 and 8.

City Commission Doubtful of Authority.—The City Commission of Battle Creek, Mich., has decided that it cannot legally grant the 6-cent fare requested by the Michigan Railway without first submitting the question to the people. As an alternative it is said the railway could decide to live up to the exact terms of the franchise which the commission has refused to amend. This would mean a straight 5-cent fare, with no transfer privileges, twenty minute service, and a 15-cent fare to the lake.

Grand Rapids Wants Six Cents.—The Grand Rapids (Mich.) Railway has petitioned the City Commission for permission to increase its passenger fares to 6 cents. The request has been referred to a special committee appointed by Mayor Gallmeyer. The application was presented on June 3. It was republished in full in the Grand Rapids papers over the signature of Benjamin S. Hanchett, president and general manager of the company, for the information of patrons of the company and the general public.

New Round-Trip Seattle-Tacoma Rates.—The Puget Sound Electric Company, Seattle, Wash., has filed with the Public Service Commission a new tariff for its round-trip passenger rates between Seattle and Tacoma and Seattle and Puyallup over its electric interurban lines. The new rate will be $1.50 for the round trip instead of $1.35 as at present, and include 11-cent war tax. This is an increase of 14 cents to the company and 1 cent for the government. The new rates are to become effective on June 24.

For Hire Jitneys Restrained.—In a recent decision the Supreme Court of Washington held that the Puget Sound Traction, Light & Power Company is entitled to an injunction against "for hire" jitneys operating under a Bellingham ordinance. The court held that the Bellingham city ordinance, which purports to give the jitneys authority to operate, is in violation of the State law, and that the temporary injunction should be kept in force until such time as the defendants comply with the bonding statute.

I. T. S. Would Cancel All Special Rates.—The Illinois Traction System has petitioned the Public Utilities Commission of Illinois for permission to cancel all thirty-day and special round-trip rates and commutation tickets. The company's petition cites the fact that it has had to stand increases in wages, cost of coal and all other materials in like proportion to the steam railways. It contends that only partial relief is requested, as it is not asking an increase in the present one-way passenger fare, which is based on 2 cents per mile.

Seven-Cent Fare for Wilmington.—An order permitting the Wilmington & Philadelphia Traction Company, Wilmington, Del., to increase its fares from 5 to 7 cents, effective from June 10, was made by the Public Utility Commission on June 5. Called upon by the City Council to explain its action the commission stated that the company is required to sell four tickets for a quarter. It is asserted that the report of an expert shows that the company is losing money and that if the city of Wilmington had not come to the aid of the company the government would probably take over the lines and charge such fares as it saw fit.

Tuscaloosa Wants a Six-Cent Fare.—The Tuscaloosa Railway & Utilities Company, Tuscaloosa, Ala., has asked permission to increase its rates on gas, electricity and electric railway fare. A committee of five representative citizens will be named to investigate the financial conditions confronting the company and to make such recommendations as the committee may deem advisable. The company wants a 6-cent fare. According to I. W. Ross, vice-president and manager of the company, the deficit of the company for 1917 was $32,000. Mr. Ross frankly stated that the first three months of 1918 convinced him that the deficit for the present year would be much greater than for the last year.

Women Conductors in Baltimore.—In an announcement made on June 5 the United Railways & Electric Company, Baltimore, Md., informed the public that it would place women conductors on some of its cars as soon as they could be recruited and trained. T. A. Cross, president of the company, in his statement, pointed out the growing difficulty of filling vacancies caused by men withdrawn for service in the army and navy and in munition and arms plants, and the necessity of calling upon women to fill these jobs. No men will be displaced. Women will be used only in such positions as are made vacant by men who leave. The women will be paid the same wages as men. Rest rooms and other conveniences will be provided. Women will be put in service only on prepayment vestibuled cars.

Increase in Tunnel Fare Postponed.—Announcement was made on June 8 from Washington that pending investigation no increase was to be made in passenger fares on the Hudson & Manhattan Railroad connecting Manhattan and the New Jersey shore. When announcement was made on June 6 that the Hudson tube fare would be increased to 10 cents for a single ride there was prompt criticism of the action in New York and New Jersey. The proposed increase was referred to in the ELECTRIC RAILWAY JOURNAL for June 8, page 1115. The increase was to have gone into effect on June 10. The determination to countermand the previous notice advising the public of an increase was announced late on June 8 by Wilbur C. Fisk, president of the Hudson & Manhattan Railroad, in the following statement: "We have been advised by the assistant director of the division of traffic that the Director General has decided that for the present no change should be made in the rates of fare of the Hudson & Manhattan Railroad, and that the subject will receive immediate careful study. Therefore, our tariffs covering the increased rate of fares have been withdrawn and there will be no change either in the rate of fare or in the method of collection until and when further orders are received from the Director General."

New Publications

Corporation Accounting

By R. J. Bennett, C. P. A. Ronald Press Company, 20 Vesey Street, New York, N. Y. 563 pages. Cloth, $3.

This new manual by Mr. Bennett covers in an excellent way the features of corporation law which the accountant should understand, and it presents in full detail the accounting technique of maintaining corporate accounts and records and preparing statements. The book is replete with practical points arising in all sorts of corporate situations, and illustrative entries, problems and exhibits are many.

Corporate Organization and Management

By Thomas Conyngton. Ronald Press Company, 20 Vesey Street, New York, N. Y. 778 pages. Cloth, $5.

This volume is a non-technical, practical and compact manual of corporation law and procedure for business men, corporation officials and attorneys. While business law is naturally affected by the continual changing of state laws, Mr. Conyngton's book gives as thorough and as up-to-date treatment of the subject as could be desired. It covers all phases of corporate organization and management, and is amply supplied with citations, precedents and working forms. The book is a revision of the author's "Corporate Organization" and "Corporate Management," superseding these widely-used works.

M. C. Brush to Turn Over Boston "L" to State

This Article Outlines the Stages of Mr. Brush's Career Which Led Logically to the Presidency of the Boston Elevated and to His Advocacy of the New Plan of Management

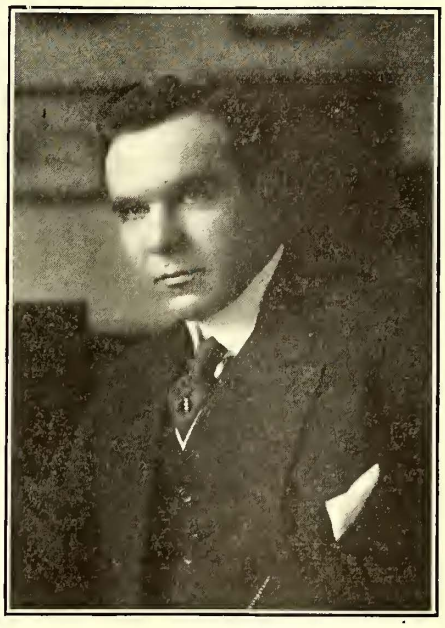
After two very strenuous and fruitful years in the presidency of the Boston Elevated Railway, Matthew C. Brush is about to turn the management of the system over to the commonwealth of Massachusetts which will manage it for at least ten years through five trustees. In thus arranging with the Legislature for the preservation of this important property during the crucial period which will exist until the public is willing to pay to private managers a reasonable price for electric railway transportation, Mr. Brush has accomplished the most important work in his transportation career. Through this accomplishment the rights of the investors will be conserved and the public will be furnished with the transportation which it desires. Mr. Brush will tender his resignation of the presidency to the trustees immediately upon their appointment in order that they may have a free hand in selecting their own executives. Obviously under the new scheme, which he advocated so ardently in the best interests of all concerned, he could not have the freedom of action which would be necessary to enable him to carry out his own ideas as to what is best for the further development of the property.

Mr. Brush has crowded so much of achievement into the seventeen years since he graduated from the Massachusetts Institute of Technology that a brief review of his career, summarizing in part what has appeared in previous issues of the ELECTRIC RAILWAY JOURNAL, cannot but prove stimulating to other ambitious young men who are planning for the future. It should also prove a worth-while object lesson to the industry as a whole.

Mr. Brush's career divides itself into three periods. The first of these was that in which he was acquiring a technical education and along with it experience in meeting people and in laying foundations for his later work in trying to furnish good transportation service. The second period was a short one spent in the mechanical departments of steam railroads in the West, where problems in maintenance of equipment and in management of men were studied. The third period, covering the past fourteen years, consisted in applying the previously acquired experience to the operating problems of electric railways.

Throughout his life Mr. Brush has had to work hard for what he got, and with very little outside assistance he put himself through the Armour Institute of Technology and the Massachusetts Institute of Technology, graduating from the former in 1897 and the latter in 1901. During his student days he worked at various capacities on the passenger boats operating on the Great Lakes, finally becoming purser on an important boat plying between Buffalo and Duluth. Here he learned important lessons in public relations, and also made many firm friends who were later of great assistance to him.

After graduation from "Tech" in 1901 he was employed in the Union Pacific repair shops at Omaha, Neb., becoming successively machinist, foreman and roundhouse foreman. Later he was with the Chicago, Rock Island & Pacific Railroad as general foreman in charge of roundhouses and shops of the company in western Kansas. All of this was accomplished in the space of two years.



M. C. BRUSH

In 1903 Mr. Brush began his service with electric railways, spending the best part of six years with the Boston Suburban Electric Company, whose service he entered in 1903 as assistant to the president. He was soon afterward elected vice-president. The year 1909-1910 he spent as general manager of the Buffalo & Lake Erie Traction Company. His connection with the Boston Elevated Railway dates back to the fall of 1910 when he was made assistant to the vice-president. In 1912 he became second vice-president and later received a virtual promotion when the two vice-presidents of the company were equalized in authority. He was elected to the presidency of the Boston Elevated Railway in 1916.

While with the Boston Suburban Mr. Brush had to struggle with the financial problems of the company and among these was that of securing greater income. He advocated the 6-cent fare. He was successful in improving greatly the financial status of the company, as well as establishing friendly relations with the public. The welfare of his employees also deeply concerned him, and he later was able to apply his ideas along this line in a broad way on the Boston Elevated System.

What Mr. Brush has done for the Boston Elevated Railway is fresh in the minds of the readers of this paper so that all that need be said now is that he has built up a compact organization, has made the public feel its interest in the welfare of the property and has secured a hearing for his progressive and comprehensive convictions as to how pressing problems of electric railway transportation must be solved. In 1914 after serving as vice-president for several years and as acting president for part of one year he became president of the American Electric Railway Transportation & Traffic Association, holding this position for one year. In 1917 he was elected to the board of directors of the Second National Bank, Boston, an honor which he very highly prized.

From what has been said it will be evident that Mr. Brush's career has been characterized by consistency and definiteness of purpose. Everything that he has done has contributed to his progress and to preparation for large executive responsibilities. He recognizes this fact and endeavors to impress upon those about him the importance of the doctrine outlined in his recent address to the Rhode Island Company Section of the American Electric Railway Association. Above all Mr. Brush attributes his success to his practice of forming and keeping friendships by showing a willingness to serve those with whom he comes in contact. While a purser on the Great Lakes he attracted the attention of passengers, among whom were several noted capitalists, by the way in which he addressed them and looked after their comforts during the voyage. A distinct influence upon his future work resulted from associations formed during these college-purser days.

Mr. Brush is but forty years of age and has been a general manager since he was not more than three years out of college. His career has been a brilliant one and should form a fitting preparation for even larger responsibilities than those he has just laid down. During his two years as president of the Boston Elevated Railway he has had the double task of supervising the operation of an enormous property under unprecedented difficulties, and on the other hand of dealing with the public in a comprehensive way and bringing to fruition a plan for insuring continuity of transportation service with justice to all concerned while the whole electric railway situation is confused. His work at Boston particularly has illustrated the progressive spirit which must animate the whole industry if it is to accomplish its best work.

Personal Mention

L. L. Campbell has been appointed assistant general auditor of the Illinois Traction System, Champaign, Ill., to succeed George R. McComb, recently appointed assistant treasurer.

H. E. Johnson has been appointed auditor of disbursements of the Illinois Traction System, Champaign, Ill., to succeed L. L. Campbell, who has become assistant general auditor of the company.

D. H. Shapiro has been appointed private secretary to Frank R. Coates, president of the Toledo Railways & Light Company, Toledo, Ohio. He succeeds A. H. Stocksteil, who is now secretary of the Doherty Men's Club, Washington, D. C.

C. R. McMahon has been appointed master mechanic of the Des Moines City Railway and the Inter-Urban Railway, Des Moines, Iowa. He was formerly connected with the Utah Light & Traction Company, Salt Lake City, Utah.

E. B. Smith, formerly with the Arkansas Valley Railway Light & Power Company, Pueblo, Col., has been appointed auditor of the Muskogee Gas & Electric Company, Muskogee, Okla., succeeding J. H. Schmidt, who has recently resigned to enter business for himself.

Charles T. Doerr, purchasing agent of the Birmingham Railway, Light & Power Company, has resigned to accept an assignment as local purchasing agent, stationed in Birmingham, Ala., for the Air Nitrates Corporation, agents for the United States government in the construction and operation of the nitrate plants at Sheffield, Ala.

L. G. Mann, secretary to P. S. Arkwright, president of the Georgia Railway & Power Company, Atlanta, Ga., and a short time ago elected assistant secretary of the company, has been called to the Naval Reserve. Mr. Mann volunteered for the service some time ago and was accepted, but he continued his duties while waiting to be called for service.

Isaac W. Gross has resigned from the motive power department of the New York (N. Y.) Railways to become New York manager of the General Devices & Fittings Company. He became connected with the New York Railways immediately after his graduation from Harvard University in 1911 with the degree of electrical engineer. At the time of his resignation from the railway, and some years prior, he was in charge of all electrical investigations. He also had charge of all the electrical testing in the department and general company illumination.

George R. McComb has been appointed assistant treasurer of the Illinois Traction System, Champaign, Ill., to succeed W. H. Carnahan, deceased. Mr. McComb entered public utility work in 1901, when he took charge of the office of the Consumer's Heat & Electric Company, Bloomington, Ill. In 1905, when this company and a competing company were acquired by the Illinois Traction Company and consolidated he retained charge of the office of the combined property. In 1909 he was transferred to Champaign, where he has held various positions in the general accounting department of the Illinois Traction System to the present.

Darton L. Babcock has joined the auditing department of the J. G. White Management Corporation, New York, N. Y. After spending several years in the service of banking institutions in Binghamton, N. Y., and New York City, Mr. Babcock entered the public utility field as an accountant. In 1915 he became connected with A. B. Leach & Company, New York City, being placed in charge of their accounting and financial routine. In 1916 he was appointed manager of the Cincinnati office of W. E. Hutton & Company, stock brokers, from whose employ he resigned to join the staff of the J. G. White Management Corporation.

F. L. Hinman, who for the past five years has been master mechanic of the New York State Railways, Syracuse lines, today severs his connection with that company to become associated with the United States Ordnance Department with headquarters at Watervliet Arsenal, Watervliet, N. Y. Mr. Hinman has had a very consistent career in electric railway work covering a period of fifteen years. He has had large plans for equipment maintenance on the Syracuse lines, and has exercised ingenuity in devising ways and means for cutting down costs. The articles which he has contributed to this paper from time to time indicate the direction in which his chief interests lie. He has also co-operated in the preparation of articles to which his name was not attached. He has been particularly successful in his relations with the numerous mechanics under him by his constant endeavor to assist them in making the most of themselves. Beginning as apprentice in the Syracuse Rapid Transit Company shops, he was successively a general mechanical shop and power-house assistant with the Auburn & Syracuse Electric Railway, at Auburn, and storeroom clerk, storekeeper, chief clerk to chief engineer W. J. Harvie, general mechanical foreman and finally master mechanic with the Rapid Transit Company and its successor, the New York State Railways, at Syracuse. This experience should have fitted him admirably for the mechanical and stores phases of ordnance work.

Oscar S. Straus, chairman of the Public Service Commission for the First District of New York, has notified Governor Whitman that he desires to retire from his office not later than July 1, next. Mr. Straus became chairman of the commission on Dec. 20, 1915. He refused to accept the place for the full five-year term, and it was understood that he would retire at the expiration of two years. He explained then that the work he had been called upon to do was finished, but his objections were overcome, and the Governor obtained from him a promise to remain for a while longer. The commission, since he has been its chairman, has been entirely reorganized, both regarding its personnel and its methods of doing business. The most important of the new rapid transit lines are in operation, and on July 1 or a short time thereafter the two lines on Seventh Avenue and Lexington Avenue will probably be running. During his tenure of office as chairman, Mr. Straus has taken a prominent part in the settlement of many labor disputes and has worked indefatigably to bring about the early completion of the new dual system of rapid transit. Mr. Straus was born in 1850. He was graduated from Columbia University in 1871. Later he practiced corporation law for a time. Then he began a career in diplomatic and public life, during which he was honored by appointment to foreign diplomatic posts by three Presidents and served under another in the cabinet. In 1912 he was the nominee of the progressives for Governor of New York State.

Obituary

Charles F. Freeman, aged sixty-three years, former president of the Rapid Transit Street Railway, Dallas, Tex., known as the South Belt Line, died at a sanitarium in Dallas on May 30. Mr. Freeman helped to organize the Rapid Transit Company and was president of the company up to the time the property was sold to Stone & Webster.

Alfred R. Miller, treasurer of the Canadian Westinghouse Company, Hamilton, Ont., is dead. Mr. Miller entered the service of the Canadian Westinghouse Company, as bill clerk in 1897, was promoted consecutively to head bookkeeper in 1903, acting assistant treasurer in 1904 and assistant treasurer in 1907. He has been treasurer of the company since 1917.

Nils M. Thorsson, assistant purchasing agent of the Chicago (Ill.) Surface Lines since 1914, died on June 6 at the age of fifty-one years. For twenty-five years previous to 1914 Mr. Thorsson was employed by the Chicago Railways, a predecessor of the present system, in the purchasing department, part of the time as purchasing agent of that company.

Arthur B. Hicks, for five years special agent for the Puget Sound Traction, Light & Power Company, Seattle, Wash., in the detection of crimes against the company's property, died in Seattle on May 24 from spinal meningitis. Mr. Hicks was born in Rose, La., forty-two years ago. He had been in the employ of the Stone & Webster interests, in various capacities, for more than fifteen years.

C. W. D. Miller died at his home in Cakland, Cal., on May 31. Mr. Miller, A. H. Pomeroy and A. W. Bishop organized the Berea (Ohio) Street Railway. Later this company was succeeded by the Cleveland & Berea Street Railway, which is credited with constructing the first interurban railway in the country. The line connected Cleveland and Berea and formed the basis of what is now the Cleveland, Southwestern & Columbus Railway. The original company also built lines at Sandusky and Mount Clemens, Mich. In 1896 Mr. Miller's health compelled him to give up his business in Ohio and he moved to Santa Barbara, Cal., where he purchased a local railway operated by mules and afterward arranged for the change in the motive power to electricity.

Charles Harvey Hile, secretary of the New England Street Railway Club and editor of its official publication, the *Street Railway Bulletin*, since Oct. 25, 1917, died at his home in Boston, Mass., on June 4, at the age of fifty-four. Mr. Hile was best known for his connection with the Boston Elevated Railway over a period of about twenty years, where he ultimately became assistant to the vice-president and then chief of maintenance. He was graduated in 1892 from the Pennsylvania State College, taking the mechanical engineering course, and later took a post-graduate course in electric railway engineering at the University of Wisconsin. He saw service in the organization of the Philadelphia Traction Company before going to Boston. In 1910-1911 he was president of the New England Street Railway Club. During the past few years Mr. Hile's health has been precarious, and about a year ago he spent a protracted leave of absence at Washington, D. C., in hopes of regaining it. His kindly personality, breadth of technical knowledge, and wide acquaintance with men in the electric railway field in New England combined to render his appointment as secretary of the club last year peculiarly fortunate. During the short period of his secretaryship he did much to improve the appearance and make-up of the club paper and to stimulate the interest of the membership in public relations. Mr. Hile had a host of friends in engineering and electric railway circles who feel his passing to be a personal loss. Representatives of the ELECTRIC RAILWAY JOURNAL bear tribute to his cordial co-operation in all matters affecting club publicity. The impress of his quiet but constructive work will be felt for a long time in the affairs of the club.

Construction News

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

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

Recent Incorporation

***Foster Traction Company, Elkhart, Ind.**—Incorporated at Indianapolis to operate the line of the St. Joseph Valley Traction Company. Capital stock, $10,000. Directors: W. H. Foster, William E. Wider, Marion E. Brady, Eugene Atkins and Joseph Kies

Franchises

Oakland, Cal.—The city of Oakland has authorized the construction by the Emergency Transportation Company of a line connecting the plant of the Moore & Scott Iron Works shipbuilding plant with the San Francisco-Oakland Terminal Railways on Eighth Street. The line will be single track, for the use of the 6000 men employed in the shipyards. Under the plan agreed upon, the United States Shipping Board will furnish the funds and will control the line, while the materials will be furnished by the San Francisco-Oakland Terminal Railways. The total cost of construction will be $20,000. W. R. Alberger, vice-president and general manager of the San Francisco-Oakland Terminal Railways, is president of the Emergency Transportation Company. [May 18, '18.]

Dallas, Tex.—The Dallas Railway has received a franchise from the City Council to construct new track on Jefferson Street from Commerce Street to Young Street.

Track and Roadway

Little Rock Railway & Electric Company, Little Rock, Ark.—This company reports that it expects to construct 1 mile of track, material for which has been purchased.

British Columbia Electric Railway, Vancouver, B. C.—Work has recently been completed by the British Columbia Electric Railway on the rehabilitation of its line from New Westminster to Chilliwack, which was badly damaged by storms and floods during the past winter.

Pacific Electric Railway, Los Angeles, Cal.—The Pacific Electric Railway is constructing about 6500 ft. of second track on its line between Long Beach and Wilmington. This line is approximately 7 miles long and connects Long Beach and San Pedro harbors. Double-tracking is taking place on that portion of the line most needed, while the balance of the single track line will be improved with the installation of a three-position all-electric automatic block signal layout. This improvement is being made in the interest of moving with dispatch large numbers of laborers employed in shipbuilding plants located at Long Beach and Los Angeles harbors and to facilitate the movement of freight trains without interruption to passenger schedules. The company recently placed in operation 3030 ft. of second track on its Gardena-San Pedro line at Los Angeles harbor to facilitate more expeditious dispatching of passenger trains handling some 4000 employees engaged in the Los Angeles Shipbuilding & Drydock Company's plant, and to increase facilities for more adequately handling carload shipment of construction material for various industries located in the West Basin of the Los Angeles harbor. The company also recently completed and placed in operation approximately 15,000 ft. of second track on its Los Angeles-San Bernardino line. This line accommodates some of the heaviest running schedules of any line on the system.

Ocean Shore Railroad, San Francisco, Cal.—This company reports that it will install a Nachod highway crossing signal.

Gary (Ind.) Street Railway.—An extension will probably be built by the Gary Street Railway on East Fifth Avenue to the Aetna guncotton plant, 2 miles east of Broadway.

Louisville (Ky.) Railway.—A report from the Louisville Railway states that the company plans to reconstruct about 3 miles of single track during this season.

Attleboro, Mass.—A bill has been signed by Governor McCall permitting the city of Attleboro to purchase and operate portions of the defunct Taunton & Pawtucket Street Railway within the city limits. Work will be begun at once repairing the road from Attleboro to Briggs Corner.

Boston (Mass.) Elevated Railway.—Operation has been begun on the extension of the Boston Elevated Railway from Summer Street extension to the South Boston Fish Pier.

Duluth (Minn.) Street Railway.—Plans are being made by the Duluth Street Railway to extend its lines from South Superior to Oliver.

Independence, Mo.—The city of Independence, Mo., by private subscription of business men, is arranging for the location of an electric line from Independence to Sugar Creek, the latter being a

small industrial settlement with a cement plant and refinery about a mile and a half from Independence. About $13,000 of the estimated total of $50,000 for the construction of the line has been subscribed. The Kansas City Railways Company will construct and operate the line. A preliminary survey has been made.

Portsmouth, Dover & York Street Railway, Dover, N. H.—The Public Utilities Commission of Maine has rendered a decision declaring that the Great Works bridge in the town of South Berwick is unsafe for street railway use and that repairs must be made. The materials for such repairs are to be furnished and the labor performed by the Portsmouth, Dover & York Street Railway.

Public Service Railway, Newark, N. J.—A contract has been awarded by the Public Service Railway to the Eastern Construction Company, Brooklyn, N. Y., for the construction of an extension on Chestnut Street, Newark, a distance of about ½ mile.

New Jersey & Pennsylvania Traction Company, Trenton, N. J.—Extensive repairs are being made by the New Jersey & Pennsylvania Traction Company to its bridges across the Delaware River at Calhoun Street. New planking is also being laid between the tracks crossing the structure.

International Railway, Buffalo, N. Y.—Operation has been begun by the International Railway on its new fast service line from Buffalo through Tonawanda, North Tonawanda, Gratwick and La Salle to Niagara Falls.

Interborough Rapid Transit Company, New York, N. Y.—The opening of the new Seventh and Lexington Avenue subways has been postponed until about July 15. Recently the Public Service Commission for the First District of New York announced that the lines would be opened to the public on June 15, but complications have made it necessary to set the date forward at least a month. One of the most important changes that will take place in the operation of the subway system when these two new lines start running will be the diverting of travel from the Grand Central subway express station to the new Times Square subway express station. Broadway trains will then cease running across Forty-second Street to the Grand Central Station. They will proceed down Seventh Avenue past the Pennsylvania Station, and uptown trains to be had at Fulton Street, Astor Place, Thirty-third Street, or any of the subway stations south of Grand Central will not cross over to Times Square, but will curve into and proceed up Lexington Avenue.

Union Railway, New York, N. Y.—The franchise committee of the Board of Estimate has denied the application of the Union Railway for permission to give up the construction of a trolley line to connect the present Union Railway line with the Dyckman Street Ferry. The committee requested that the work on the new line be completed within six months. The new line is to begin at the 207th Street bridge, extend to Nagle Avenue, thence south to Dyckman Street and west to the ferry.

Sandwich, Windsor & Amherstburg Railway, Windsor, Ont.—This company proposes to divert about 3 miles of its line through the property of the Canada Steel Company, near Ojibway, Ont., by moving the line back about ½ mile. It also plans to lay a second track on a portion of this diverted line during the summer.

Philadelphia, Pa.—The committee on street railways of the City Councils of Philadelphia has reported favorably on an ordinance authorizing the Philadelphia Railways to construct an extension from its southwestern trolley line to the Hog Island shipbuilding plant. The Emergency Fleet Corporation will finance the extension and be reimbursed by the company later.

Hull (Que.) Electric Company.—Work has been begun by the Hull Electric Company on the double-tracking and paving of its line on Montcalm Street from Aylmer Road to Montclair Avenue and the Chelsea Road, about 1½ miles.

Dallas, Tex.—The Texas Electric Railway, the Dallas Railway Company and the Northern Texas Traction Company have ordered a carload of standard steel ties from the Standard Steel Tie Company of Dallas, and will make a thorough test of these ties under local conditions.

Dallas (Tex.) Railway.—The City Commission of Dallas has issued an order directing the paving of Beacon Street from Columbia to Tremont. Of the cost, the Dallas Railway must pay $4,834 and the city and property owners the balance.

Orange, Tex.—Announcement has been made by officials of the Chamber of Commerce of Orange that negotiations are under way and are near consummation which will insure a street railway system for Orange. It is understood that the Stone & Webster Corporation is considering installing car lines in Orange to serve the shipyards and other industries.

Seattle (Wash.) Municipal Street Railway.—The Board of Public Works of the city of Seattle will come to a decision in the near future as to the clearances to be allowed steam railway tracks over which the elevated structure of the Seattle Municipal Street Railway will pass in the industrial district. The question is in the hands of a special committee of the board, consisting of Thomas F. Murphine, superintendent of utilities, City Engineer Dimock and Charles R. Case, superintendent of streets. Railroad men and engineers, including W. E. Weeks, safety appliance engineer, employed by the government railway administration, argue strongly for a 9-ft. clearance. Such a clearance would add about $16,000 to the cost of the elevated line. The clearance plan at present calls for a clearance of 8 ft. on straight line and 80 ft. 6 in. on curves.

Power Houses and Substations

Los Angeles (Cal.) Railway.—The Los Angeles Railway has just ordered two General Electric and two Westinghouse 1500-kw. commutating pole, self-starting rotary converters, together with the necessary 50 cycle, 15,000-volt oil-insulated, self-cooled transformers. These machines will replace equipments intended for stand-by service.

Wilmington & Philadelphia Traction Company, Wilmington, Del.—It is reported that the Wilmington & Philadelphia Traction Company will apply to the War Finance Corporation for a loan to assist in the installation of two new boilers and also for the installation of a rotary converter in the company's plant, as recommended by the Public Utilities Commission.

Manhattan City & Interurban Railway, Manhattan, Kan.—A report from the Manhattan City & Interurban Railway states that it expects to purchase a second-hand 200-kw. rotary converter.

Kansas City (Mo.) Railways.—A contract has been awarded by the Kansas City Railways to L. Breitag & Son Construction Company, Kansas City, for the construction of a new substation, 43 ft. x 82 ft., at a cost of $25,000.

Portland Railway, Light & Power Company, Portland, Ore.—Projects of the Portland Railway, Light & Power Company to increase the power facilities in Portland by development of water rights on the Clackamas River, involving an expenditure of $1,550,000, have been approved by John R. Lewis, state engineer. One of the projects approved is for the appropriation of 667 second-feet of water, together with the waters of the Clackamas River for development of 10,000 hp. The proposed plans will involve the construction of a flume 4 miles long, with a power plant, to cost about $1,250,000. Another application calls for the construction of the Timony Meadows reservoir on Oak Creek in Clackamas County of 40,400 acre-feet of water. This project includes the construction of a dam 80 ft. high and 440 ft. long, to cost about $300,000. These projects were started by the company several years ago and later dropped.

Chambersburg, Greencastle & Waynesboro Street Railway, Waynesboro, Pa.—Construction has been begun by the Chambersburg, Greencastle & Waynesboro Street Railway of a large new steel tower to be located near the new building of the company just completed in East Main Street. The tower will be fed from Security, Md.

Puget Sound Traction, Light & Power Company, Seattle, Wash.—A permit has been granted to the Puget Sound Traction, Light & Power Company for the erection of a reinforced concrete smokestack, 225 ft. high, to cost about $15,000.

Manufactures and the Markets

DISCUSSIONS OF MARKET AND TRADE CONDITIONS

FOR THE MANUFACTURER, SALESMAN AND PURCHASING AGENT

ROLLING STOCK PURCHASES • MARKET QUOTATIONS • BUSINESS ANNOUNCEMENTS

Southeastern Roads Not Buying Much

Spotty Purchases Bring Totals Lower Than Previous Year—Operating Costs Increased

A survey of the street railway field covering the Southeast, together with information obtained from manufacturers, indicates that practically no large apparatus is being bought. A few inquiries are in circulation for the exchange of old car equipment for new, but it is not expected that any transactions along this line will be consummated now, as the occasion is not propitious even though the new equipment would effect operating economies. While the volume of sales for maintenance and upkeep materials covering the entire section remains comparatively steady, hand-to-mouth and spotty buying has tended to force the total to lower levels than those reached during the same period last year.

Not a few companies have reached their capacities and little or no reserve remains, which certainly leaves narrow margins to work on when the present factory and transportation conditions are taken into consideration. There are a number of properties that would like to install additional generating capacity and order new rolling stock, but in most of these instances earnings are not sufficient, and relief in the way of increased fares is coming slowly. The utilities are hedged around with numerous difficulties such as a scarcity of money with accompanying high rates of interest; increasing cost of materials and labor, the latter hard to secure; increasing operating ratios where the margins are growing less each day.

From data secured up to and including February, 1918, on operating revenues and expenses covering the so-called Southern district, south of the Potomac and east of the Mississippi, operating ratios have increased 4.33 per cent over the same period in 1917.

Although the Capital Issues Committee has advanced funds to several utilities so far, the tendency toward decreased net revenues does not look encouraging for any great measure of financial relief from this quarter, in view of the fact that the committee requires a strong financial report before lending the necessary funds.

The labor item is especially acute at cantonment centers and coastal cities where new shipyards are being located. Ordinarily unskilled labor at these points was plentiful at $1.50 per day, but it is almost impossible to get workmen now for $2.50 per day. This condition is to be expected when shipyards will pay 40 to 60 cents per hour for the same class of workmen. It has been reported that there have been times when schedules were curtailed owing to the shortage of platform crews, combined with the lack of shopmen and inspectors.

Production of Bituminous and Anthracite Coal

Improved Transportation Conditions Result in Increase of Weekly Output —Efforts for Clean Fuel

For the week ending June 8 the production of bituminous coal showed a decrease, for the period closing June 1 of 1,025,000 net tons or 8.7 per cent. The output of soft coal (including lignite and coal made into coke) is estimated at 10,774,000 net tons as compared with 11,779,000 net tons during the week of May 25, according to estimates furnished by the United States Geological Survey. The operators reporting produced 77 per cent of total production or 92 per cent of total rail shipments. These 5072 mines were operated to 75.8 per cent of their present capacity, while the mines reporting for the week ended May 18 were operated at 76 per cent. It will be noted that the increase in production for the week ended May 25 compared with the week of the 18th amounted to 0.7 per cent, whereas the per cent of present capacity as reported by the operators decreased 0.2 per cent. In all fields increased production is attributed mainly to improved transportation conditions.

The Federal Fuel Administration has just issued regulations governing the preparation of bituminous coal. Anthracite coal has been inspected for a long time and is being carefully prepared to insure good fuel. Certain shippers of "snow bird" coal from the anthracite region have been stopped by the local administrators, greatly to the satisfaction of the anthracite industry, for the anthracite operators are insistent for clean coal for the consuming public. In every contract between operators and miners, as agreed to and upheld by the United Mine Workers, there is a penalty on miners who load impurities with coal that could reasonably be kept out.

It would take a miracle to get 100 per cent perfect production of anthracite and this the Fuel Administration is aware of and fully recognizes without undue comment. Anthracite compares well in preparation with any other product of large consumption.

Pressure of Conditions in Small Tool Market

Cogent Remarks by a Leading Manufacturer—Distribution of Products on an Even Basis

At the convention in Cleveland, Ohio, on May 15, 16 and 17 of the Supply & Machinery Industry Manufacturers, several interesting addresses were delivered. One of the prominent manufacturers in the small tool field, Richard T. Law, sales manager of the Standard Tool Company, Cleveland, in speaking on the war situation called attention to certain prevailing conditions by saying:

"If the increased demand for small tools had been uniform it would have been a comparatively simple problem, but it wasn't. On some sizes the demand has remained about the same, on others the demand has increased 400 and 500 times. When you stop to consider that the machinery we use is not to be found in the open market, but must be made in our own shop, you have some idea of the magnitude of the work.

"Some sizes we carry in stock, others we have orders ahead for fourteen months. Formerly we kept 30,000 sizes and kinds of tools in stock, but not so to-day. So anticipate your needs as much as possible. It is well to be cautious for the future is obscure. This is not a good time to speculate. The products should be distributed evenly and where they will do the most good. The war industries and government are coming in for large amounts. Do not wait until you are out for a thing before ordering. It is the man who has kept ordering small orders month after month and has had the goods gradually dribbling through all the time that is selling the small tools to-day."

Railway Motor Market Conditions

Regular Sizes Easier to Obtain on Short Delivery—Accumulated Stock Reports—Price Changes

With the buying of electric railway equipment generally estimated on a minimum scale, the supposition was indulged in that a stock of railway motors had been gradually accumulating. This led to a special inquiry on the part of the ELECTRIC RAILWAY JOURNAL, with diverse results. One of the companies which manufactures this class of equipment stated, through the chief of its railway department, that the stock of railway motors is

nil. No accumulation had been attempted during the lull in buying, other work of more immediate and pressing importance being given attention. Each order for railway motors was special, and its acceptance, completion and shipment was subject to individual treatment at the factory. Deliveries could not be promised under six or eight months, unless a priority order was forthcoming.

Another company of equal reputation stated it was surprising how many railway motors were being bought. A number of traction companies were rapidly discarding their old equipment, replacing it with improved devices, especially in motors.

Deliveries of motors of 40 hp., the same company declared, could be made out of stock in from six to eight weeks, which would be considered a hurry order. Special motors could not be shipped under a year. This company has a large if not a greater accumulation of motors on hand at present than in normal times.

Within a year prices on railway motors have advanced from time to time. Since the war the figures have gone up 75 per cent. During the last six weeks an increase of 10 per cent was made by one manufacturer. This is supposed to be about as high as this class of equipment will go, but manufacturers who were consulted were not altogether positive as to what may occur in the future, considering the position of steel and other essential material. Another 10 per cent price increase was announced by all the principal motor manufacturers.

Women Employees in a Railway Supplies Plant

Skilled Men Desert Posts for Higher Wages—Acute Conditions Relieved by Female Substitutes

It is doubtful whether any one place has been so disrupted by labor troubles and shortage as Philadelphia, Pa. The belief is that every industry has been made to feel what the loss of skilled workmen means. In Philadelphia, however, and its tributary territory, so many important war industrial enterprises—publicly or privately owned and conducted—of great magnitude, needing thousands of employees, that every other manufacturing concern has had its factory staff drawn upon. The draft almost crippled some plants and others are kept in operation only by the employment of women.

Of course, this is no innovation. Other firms elsewhere have gradually been taking on women operatives more or less to their advantage. The Electric Service Supplies Company, Philadelphia, whose transactions prior to the war with traction roads and power houses was 85 per cent of its business and is still 35 per cent, which is considered very satisfactory, has had a peculiar experience. The company has an unusually attractive plant from the point of air, light, perfect ventilation and location. Before the great shipyards, munition plants, powder mills and other war activities were in full swing the company had a corps of skilled machinists and metal workers equal to that of any plant in the electrical field.

When the Hog Island and other shipyards in the vicinity were offering unheard-of wages, the men deserted almost in a body. A few returned who had been rejected as not measuring up to the high standard of competency established by the ship workers. One of the munition plants in the neighborhood seeking high grade steel workers and machinists kept the Electric Company figuring how it could retain a few, at least, of the men actually needed by meeting any reasonable advance in wages.

Even common, unskilled labor, retained for physical work only, is receiving from $3 to $3.50 a day. At that men are hard to get and hold.

With all its trouble and determination to keep the plant operating at 100 per cent efficiency, in the meantime having received a number of large government contracts, the company displayed no rancor toward its old employees. It started in to fill the gap by employing women. A few weeks ago a number of girls were engaged for light work. Everything in the way of proper surroundings was provided. A special matron was employed to look after the physical well-being and comfort of the women. Rest rooms were set aside and equipped, as they are necessary and desirable. Careful instructions were given by competent men and in a remarkably short time the girls were found to be more adaptable and efficient than the men who had preceded them. While learning a fair wage is paid to the women, and when competent to assume the task, workmen's full compensation is accorded. This alone greatly pleases the female operatives.

Much to the company's surprise it found the new workers more conscientious and painstaking than men. More real interest is shown in the tasks allotted. Their usefulness is gradually being extended, stamping machines are being operated and other work assigned them in which women's natural deftness and intelligence is peculiarly fitted.

Their skill and the general results are reported as very satisfactory and gratifying. The conduct and appearance of the men about the plant has also undergone a transition with the presence of the girls. The improved deportment of the men is also a source of gratification. With this agreeable experience, the company is making arrangements to employ a large number of women in every department where their physical capacity will not be overtaxed.

This testimony to the worth of women in manufacturing plants is supported by the declaration of other firms in the electrical line elsewhere. Not only in Philadelphia, but in many other communities the labor situation continues tense and is growing worse.

Rolling Stock

Nipissing Central Railway, North Cobalt, Ont., Canada, expects to purchase one snowplow.

Manhattan City & Interurban Railway, Manhattan, Kan., is in the market for second-hand airbrake equipment.

Pacific Electric Railway, Los Angeles, Cal., controlled by the Southern Pacific Company, has ordered twenty safety cars from the American Car Company, with delivery in August.

Boston (Mass.) Elevated Railway has placed an order for six double-truck sweepers with the Russell Car & Snow Flow Company, Ridgway, Pa. Delivery is to be made in the fall.

Gary (Ind.) Street Railway, reported as being reorganized from the Gary & Interurban Railroad Company, is said to be contemplating the purchase of ten new cars for city service. Recently the company acquired six double-truck center-entrance cars—two motors and four trailers—of all-steel construction.

Richmond Light & Railroad Company, New Brighton, S. I., N. Y., is making preparations for buying twenty new cars of the closed type. Specifications are now being prepared and the order will be placed by the United States Shipping Board, Emergency Fleet Corfor serving the shipyard on Staten Island is considered inadequate for the extraordinary service required. Twelve open cars are now used, this number soon to be increased to twenty.

Inter-Urban Railway, Des Moines, Iowa, has a 70-ton electric locomotive on order with the Westinghouse Electric & Manufacturing Company, East Pittsburgh, Pa. This road's new locomotive equipment now includes two from the Westinghouse Company of 60-tons and 70-tons weight respectively, and one General Electric locomotive of 55 tons.

Boston (Mass.) Elevated Railway furnishes the following partial specifications for the 200 motor and 100 trail-cars under consideration, as previously mentioned in this paper.

Number of cars under consideration	200 motors, 100 trailers
Name of road	Boston Elevated Railway
Type of car	Center entrance passenger
Seating capacity	Motor 58-60; Trailer, 62
Weight (total)	Motor 44,000 lb.; Trailer 26,000 lb.
Bolster centers, length	24 ft. 0 in.
Length over bumpers; motor	48 ft. 9½ in.
Trailer	48 ft. 2⅝ in.
Width over all	8 ft. 8¾ in.
Height, rail to trolley base	11 ft. 6½ in.
Body	Semi-steel
Interior trim	"Aero" metal-sash trim bronze
Headlining	Agasote
Roof, arch or monitor	Monitor
Couplers	Tomlinson
Designation signs	Hunter-Keystone
Door-operating mechanism	Pneumatic
Fare boxes	International Register Co.
Trolley catchers	Q. P. Signal Co.
Wheels (type and size)	25 in. steel

New Advertising Literature

Computer Manufacturing Company, San Francisco, Cal.: Folder, illustrated, describing the Ross precision computer, which multiplies and divides numbers instantly.

Combustion Engineering Corporation, New York, N. Y.: Bulletin C1, illustrating various installations of the method and operation of the "Coxe Stoker," the title of the pamphlet.

Wheeler Condenser & Engineering Company, Carteret, N. J.: Bulletin showing the Wheeler-Balcke cooling tower in numerous designs and capacities varying from a few thousand gallons per hour to nearly a million gallons per hour. Several pages are also devoted to the Wheeler-Barnard forced-draft cooling tower. The booklet is well illustrated with actual installations.

O. M. Edwards Company, Syracuse, N. Y.: Catalog H on trapdoors and fixtures. Illustrates different types of the Edwards all-metal trapdoor for steam and electric railway cars, including a new type of adjusting bracket and plug for trapdoors by which a very fine adjustment of the spring on these doors is obtained. The trapdoor lock, design H, is also shown. Views are given of several electric cars equipped with these doors.

G. & W. Electric Specialty Company, Chicago, Ill.: Catalog describing and illustrating its several distribution specialties. In this bulletin series cut-outs, filling compounds, ground-pipe caps and points, primary cut-outs and fuses, line disconnectors, cable and conduit hangers, outlet hoods, potheads, subway cut-outs, distribution boxes, switching boxes, spice boxes and tap boxes are described.

Ford, Bacon & Davis, New York, N. Y.: Illustrated description of Strawberry Dam on the south fork of the Stanislaus River, Cal., belonging to the Sierra & San Francisco Power Company. The structure is said to be the largest of its type in the West, namely a granite rock-filled dam, sealed with a reinforced-concrete apron and concrete toe wall to bed rock. The structure was designed and the construction supervised by Ford, Bacon & Davis.

Drew Electric & Manufacturing Company, Indianapolis, Ind.: A complete and comprehensive catalog describing and illustrating its overhead line material and electric railway specialties. It is known as catalog No. 18 and contains specifications and photographs of splices, trolley frogs, trolley crossings, adjustable crossings, section insulators, approachers, triple-beam insulators, pole brackets, line suspensions, feed-in hangers, insulated hangers, cap-and-cone hangers, globe strain insulators, giant strain insulators, standard insulated bolts, porcelain strain insulators, etc. It also contains various accessories used on electric railways. High voltage porcelain insulators are extensively treated and diagrams are given illustrating construction and sizes. Glass insulators are also described and illustrated.

Trade Notes

Railway Improvement Company, New York, N. Y., announces that it has received an additional order for eleven Eico coasting recorders from Stone & Webster for the Houghton (Mich.) County Traction Company.

The Parr Terminals Company, Wilfred N. Ball, engineer, 225 First National Bank, Oakland, Cal., desires manufacturers, jobbers and distributers to send him catalogs and other data on electrical materials or equipment used in the construction of piers, warehouses, industrial buildings, belt line railways and street work, cargo handling equipment; general shipyard and machinery equipment.

Liberty Steel Products Company, Inc., New York, with offices in the Woolworth Building, announces the appointment of J. W. Weinland, formerly manager of the brake-beam department of the American Steel Foundries, as district manager in charge of the Western sales office which has been opened at 1901-1903 McCormick Building, Chicago. The company also announces that S. W. Midgley has been appointed a special representative in the Western railroad sales department of the company. Mr. Midgley has been connected with railroad supplies during the last sixteen years in the sales departments of the National Car Coupler Company, Curtain Supply Company and Acme Supply Company.

NEW YORK METAL MARKET PRICES

	June 5	June 12
Copper, ingots, cents per lb	23⅛	23⅛
Copper wire base, cents per lb	26½ to 26¾	26½
Lead, cents per lb	7⅛	7.25
Nickel, cents per lb	40	40
Spelter, cents per lb	7⅛	7.62½
Tin, Chinese,* cents per lb	.90	.92
Aluminum, 98 to 99 per cent., cents per lb	†33.00	†32.00

* No Straits offering. † Government price in 50-ton lots or more, f.o.b. plant.

OLD METAL PRICES—NEW YORK

	June 5	June 12
Heavy copper, cents per lb	22	22
Light copper, cents per lb	19½	19½
Red brass, cents per lb	19	19
Yellow brass, cents per lb	13	13
Lead, heavy, cents per lb	6	6¼
Zinc, cents per lb	5¼	5¼
Steel car axles, Chicago, per net ton	$41.52	$41.52
Old carwheels, Chicago, per gross ton	$29.00	$29.00
Steel rails (scrap), Chicago, per gross ton	$34.00	$34.00
Steel rails (relaying), Chicago, gross ton	$60.00	$60.00
Machine shop turnings, Chicago, net ton	$16.00	$16.00

ELECTRIC RAILWAY MATERIAL PRICES

	June 5	June 12
Rubber-covered wire base, New York, cents per lb	27 to 34	27 to 34
Weatherproof wire (100 lb. lots), cents per lb., New York	30¼ to 30.40	34¼ to 37.10
Weatherproof wire (100 lb. lots), cents per lb., Chicago	35.43 to 38.00	35.43 to 38.35
T-rails (A. S. C. E. standard), per gross ton	$70.00 to $80.00	$70.00 to $80.00
T-rails (A. S. C. E. standard), 100 to 500-ton lots, per gross ton	$67.50	$67.50
T-rails (A. S. C. E. Standard) 500-ton lots, per gross ton	$62.50	$62.50
T-rails, high (Shanghai), cents per lb	4¼	4¼
Rails, girder (grooved), cents per lb	4¼	4¼
Wire nails, Pittsburgh, cents per lb	3½	3½
Railroad spikes, drive, Pittsburgh base, cents per lb	4½	4½
Railroad spikes, screw, Pittsburgh base, cents per lb	8	8
Tie plates (flat type), cents per lb	*3¼	*3¼
Tie plates (brace type), cents per lb	*3¼	*3¼
Tie rods, Pittsburgh base, cents per lb	7	7
Fish plates, cents per lb	*3¼	*3¼
Angle plates, cents per lb	*3¼	*3¼
Angle bars, cents per lb	*3¼	*3¼
Rail bolts and nuts, Pittsburgh base, cents per lb	4.90	4.90
Steel bars, Pittsburgh, cents per lb	5	5
Sheet iron, black (24 gage), Pittsburgh, cents per lb	4.90	4.90
Sheet iron, galvanized (24 gage), Pittsburgh, cents per lb	5.80	5.80
Galvanized barbed wire, Pittsburgh, cents per lb	4.35	4.35
Galvanized wire, ordinary, Pittsburgh, cents per lb	3.95	3.95
Car window glass (single strength), first three brackets, A quality, New York, discount†	80%	80%
Car window glass (single strength, first three brackets, B quality), New York, discount	80%	80%
Car window glass (double strength, all sizes AA quality), New York discount	82 & 3%	82 & 3%
Waste, wool (according to grade), cents per lb	11½ to 22	11½ to 22
Waste, cotton (100 lb. bale), cents per lb.	13 to 13½	13 to 13½
Asphalt, hot (150 tons minimum), per ton delivered	$38.00	$38.50
Asphalt, cold (150 tons minimum, pkgs. weighed in, F. O. B. plant, Maurer, N. J.), per ton	$42.00	$42.50
Asphalt filler, per ton	$45.00	$45.00
Cement (truck lots), New York, per bbl	$3.20	$3.20
Cement (carload lots), Chicago, per bbl	$3.26	$3.26
Cement (carload lots), Seattle, per bbl	$3.60	$3.60
Linseed oil (raw, 5 bbl. lots), New York, per gal	$1.59	$1.59
Linseed oil (boiled, 5 bbl. lots), New York, per gal	$1.58	$1.58
White lead (100 lb. keg), New York, cents per lb	10	10¼
Turpentine (bbl. lots), New York, cents per gal	52½	51½

* Government price. † These prices are f.o.b. works, with boxing charges extra.