Street Railway Journal

VOL. XXIV. NEW YORK, SATURDAY, DECEMBER 10, 1904. No. 24.

PUBLISHED EVERY SATURDAY BY THE

McGRAW PUBLISHING COMPANY

MAIN OFFICE:

NEW YORK, ENGINEERING BUILDING, 114 LIBERTY STREET.

BRANCH OFFICES:

Chicago: Monadnock Block.

Philadelphia: 929 Chestnut Street.

Cleveland: Cuyahoga Building.

London: Hastings House, Norfolk Street, Strand.

Cable Address, "Stryjourn, New York"; "Stryjourn, London"—Lieber's Code used.

TERMS OF SUBSCRIPTION

In the United States, Hawaii, Puerto Rico, Philippines, Cuba, Canada and Mexico.

Street Railway Journal (52 issues)..... $3.00 per annum

Combination Rate, with Electric Railway Directory and Buyer's Manual (3 issues—February, August and November) $4.00 per annum

Both of the above, in connection with American Street Railway Investments (The "Red Book"—Published annually in May; regular price, $5.00 per copy).....$6.50 per annum

Single copies, Street Railway Journal, first issue of each month, 20 cents; other issues, 10 cents.

To All Countries Other Than Those Mentioned Above:

Street Railway Journal (52 issues), postage prepaid..... $6.00
25 shillings. 25 marks 31 francs.

Single copies, first issue of each month, 40 cents; other issues, 15 cents.

Subscriptions payable in advance, by check or money order. Remittances for foreign subscriptions may be made through our European office.

Entered as second-class matter at the New York Post Office.

EDITORIAL NOTICE

Street railway news, and all information regarding changes of officers, new equipments, extensions, financial changes and new enterprises will be greatly appreciated for use in these columns.

All matter intended for publication must be received at our office not later than Tuesday morning of each week, in order to secure insertion in the current issue.

Address all communications to

STREET RAILWAY JOURNAL.
114 Liberty Street, New York.

Concerning Tests

The practice of testing equipment and supplies is one which has of late grown considerably in favor among electric railways, but like many other good things in life, it may easily be abused. It is certain that the most convincing of all tests is that of every-day service, but this point is often forgotten in the enthusiasm with which experimental investigations are frequently taken up. Thus, a road will sometimes make a test of the temperature of its cars under different conditions of heater operation by applying and measuring the current and the heat when the car is standing still in the car house, instead of taking thermometer readings with the car out on the line carrying passengers. Such a method as this may be well enough when merely rough comparisons of different makes of heaters are desired, but it throws little light upon the results of actual operation. In like manner, there is no better way to determine experimentally the heating of motors than to take their temperature by thermometer and resistance rise after a few service tests under business conditions. The stand test has its own value for comparative purposes, but it takes the combination of heavy grades, sharp curves and a well filled car on a stormy day to bring out what might be called the latent heat of the motor.

It is remarkable to what a degree of elaboration experiments are now and then carried, when a result good enough for all practical purposes can be obtained by simple methods. An instance of this occurred in the practice of a road which desired to determine the energy consumption in kilowatt-hours per car-mile over one of its routes. Instead of connecting a recording wattmeter to the motor circuit, the company fitted up a test table with various ammeters, voltmeters, switches and circuit breakers; squeezed the outfit into the none too commodious vestibule and then ran a couple of times over the line without passengers and in the wake of a regular car. Readings were taken every half minute and the results calculated at length! Even if the company possessed no recording wattmeter it would not have been a difficult matter to borrow one from the local electric light organization, in which case the experiment could have been performed without taking up the time of two employees, and getting questionable results at that.

The problem of knowing what is good enough is the sticking point in a great deal of test work. No small amount of time and money can be thrown away in experiments by hasty or ill-considered methods. It is generally a mistake to lay the burden of making tests of a special nature upon the operating department of a large road. Such a course is liable to hamper the regular business, and when men laden with the responsibilities of keeping a great system in motion are required to undertake an exhaustive and scientific study of special equipment, there is every likelihood that justice will not be done to the tests, interested as the men who are making them may be to secure good results. It is the place of the engineering department and the consulting engineer to do this sort of work. The lack of a realization of this fact has proved expensive to many roads. The expert should be called upon, like the physician, to correct railway ills, and it is rarely that his services are overpaid. Nevertheless, throughout the entire range of industrial life one constantly sees unqualified or overworked employees given the responsibility of important experiments which carry far-reaching financial decisions upon their results.

On small roads the test problem demands the simplest possible methods. Fortunately, the ammeter and the voltmeter, aided by the wattmeter, are equal to about everything electrical likely to be called in question in such cases. It is a good plan

for a group of small roads in a given territory to unite in securing the services of a competent engineer if they find the expense too high to take up specialist work on their individual account. Something of this sort has already been suggested in the telephone field, and there is no reason why this benefit enjoyed by roads under a centralized management should not also be had by small but independent electric railways.

Sometimes the purchasing department is charged with the making of tests, and this is good practice where the materials, supplies and equipment are bought in large quantities. The detailed work of making the experiments should, of course, be done by the company's engineers. Greater co-operation between the purchasing and engineering departments is essential to the securing of the best results. It is not uncommon to find purchasing departments incapable of identifying the apparatus listed on the bills of lading, through lack of technical knowledge; and, on the other hand, it is not every engineer who knows the practice of his company in blank forms from A to Z. In the case of small roads, simple tests of supplies, supplemented by close observation of the results in service operation, are generally adequate. What is wanted is the best equipment for practical service, bearing in mind flexibility, depreciation, cost of operation, fixed charges and other points not in general immediately determined by any other than service tests. It must always be remembered that the service test of the apparatus in daily work costs far less than special experiments, and there is room for great progress in analysis of equipment and material on the basis of operating experience. Lastly, when special tests are made, their planning and execution should provide for a minimum possible interference with the regular traffic.

The Accident Problem

During the past eight months a number of most deplorable accidents have taken place upon land and sea. Fires, floods and collisions have brought unspeakable grief to many homes; the columns of the daily press have been filled with the details of fatal calamities, and there has grown up a feeling in some quarters that it is no longer safe to travel in the United States. It is important for every transportation official to do two things in reference to the accident problem: First, to study the cause of every calamity which comes to his attention and to apply his conclusions for the safety of his own road; and second, to allay the public agitation as far as possible by letting his passengers see for themselves the precautions which good service insures against accidents of the preventable kind.

Properly to analyze the details of accident prevention, one would be obliged to run the entire gamut of railway operation. The subject is too broad to be taken to pieces and put together again within the compass of a few paragraphs, but several points have been so strongly emphasized by the experiences of this year that it seems profitable to touch upon them briefly, with particular reference to electric railways.

Perhaps the most striking lesson of the great fires which have raged in various parts of the country, beginning with the Iroquois Theater disaster in Chicago and ending with the General Slocum holocaust, is the importance of inspection in modern industrial life. To a hard-headed, practical man of business it often seems like throwing money away to maintain an expensive staff of employees whose duties are of a non-constructive and almost negative character in comparison with the work of production which brings in positive and measurable results. A properly inspected industry often runs along month after month without the least evidence that inspection is needed, and it is not difficult for lax methods to creep in when report after report O. K.'s the operating conditions and receives but a single glance from the manager, on its way to the files. It is vitally important to realize that adequate inspection is a species of insurance, and that the very absence of trouble is sure proof that it pays to spend the money necessary to keep the business or the service in good trim. The street railway traffic inspector's work is little noticed, for example, as long as the cars move smoothly and regularly; the reports of the inspector of fire risks in car houses create little comment as long as there is no scare on account of flames, and so on down the line. It is only in times of unusual happenings, emergencies and casualties that the full value of inspection is appreciated. Then, when it is often too late, the barn door is locked after the horse is stolen, and inspection is begun on a regular basis.

Of equal importance with inspection, the value of discipline is taught by the great majority of accidents. A large number of factors enter into the operation of every electric railway, any one of which is capable of causing trouble if neglected. The higher the car speed, the more important discipline becomes, so that its influence is a maximum on the interurban railway with a single track. It is well known that locomotive engineers on steam roads often "take chances" to save the reprimand which is liable to accompany lost time, and it is unfortunately true that the same state of affairs is not unknown in the interurban electric railway field. If there is any one thing which the accidents of the past year or two upon these roads have emphasized, it is the vital necessity of taking no chances. Discipline cannot be properly enforced when despatchers break the rules by notifying car crews that written orders are unnecessary for the working of unusual movements on single track against the direction of traffic; when car crews depend for their knowledge of rules in force and rules superseded upon the opinion of the older employees; or when rule books are not kept up to date by trainmen, either through pen and ink changes or pasted and printed slips inserted in the books as soon as superseding orders are published and posted in the car houses. Safe operation demands a set of rules which do not conflict; it demands not only the strictest obedience to those rules, but their perfect understanding on the part of all transportation employees. As small an oversight as the failure to see that the men keep their rule books up to date may easily become the first cause of an accident that will bring a road to the verge of bankruptcy, to say nothing of the lives at stake.

In discussing these points it has not been forgotten that safety is a relative term at best, and that a certain amount of risk goes with every journey, no matter how well a road may be operated. This applies to all the affairs of life which have to do with the great instruments and facilities of civilization, and is the compensating price nature exacts for co-operating with mankind. It is well to bear in mind that the loss of life each year in a single city like New York or Boston from preventable diseases amounts to a total that would stagger humanity if it were not spread out into a few inconspicuous deaths each day. This is a point worth making when unjust criticisms of a road's operation are brought to the manager's door. It does not in the least excuse heedless, faulty or reckless operation in any form, but it is worth quoting when the "statistical cranks" begin to write letters to the daily papers. When all that human foresight can do to prevent accidents is accomplished, the manager's duty is done.

Car Lighting

Why is it that the lighting of street cars should be less carefully planned and effective than that of any other enclosed area? The amount of energy allotted to the task is more than adequate, but the result often leaves much to be desired in the way of comfort. Of course, street car lighting labors under the difficulty of a voltage necessarily somewhat variable, and therefore uniformity of illumination cannot be attained, but, nevertheless, it would not be a difficult matter to make considerable improvement. At present the lighting is often lavish, but the passengers, for whose convenience the car is lighted, do not get the full benefit of the expenditure in their behalf. The actual amount of energy used in lighting is very considerable. On modern cars of the kind now in extensive use, the energy required for operating the lamps may rise to the neighborhood of a kilowatt when a double series is used, even passing over the arc headlight now frequently seen. Even with a single series, the power consumed on a large system is by no means negligible, particularly since it comes on at the peak of the general load. It often approximates, and sometimes exceeds, 5 per cent or 6 per cent of the total energy required for the system during the hours of darkness, and it is relatively greater than the nominal output would suggest, since it is a continuous load, where the car is running coasting or at rest. Six per cent of the power cost for the hours of darkness runs up a considerable bill at the end of the year, and if any saving can be made without injuring the effectiveness of the illumination, it is assuredly well worth making.

Light is provided for the convenience of the passengers, chiefly to enable them to read with comfort, since for other purposes than reading, comparatively little light is required. Therefore, the illumination should be planned much as it would be in a room in which people wish to read, a room long and narrow, and low-studded, to be sure, and somewhat at a disadvantage as regards diffusion of light from the rather dark finish and the very large relative window area. As standing passengers must be considered, the ceiling is obviously the proper place for the lights, according to the usual custom. The kind of light generally in use, however, is altogether wrong. With very few exceptions, street car lights are 16-cp lamps, with anchored filaments and clear globes installed in the simplest sort of socket fixtures, usually with the axis of the lamp vertical. It is well known that the ordinary lamp with its axis vertical, or nearly so, has a tendency to throw most of its light sideways, which is ineffective in a long, narrow space. Special lamps are made with filaments planned to throw light downward, but on street cars the simple anchored loop filament is probably more stable than any freak forms, and the same advantage of distribution can be gained by the simplest sort of diffusing reflector arranged to throw plenty of light into the lower part of the car. Next, the bad effect of clear globes must be considered. One may be able to read very comfortably in his car seat by the aid of the lamp above him, but the lamps on either side shine obliquely into his eyes, and, the iris closing in self-protection, the effective light of the near lamp is less useful. Hint number two: Use very lightly frosted globes under the reflectors. By this means the light will be more efficient for seeing by and will tire the eye far less. These suggestions are not in the least out of the ordinary—they merely apply to street car lighting, the methods which are known to be good in lighting other spaces.

But this is not the whole story. If the lights are thus installed, their practical effectiveness is so greatly increased that the amount of energy required to light the car is materially reduced. Perhaps the decrease in energy permissible may not allow using a single series of the same lamps previously used in double series, but it certainly will allow a single series of somewhat more powerful lamps or a double series of considerably less powerful ones. It is a demonstrated fact that proper reflectors installed in a space shaped like a car can be made to double the effective illumination in the useful directions, leaving the energy unchanged. The gain in effectiveness produced by slightly frosted globes considerably more than compensates for the light absorbed, so that all in all, it is reasonable to expect that a really skilful use of lights in a car would enable the energy used to be reduced by nearly one-half without in the least sacrificing useful illumination. And this could be done at an added expense so small that the energy saved would pay for it in the first few weeks. It would be a very comfortable thing, too, to get rid of the quite needless added load. The burden of winter is severe enough with its track cleaning and car heating without wasting even 2 per cent or 3 per cent of the power in doing ineffective and indeed injurious lighting. It is small wonder that street car men have followed the common errors in planning illumination, for these errors are rampant everywhere, and are being corrected only very slowly. As regards results, one can practically convert a 4-watt lamp into the equivalent of a 2-watt lamp by giving some attention to adroit location and judicious shading. In street car service the scheme of improvement is simpler than in ordinary rooms, and the gains are correspondingly easier to make. Try it on in the next cars you equip and let the result tell its own story. Eight-cp or 10-cp lamps in a double series, properly shaded, will do wonderful work in lighting the car, and they can now be had of good stability and lift, or a single series of moderate voltage lamps can be made to do the work instead of a double series. At all events, it is well worth the trying.

Losing Time at Car Houses

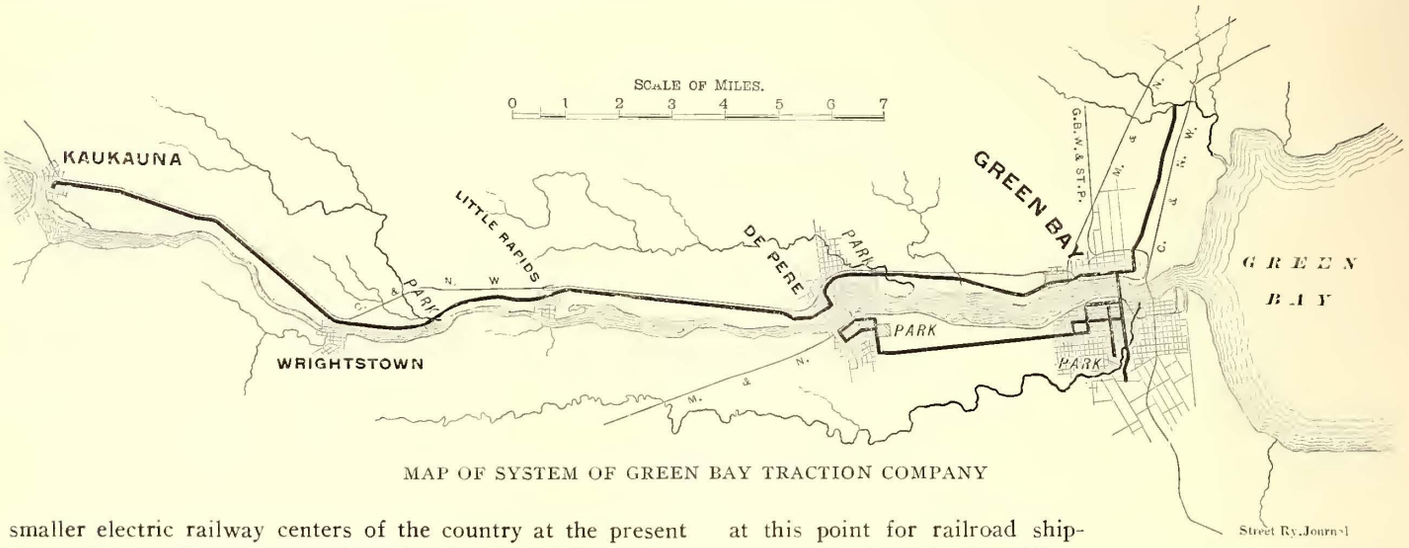
Failure to maintain the established schedule is a common occurrence on street railway systems. Often delays occur which the operating company is powerless to avoid, but the more one watches the service of a particular road, the more one discovers small delays, which, if prevented, might easily account for the difference between reaching the end of the route late and arriving on time.

Observation upon a large number of electric roads shows that in the great majority of cases there is a delay of fifteen seconds to a minute when a car passes a car house. Relief crews are seldom on the exact spot when the time comes to change with retiring crews. Frequently verbal instructions of a more or less lengthy character have to be issued by car house foremen to motormen and conductors; sometimes the car is held while the crew get a quick lunch at the nearest counter; often there is delay in filling empty sand pails and boxes, or slowness in notifying passengers to change cars when a car is run into the house from being disabled, and frequently a car has to wait on the main line until the conductor can run forward to set the switch away from the car house tracks.

All these things use up valuable time, annoy the passengers and put an added strain upon the equipment in making up delays, if the schedules are figured closely. As little defects in the transportation machine, they deserve attention, and the ideal of always keeping the cars moving is a good mark to aim at in the effort to secure more efficient operation.

ELECTRIC RAILWAYS AT GREEN BAY, WIS.

The electric railways centering at Green Bay, Wis., which are about to be consolidated under the Green Bay Traction Company, furnish a good example of what is being done in the smaller electric railway centers of the country at the present time. Street railway systems in cities the size of Green Bay have frequently been rather unprofitable investments, and, in fact, the street railway system at Green Bay was in receivers' hands but a few years ago. By the introduction of sound operating methods and good construction, and by making the city system the nucleus for suburban and interurban lines, properties of this class are being put on a paying basis, with prospects of giving even better returns in the future, and this is the case at Green Bay.



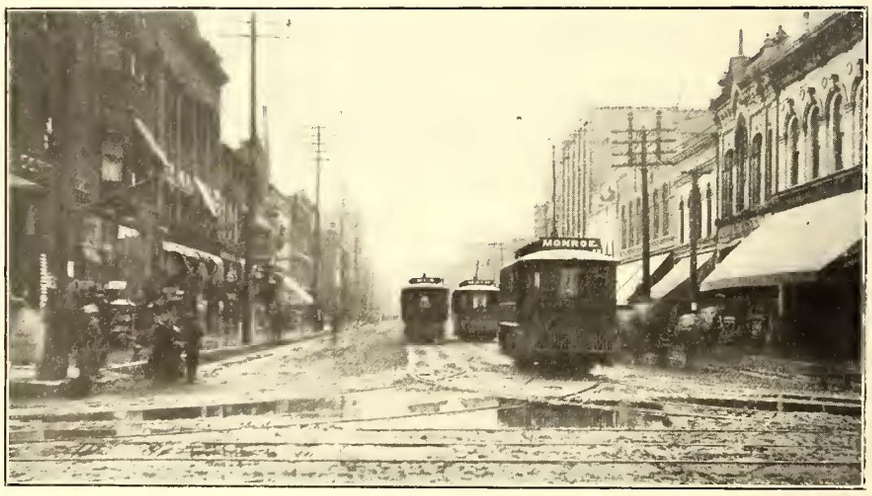
MAP OF SYSTEM OF GREEN BAY TRACTION COMPANY

Green Bay is now a city of about 25,000 inhabitants, these figures being based on the last school census. The Fox River Electric Railway & Power Company, which has owned and operated the street railway lines in Green Bay and an interurban line to East Depere (22 miles of track in all), is to be taken over by the Green Bay Traction Company, which will also take and operate the new interurban line between Green Bay and Kaukauna, 23 miles distant, which has been built by the Knox Engineering Company under contract for the Knox Construction Company. The accompanying map shows the entire system, including both the interurban lines. The new interurban line to Kaukauna being of most recent construction, will naturally receive the most attention in this article.

The population directly on the lines of the company is as follows:

Green Bay	25,000
East and West Depere	6,000
Little Rapids	100
Wrightstown	600
Kaukauna	6,000
Total	37,700

At Kaukauna, connection is made with the interurban lines of the Wisconsin Traction, Light, Heat & Power Company, which connects Kaukauna with Appleton, 7 miles distant, Appleton in turn being connected by a chain of interurban roads with Menasha, Neenah, Oshkosh and Fond du Lac. This chain of cities from Fond du Lac to Green Bay offers exceptional opportunities for profitable interurban roads. The Green Bay-Kaukauna interurban completes the last link of the chain. Green Bay is located on Fox River, near a point where it empties into Green Bay. It is one of the important ports of the western side of Lake Michigan, and receives a large amount of lake freight for distribution over Northern and Central Wisconsin, since it is nearer to the point of consumption than any of the ports further east on the lake shore. Much Eastern coal is received at this point for railroad shipment to points further West. There are a number of immense coal docks. Green Bay is also a wholesale distributing center for a large territory North and West, as can be seen by the fact that the Chicago & Northwestern Railway alone has 35 miles of siding in Green Bay, to say nothing of the two other steam railroads reaching that point.



MAIN STREET, GREEN BAY

As regards the Fox River Valley in general as a territory for an interurban road, it may be said that it is not only a fertile and thickly settled farming country, but because of the water power available along the Fox River and the clear waters of the river, many industries have been attracted to it, and especially paper mills, of which one or more can be found at nearly every town. At Kaukauna several large paper mills are now operating, but this town has not had anything like the development which its natural advantages would give it in the past twenty years because of a long continued litigation over the water power rights. The river has altogether a fall of about 50 ft. in the vicinity of Kaukauna, but much of this water power has gone to waste because of the aforesaid legal disputes over its ownership. Recently, however, these matters have been settled, and there is sure to be a very rapid growth at this point. There is also some undeveloped water power at Little Rapids. The farming country between towns is settled with Holland and Dutch, and the land is divided into small farms. On look-

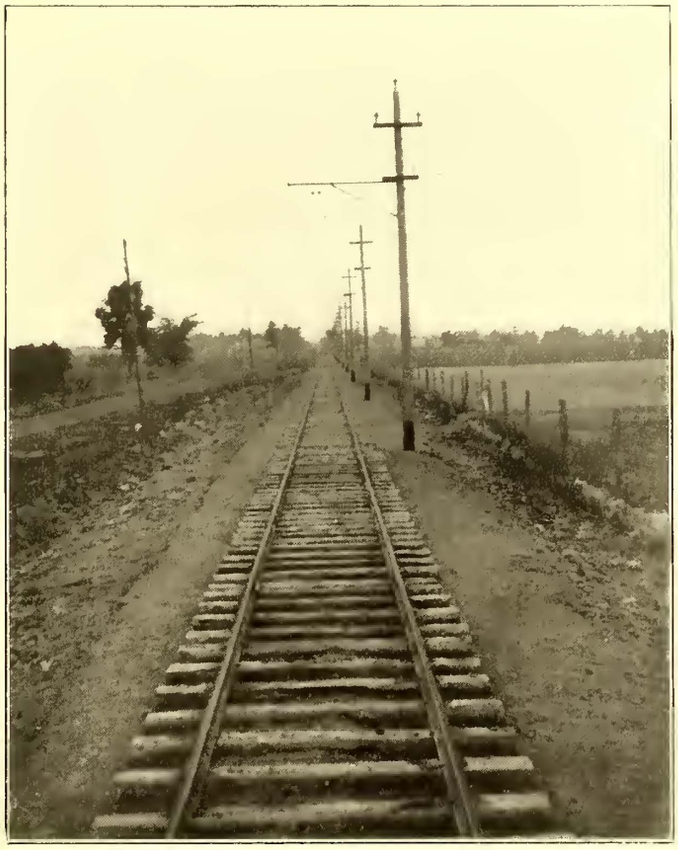
ing at the map of the system, it might be thought that the parallel lines between Green Bay and Depere are unjustified. The line on the east side of the river between Green Bay and East Depere has been in operation for some time. To have utilized the East Depere line for the through interurban line to Kaukauna would have involved the building of a very long bridge, as the Fox River is very wide. The building of this bridge would have cost nearly as much as the building of the line up the west side of the river, and had it been built the territory on the west side of the river would not have been served. The line between East Depere and Green Bay is of a suburban character which calls for frequent stops, and this would make it further undesirable to operate through interurban cars over the east side route. This east side route has a number of large institutions along it, among which are the State Reformatory, a large Catholic orphan asylum and an Odd Fellows Home. At the present time it requires ten city cars to maintain the regular schedule, besides one car making a round trip each hour to East Depere on week days.

On Sundays this East Depere line is given two cars. There are five city routes in Green Bay, over which service is given on a fifteen-minute headway, all cars being scheduled to arrive at the center of the town about the same time for the convenience of passengers wishing to transfer. On the interurban line to Kaukauna it is intended to give an hourly service, making the run between the cities in one hour; this service will therefore require two cars, the interurban line being 21.6 miles long, to which must be added 2 miles in the city of Green Bay. The total run is 23.6 miles, which should easily be made in one hour over the character of road which is being constructed.

The new interurban track is built on a private right of way except in towns where franchises for fifty years have been obtained. The right of way is 33 ft. wide except at fills, where it is enough wider to accommodate the fill. The rails are 70-lb. A. S. C. E. Section T, laid on 6-in. x 8-in. x 8-ft. ties, laid 2 ft. between centers. The ballast is 6 ins. thick. Between Green Bay and West Depere a stone ballast is being used, and between Depere and Kaukauna gravel ballast. Gravel is not

CUT NEAR RIDGE POINT PARK

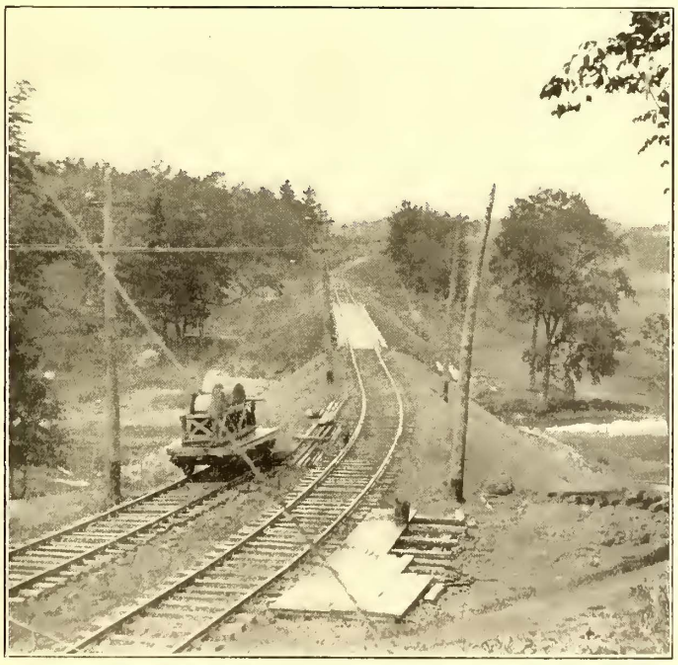
abundant in this part of the country, but two good beds have been secured near the right of way. The grades are made 14 ft. wide on top for the reception of the ballast, and have a slope of 1 to 1½. The total amount of grading on the line amounted to 95,000 cubic yards. The private right of way has been fenced with wire netting fence 48 ins. high, with a barb wire



SAMPLE OF LINE AND TRACK READY FOR BALLAST

along the top. The East Depere line, which was built several years ago, has 45-lb. T-rail outside of towns and 60-lb. T-rail in East Depere. The frogs and switches on the new interurban line were furnished by the Paige Iron Works.

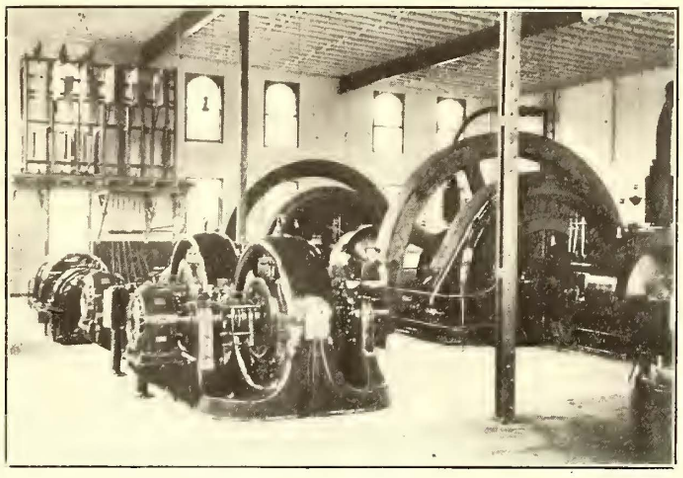
A new plan of bonding is being used which will be watched



LARGE FILL AND TRESTLE AT APPLE CREEK

with interest. The bonds are pressed copper-wire cable bonds, known as the Form 2 soldered bond of the Ohio Brass Company. These bonds have a cross-section of 250,000 circ. mils. They are being located in an unusual place for a bond, namely,

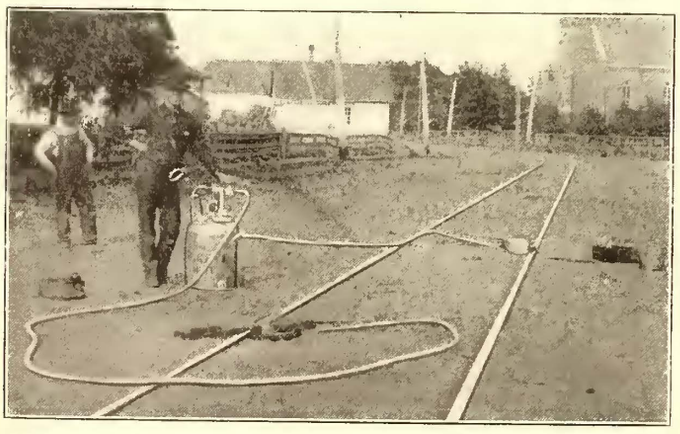
just above the angle-bar on the outside of the head of the rail. They are fastened entirely with solder. One of the accompanying engravings shows one of these bonds during the process of soldering, each end of the bond being clamped to the rail head



VIEW IN ENGINE ROOM, GREEN BAY POWER HOUSE

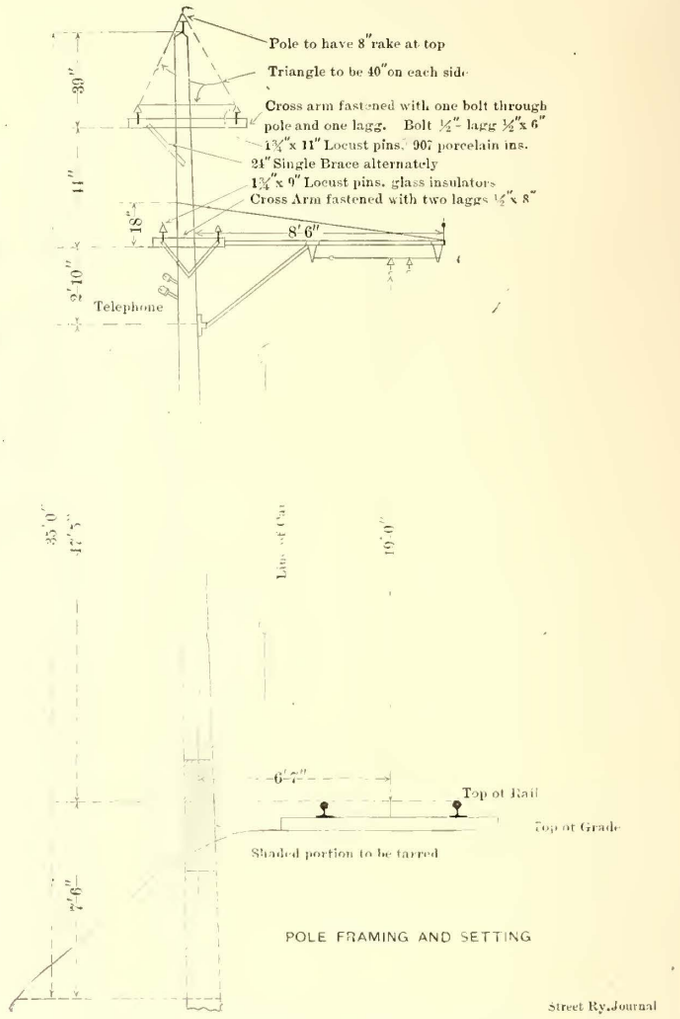
while the soldering is going on. The rail heads are heated with kerosene blow torches, which are used as shown in another engraving. These torches are laid so that the flame strikes the joint, two torches being used at a time, supplied with kerosene under pressure from a tank holding 20 gallons, the tank pressure being supplied by a hand air pump. These torches give a large flame and have been used with good success. They are made by Walter McLeod, of Cincinnati. The rubber hose connecting the tank with the burners is protected with steel tape, spirally wound. The object of placing the bonds in such an exposed position is to have them where they can be easily examined and any poor connections noted. Of course, the success of the soldering process depends on getting the rail hot enough to thoroughly melt the solder. Cross bonds of No. 00 cross-section are placed 100 ft. apart.

The standard overhead construction is shown in one of the accompanying drawings. Two No. 00 trolley wires are placed on brackets 19 ft. above the rail. The high-tension transmission lines on top of the pole are of No. 5 copper, placed 40 ins. apart. The transmission voltage is 16,000. The insulators are Locke brown porcelain No. 307. The direct-current feeders are on saddle type glass insulators, placed on a cross-arm. About 18 miles of the 21.6 miles of interurban line has, in ad-



KEROSENE TORCH FOR SOLDERING RAIL BONDS.

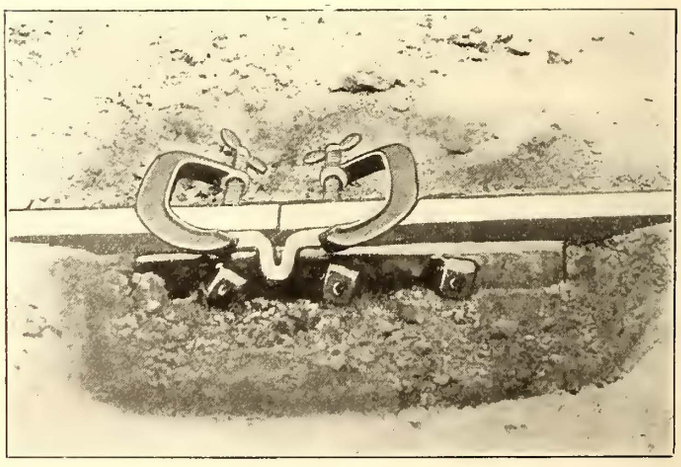
dition to the trolley wires, a 3000 circ. mil direct-current feeder. The poles are placed 100 ft. apart. The telephone wires are No. 10 copper, placed on wooden brackets and transposed every eighth pole. The brackets and trolley wire insulators are of Ohio Brass Company make, supplied through Porter & Berg, of Chicago. Five Garton direct-current lightning arresters have been placed to each mile of road. Under the draw-bridge at Green Bay, near the power station, a 16,000-volt, three-phase



CROSS SECTION, SHOWING STANDARD TRACK INTERURBAN CONSTRUCTION

submarine cable has been placed. The terminal pole at the end of the draw is shown in one of the engravings. The high-tension wires and the low-tension and telephone wires have separate terminal houses.

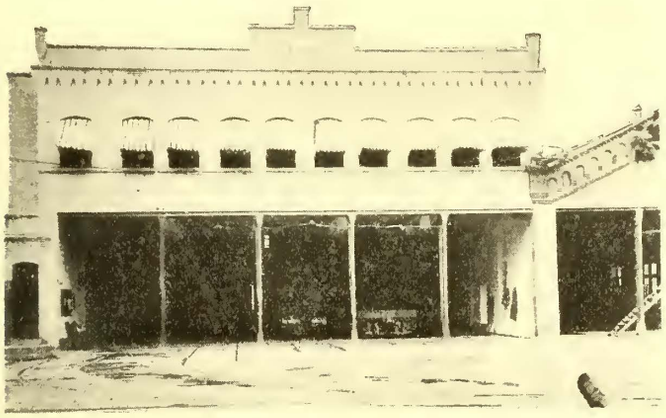
A new power station has been built on the company's prop-



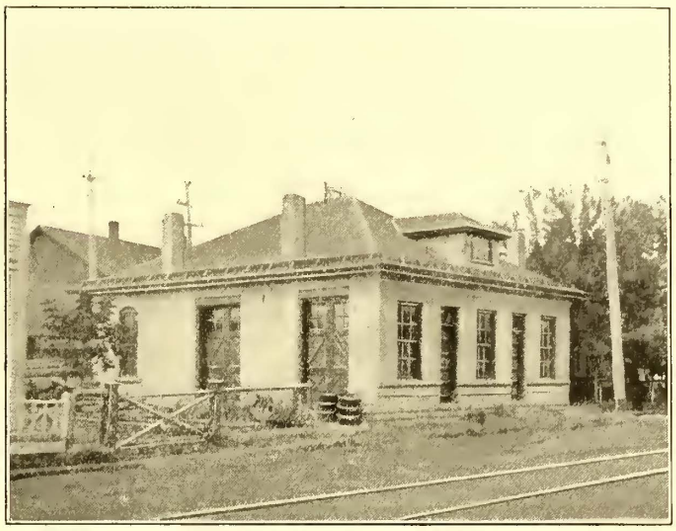
CLAMPS FOR SOLDERING RAIL BONDS

erty at Green Bay for supplying all the lines. The old power station is to be dismantled and fitted up as a repair shop, plans of which are shown. The power house, offices and repair shops are all located on the same piece of land on the Fox River at Green Bay, not far from the business center. The power sta-

tion is equipped with low-tension, alternating-current generators, which supply rotary converters in the power station, and also transmit power at 16,000 volts to a sub-station at Wrightstown. While the present system operated from this power house would hardly justify such a complete alternating-current equipment, the prospect that power will be supplied in the future to other lines centering at Green Bay made it seem advisable to build a strictly alternating-current power station. The sub-station in the power station supplies all the city lines and 5 miles of interurban, or as far as Depere. The remainder of the new interurban line is supplied from the sub-station at Wrightstown. The power station is a substantial brick building, as shown. Being located on the river, it can obtain coal by boat or over a steam road siding, the latter probably being the most economical method because of the cheapness with which coal can be unloaded from boats at a neighboring coal dock, into dump cars, which can be run on an elevated track in the rear of the boiler room and there dumped. The plant is, of course, operated condensing with water from the river.



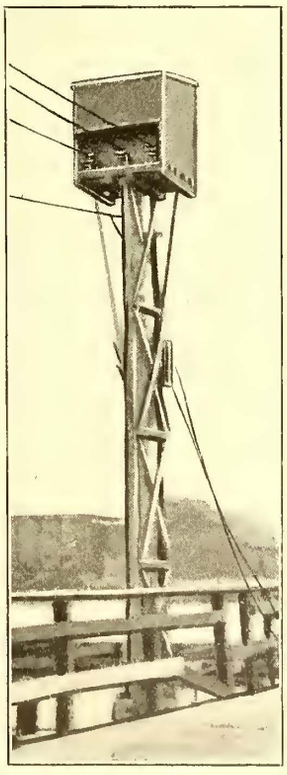
NEW CAR HOUSE, OFFICES AND CLUB ROOMS



SUB-STATION AT WRIGHTSTOWN

The generating apparatus consists of two 500-kw, 25-cycle, three-phase, 375-volt Westinghouse alternators, having thirty-two revolving field poles. Each is direct connected to a cross-compound Reynolds Corliss condensing engine, made by the Allis-Chalmers Company, rated at 850 hp, with an overload capacity of 1275 hp. These engines have cylinders 20 ins. and 40 ins. x 48-in. stroke, and run 94 r. p. m. There are three 350-hp Stirling boilers, built for 160 lbs. steam pressure. The engine exhausts are condensed by a Worthington siphon condenser. The circulating pump for this condenser is 12 ins. and 15 ins. x 10-in. stroke. The air pump is 6 ins. and 12 ins. x 12-in. stroke. A Vater heater, made by the Kaestner Manufacturing Company, with a capacity for 1200 bhp, has been installed to utilize the heat from the auxiliary engine exhausts. There are two 9-in. x 5-in. Worthington feed-water pumps of 30-gallon per hour capacity. The piping in the station was furnished by the Crane Company. Excitation for the alternators is furnished ordinarily by a 37½-kw exciter, driven by a 50-hp induction motor. The other exciter, which is used when the station is started, is of the same capacity, driven by

POWER HOUSE, CAR HOUSE AND OFFICES

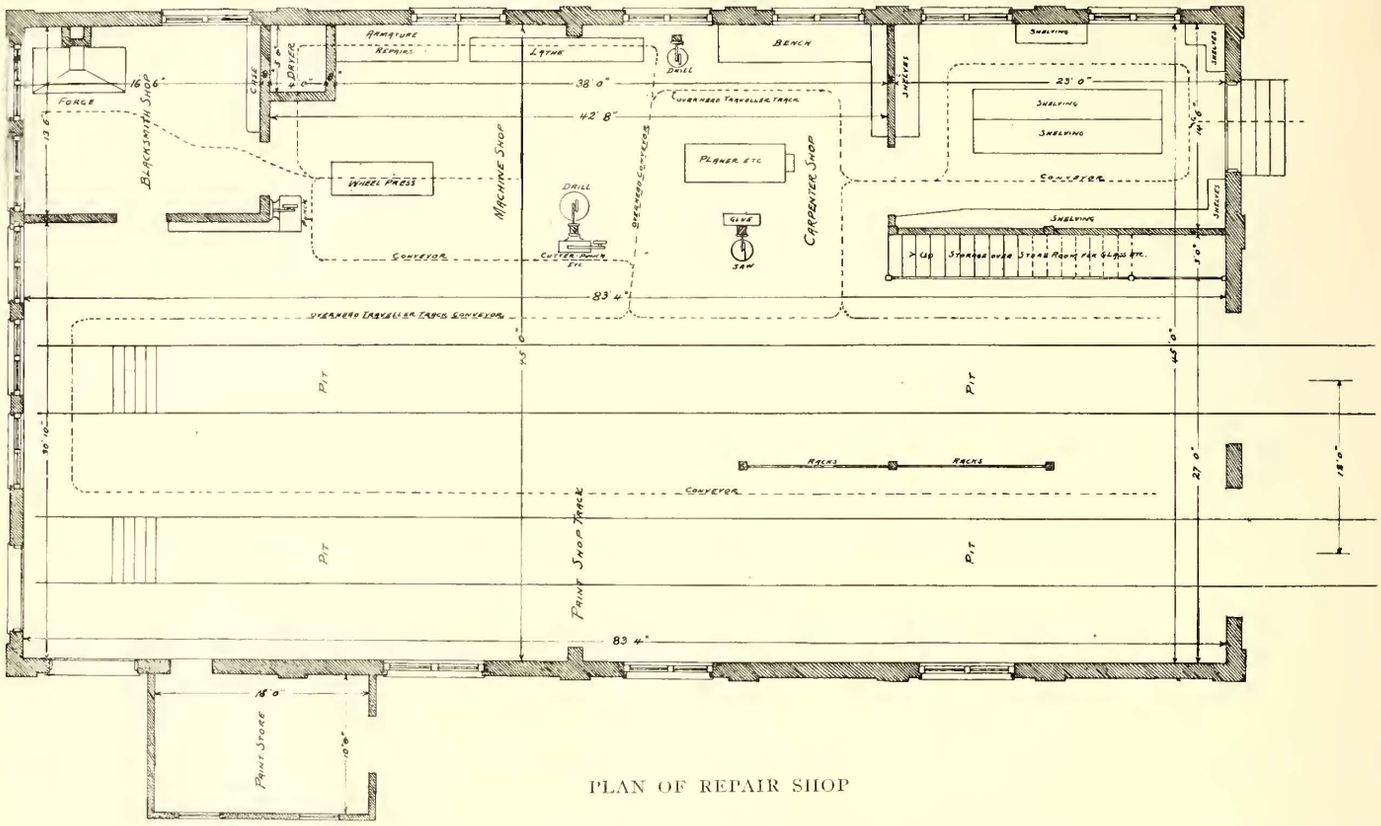


TERMINAL HOUSE FOR 16,000-VOLT CABLE

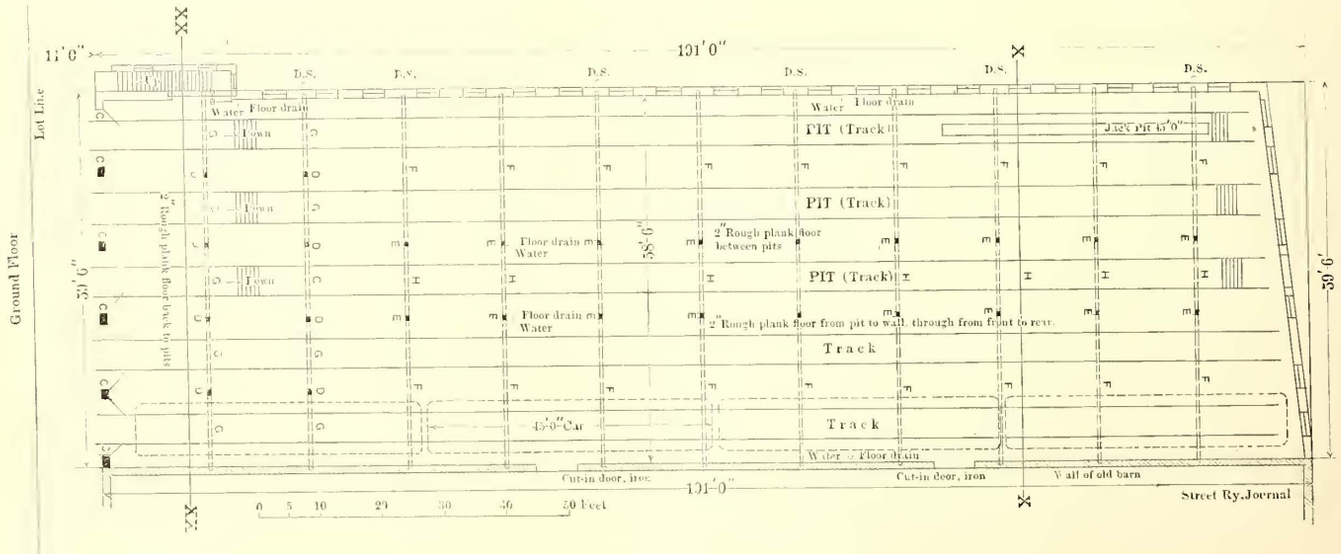
a small vertical engine. All engine foundations are of concrete. The water from the condensers discharges into a concrete trench leading straight to the river. Above the water in this trench is the intake pipe for the condensing water, which has its end located near the bottom of the river, hot water being discharged on the surface. The chimney is 170 ft. 4 ins. high above the grates, and contains 320,000 bricks. The flue is 8 ft. in diameter in the clear. The inside lining, with air space between it and the chimney proper, extends up 100 ft. The foundation is concrete, 26 ft. 4 ins. in diameter. The diameter where the brick commences is 16 ft. The outer wall is 37 ins. thick at the base, and the inner wall is 17 ins. thick. The outside wall tapers to a thickness of 13 ins. The inside tapers to 4 ins. The concrete foundation, 9 ft. 8 ins. thick, rests on piles, and is reinforced at the bottom with 12-in. I-beams. At the top are sixteen metal points, 4 ft. high, set into concrete and connected to two No. 00 ground wires for taking away static discharges and preventing damage from lightning.

The sub-station in the power house has two 300-kw rotary converters, and the sub-station at Wrightstown has two 200-kw rotary converters. There are two sets of step-up and step-down transformers, each set of sufficient capacity for operating one converter, but arranged to be connected in parallel. The high-tension switches are of the stick type, with the enclosed release fuse commonly known as a "sneezer." As the company supplies power for operating 500-volt stationary motors in Green Bay, a synchronous motor generator has been placed in the power station. This is operated by the 375-volt alternating current from the large generator. A rotary converter was not used for this purpose because the voltage of the railway system is about 100 volts higher than the regular voltage of the power circuit. This motor generator is of 100-kw capacity, and was built by the National Electric Company.

The four Niles cars purchased for the Kaukauna line are 45 ft. 5 ins. over all, with 35-ft. bodies. The width is 8½ ft. They have smoking compartments and toilet room. The interior



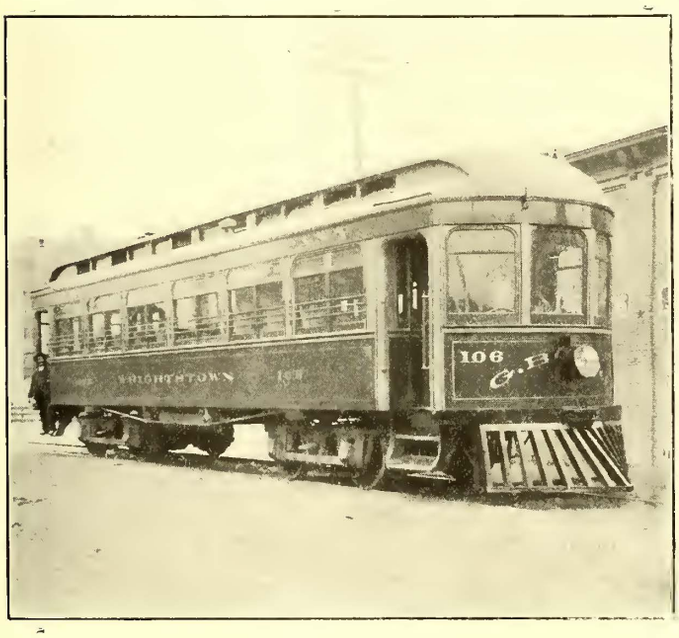
PLAN OF REPAIR SHOP



PLAN OF NEW CAR HOUSE

finish is oak. They are intended to operate as single-enders. A Franklin hot-water heater is placed in the motorman's cab. The cars are mounted on Taylor M. C. B. trucks, with four Westinghouse No. 56 motors. The truck wheel base is 6 ft., the wheels are 33 ins. in diameter, and the axles 5½ ins. The standard M. C. B. flange has been used on these cars. Besides these cars, the new interurban line has one baggage car, one construction car, which is used also as an electric locomotive, and four flat cars. For the East Depere service there are two double-truck cars very similar to the first described. The city lines are served by short, single-truck cars, equipped with recent types of Westinghouse motors.

Accompanying this article are plans of the new car house and office building recently built. This building is 58½ ft. x 191 ft. Adjoining it is the old car house of about the same size, which is being remodeled into a very good building. Most of the tracks have pits with concrete floors. In the rear is the old power station, which is to be remodeled into a machine and repair shop. Interurban lines are to be operated with a telephone despatching system having International Telephone Manufacturing Company's instruments located in booths at the



STANDARD CAR

turn-outs. The latter are designed to permit a half-hour headway.

A beautiful spot for a pleasure resort has been secured at the point where Apple Creek enters the Fox River, the location of which can be seen on the map. This strip of ground is easily accessible from the interurban track, and is without doubt one of the most beautiful places in Wisconsin. It consists of a high bluff, on one side of which is the Fox River, and on the other side Apple Creek. The ground is wooded with good sized second growth timber. It is proposed to build a club house on one of the highest points, and it will make an ideal place for a day's outing and will not necessitate any large investment.

The building of the new interurban line has been carried on under the direction of President George W. Knox, of the Knox Engineering Company, of Chicago. R. M. Heskett, secretary of that company, was resident engineer in charge of the work. The civil engineering was in charge of Lincoln Nissley, assisted by Thomas Kester. T. W. Parsons was superintendent of track construction, and M. J. Kinch, superintendent of electrical construction. The architect of the buildings was George W. Kennerly, and the steam piping and machinery was erected by E. A. Blodgett. The entire city and interurban property is now under the general management of George W. Knox, with M. J. Kinch as superintendent. The system is controlled entirely by Green Bay capital. The officers of the Fox River Electric Railway & Power Company, which is to be taken over by the Green Bay Traction Company, are the financial backers of the enterprise. These officers are: President, A. M. Murphy; vice-president, W. P. Wagner; secretary, B. L. Parker, and treasurer, F. E. Murphy.

THE "JUDGE" AT LOUISVILLE

BY GEORGE E. THOMAS
Supervising Engineer Interborough Rapid Transit Company

Considerable information has been published of the construction of the electric locomotive, the "Judge," which was built under the patents of Thomas A. Edison and Stephen D. Field, and was employed to carry passengers at the Chicago Exposition of 1883, but little is known of its subsequent history. At Chicago, the electric railway was in a gallery of the Exposition Building, so that, being under cover, the questions of insulation and construction were not particularly serious. The Chicago Exposition lasted about thirty days, and the road in that city, as well as that in Louisville, was installed by the writer and Frank B. Rae.

From Chicago the locomotive was taken in July, 1883, to the Southern Exposition at Louisville, where a road, nearly 1 mile in length, was constructed in Dupont Park, which was part of the Exposition grounds. One of the restrictions imposed by the owners of the park was that none of the trees should be removed or injured. Consequently it was quite a difficult matter to install the road, as the promoters wished to embody every feature of a regular railroad, including bridges, a tunnel 700 ft. long, a timber trestle 500 ft. long, a deep cut, etc., all of which were fully carried out.

The tunnel was a very interesting section, and was built of light timber with soil spread over, with tarred felt on the outside, and very carefully lined on the inside with black paper lining to exclude the light. On approaching this tunnel, all light was extinguished until nearing the center, when, very much to the disgust of some of the young folks especially, the light would be thrown on, revealing a number of blushing faces and a general roar of laughter. There were two stations, one at the Exposition Building and another at the Art Gallery, a building about one-half the distance around the park.

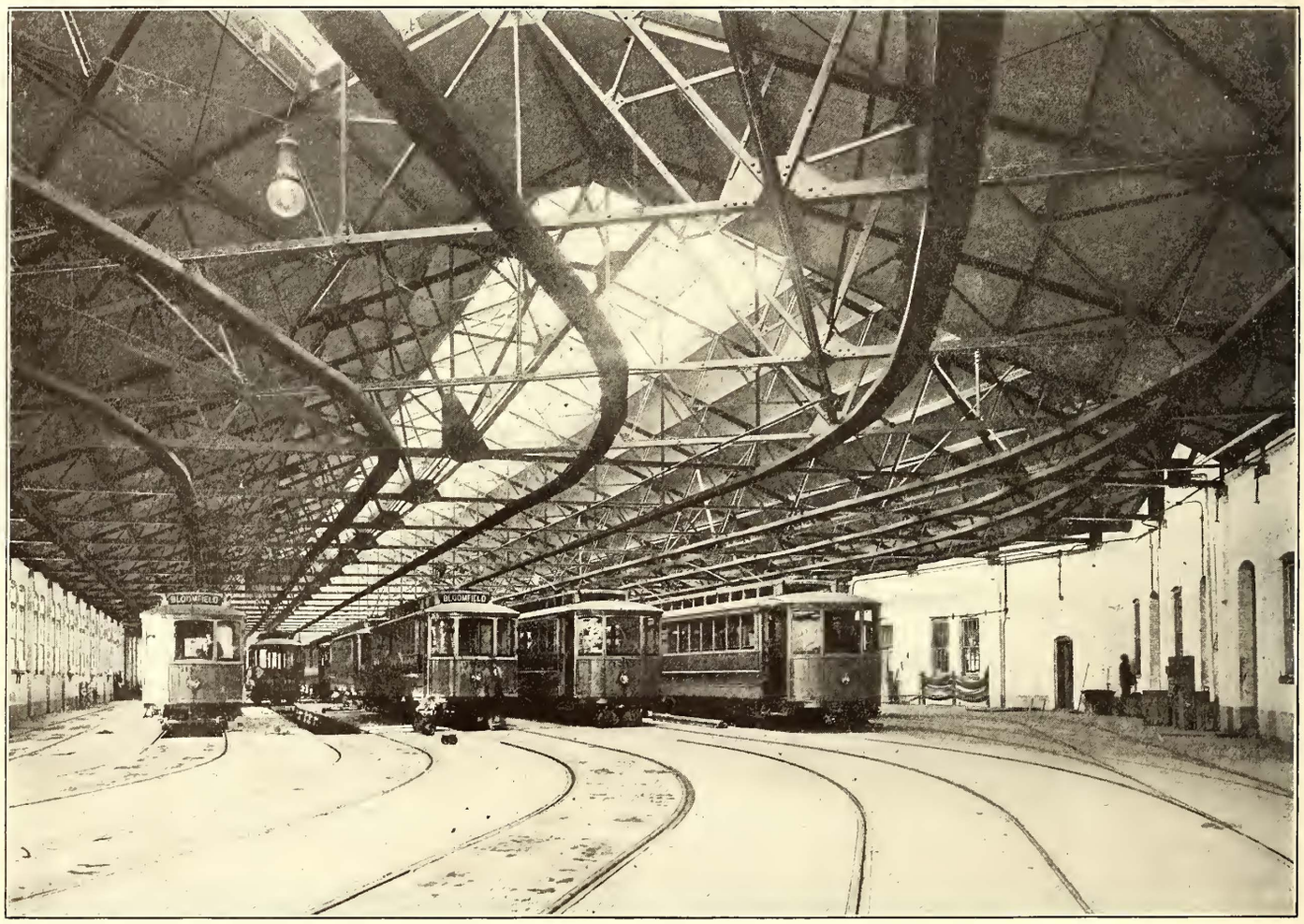
One of the remarkable features in connection with this railroad was its power plant and house. The engine employed was a 120-hp Harris Corliss engine, which drove a line shaft, and attached to which was a variety of machines, such as a brick machine, peanut roaster and carpet cleaner, etc., etc., as well as the 200-light 110-volt Weston generator which supplied current to the railway. It was, however, the first power house for railroad purposes in America.

The current was taken to the locomotive, as in the Chicago Exposition, by a third rail, which consisted of an iron bar ½ in. thick x 4 ins. high, set in cast-iron chairs mounted on wooden insulators, which were supported on the ties. The third rail and contact rail joints were electrically connected by soldered copper bonds. The current was taken from the third rail to the motor, as in Chicago, by U-shaped phosphor-bronze brushes, which rubbed along each side of the third rail.

The line was started in the middle of August and remained in operation until Dec. 1, or about 100 days. During this time the locomotive made frequent daily trips, hauling two trailers having an aggregate carrying capacity of about seventy-five passengers. After the termination of this Exposition, the locomotive was taken to Chicago and there dismantled by the writer upon the order of its owners, the Electric Railway Company of the United States. The two Weston 200-light machines, one of which was used as a motor and the other as a generator, and which had originally cost about $2,200 each, were sold for about $550 each.

DIVISION TERMINAL IMPROVEMENTS IN NEW JERSEY—NEW SHOP METHODS

A very strong policy of improvement is to be noted in the railway department of the Public Service Corporation of New Jersey in the large amount of new work which has of late been carried out in its mechanical and electrical departments. The new work includes track and permanent way improvements, increase of power plant facilities, extensions of the high-voltage power distribution system, new repair shop installations, and the purchase of a large amount of rolling stock. Of the latter, large deliveries have recently been made from the Brill, Stephenson and Cincinnati car companies, of heavy double-truck four-motor cars. The storage air-brake system was recently installed on some of the company's cars, as described in the June 5, 1904, issue of the Street Railway Journal, and has proven so satisfactory that it is being extended to other parts of the system, including the Bayonne and Plank Road lines; when these are fully equipped the Corporation will have in all 176 cars operating with the storage air-brake system.



VIEW IN THE NEW MONTCLAIR CAR HOUSE OF THE PUBLIC SERVICE CORPORATION OF NEW JERSEY, SHOWING ARRANGEMENT OF TRACKS AND PITS

Among the most important are the improvements in repair shop facilities. Two large new car houses with complete repair shop equipments have recently been installed by the company, one at Paterson and the other at Montclair, each serving one of its important trunk lines. On account of the distance of these points from the main overhauling shop at Newark, each car house has been provided with a complete and effective repair shop equipment for making heavy repairs. Large shop working areas have been provided at the side of the car storage room, in each instance, where the machine tools necessary for light and heavy repairs are placed, and every other facility for securing ease and convenience, as well as economy, in this important branch of work has been installed. Considering the development that has been made, not only in the size of cars and equipment, but also in the rapidity of the schedules operated, these shop provisions are most timely and valuable, and represent what is perhaps the best practice in modern electric railroading.

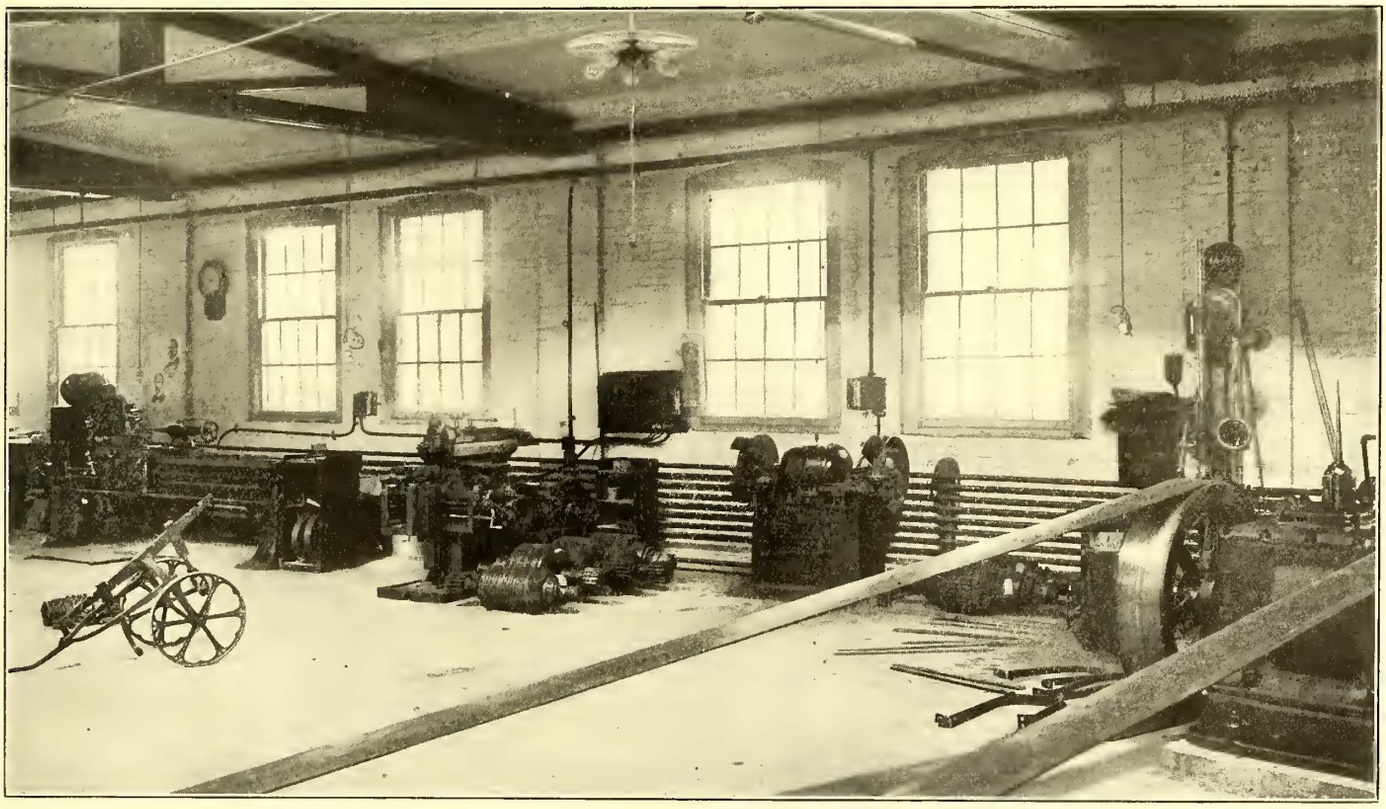
The operating conditions of those lines of the Public Service Corporation which radiate to the east and west of Newark are difficult. The average round trip is from 20 to 30 miles, and much of the territory traversed, especially in the Orange districts, is hilly. Owing to the large number of passengers carried and frequent stops in the more thickly settled villages traversed, and to the long runs between villages, the service required of the equipments is severe, so that the problem of maintenance is a difficult and trying one. It has, however, been carefully studied and is amply provided for in the new shops that have been installed at the above-mentioned points; much forethought has been given to the various problems to be met, and it is safe to say that no system in the country is better able to take care of the running repairs at car houses than those of the Public Service Corporation.

THE CAR HOUSE

The car house and shop installation at Montclair, which is the later of the two, consists of a storage barn, containing nine tracks, and an addition of irregular shape, running along the east side, providing stock room and shop facilities. The car house is covered by a single span of roof, making, by reason of the ample skylighting provided, a very light and convenient storage and working room. This storage room contains eight tracks, all of which extend to the rear of the main room. Four

pits are provided, which open together beneath the floor, and thus provide for the storage of parts during repairs; this feature also provides unequaled facilities for the mounting of scaffolding for easier work upon the car bodies from beneath. An important point in the pit construction is to be seen in the use of 9-in. girder rails for the pit tracks, which are of sufficient strength to carry easily the weight of the cars between supporting posts without the use of stringers under them; this is an important feature, as by the elimination of the heavy wooden stringers usually used under the rails a great deal of extra room in the pit is made available.

An accompanying illustration shows the interior of the Montclair car house and clearly brings out its cleanly and attractive appearance. The main car shed portion of the building is built in two sections, which are arranged about 30 degs. out of line to correspond with a bend in the adjacent side street. The total length of the house, measured along center lines, is about 350 ft., and it has a width of 75 ft. at the front and 100 ft. at the rear, which is the result of the peculiarly shaped plot occupied. Seven tracks enter the house at the front and diverge to nine at the rear, all being spaced to about 9 ft. between centers.



THE MACHINE SHOP AT THE NEW MONTCLAIR CAR HOUSE, SHOWING A MODEL MACHINE-TOOL EQUIPMENT FOR RUNNING REPAIRS

Ample lighting is provided by large windows, not only at the sides, but in the lantern above the roof trusses, which, together with the effect produced by the white interior finish of the walls, makes the room most convenient to work in. The roof structure is of the steel-truss type, as shown in the view, the trusses having clear span of 75 ft. and 100 ft. between walls. The trusses are spaced at 16 ft. centers, and are arranged to give 16 ft. of clear head room beneath the lower chords.

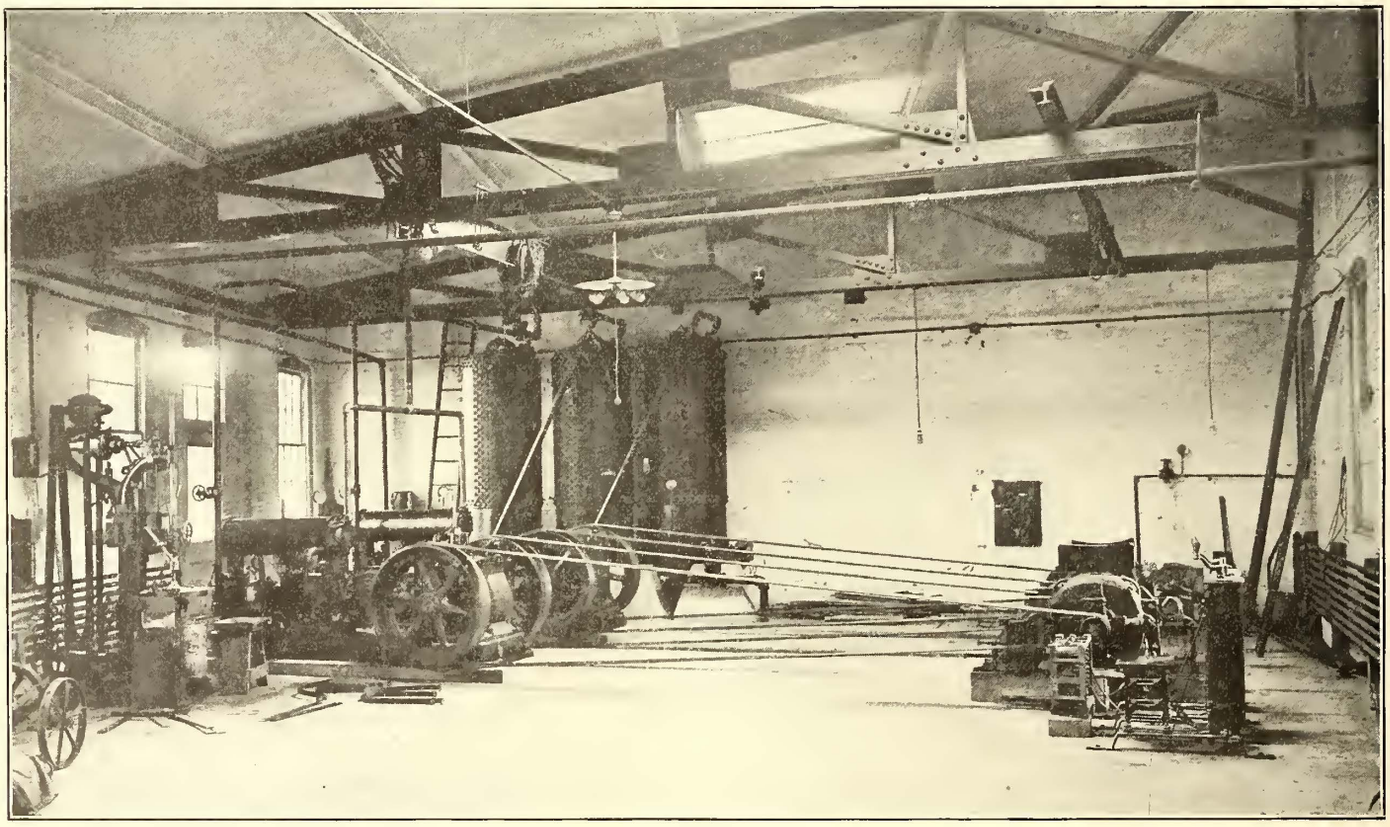
The floor, in this as well as in the other rooms, is of concrete, finished flush with the heads of the rails, to permit trucks to be easily rolled over them in transporting material. At one corner of the storage room at the rear a wash room is partitioned off, into which cars are run for their washing at regular intervals. The room is shut off by a sheet metal partition, with a rolling shutter door, so that in winter it may be easily heated for more thorough work in washing, in which case also hot water will be used. The floors in this room are sloped to center drains under each of the two tracks entering it, for facilitating the drainage of wash water.

The machine shop, the stock room and the other auxiliary rooms, including the car men's club and locker rooms, and also the sub-station rotary converter building adjacent, are located along the east side of the car house, as shown in the accompanying plan. Immediately at the front of the building is located the office of the division superintendent in charge of operation upon this district, while directly in the rear is the sand room. Following this is the employees' room, the locker room, the club and reading room, and then the machine shop. The rotary converter sub-station occupies a space at the rear of the club room, so that it is not directly connected with the other buildings.

THE MACHINE SHOP

The machine shop and stock room are, as shown, located toward the rear of the car house and at the east side, with windows on both sides, to provide ample lighting. The stock room is 16 ft. x 32 ft. in size, and is provided with bins conveniently arranged in which all stock supplies from trolley wheels, brush holders, carbons, etc., down to the various sizes of bolts, washers, screws, etc., kept on hand are arranged in the order of their size. The equipment of this room is complete, and the manner in which it is cared for has been worked out to a very convenient schedule, so that supplies of all kinds are maintained in stock without fail; in this department the spare armatures, field coils, controller drums and other parts of electrical equipment are also kept. A noticeable feature of the room is the cleanly manner in which it is kept; the white interior finish of the room lends to the general feature of cleanliness and furnishes a valuable incentive to maintain it in this condition. This room has proven a most efficient aid to the prosecution of the work at this point, and its maintenance in this form has proven a distinct advantage. Electrical repair work is not provided for to any extent at this shop, this being done at the main shops at Newark, but a sufficient supply is always maintained to supply running requirements.

In the machine shop adjacent, which is about 30 ft. x 72 ft. in size, ample room is provided for the machine tool equipment and the benches for all classes of bench work, and it also includes the air compressor outfit which was recently installed to supply the high-pressure storage air for the storage air-brake system used upon the lines of this company. The latter equipment, which, as above mentioned, was described in the June 25 issue of this journal, is of more than usual interest on account of the supersession of the individual motor-driven air compressor upon each car by storage tanks in which a large quantity of compressed air is stored under very high pressure, and fed to the brake system through a reducing valve. An accompanying photograph illustrates the equipment of compressors and storage tanks in the machine shop at the Montclair car house. Each of these compressors can compress 100 cu. ft. of free air per minute. They are of the two-stage type, with cylinders in tandem, each of which is provided with water-cooling jackets of the usual type; each is driven by a Westinghouse type 56 railway motor, provided with special armature shaft, with driving pulleys upon each end, and two belts are used to drive each compressor, one running to either fly-wheel. The compressors operate at 100 r. p. m. and deliver at a pressure of 325 lbs. per square inch. The motors are controlled by the standard K-10 type of controllers, which are individually mounted near the motors, as shown. The air compressors, as well as also the brake equipments upon the cars, were supplied by the National Electric Company, of Milwaukee, Wis.



VIEW IN END OF MACHINE SHOP IN WHICH THE AIR COMPRESSOR PLANT FOR THE STORAGE AIR-BRAKE SYSTEM IS LOCATED

The station storage tanks, three in number, are located at the rear of the compressors and set in a pit in the floor, as shown. The air passes from the high-pressure delivery of the compressors to the first tank, which is provided with a safety valve; from that tank it passes to the middle tank, and thence to the third, from which delivery is made to the street car hose delivery boxes for the cars. The air in thus passing serially through the three tanks, is thus afforded the maximum opportunity to cool before entering the car storage tanks. The station tanks are of heavy construction, 36 ins. in diameter and 18 ft. high; the three have a total capacity of 382 cu. ft., their combined capacity at the pressure of 325 lbs. being 8434 cu. ft. of free air. They are made of ½-in. steel plate, with convex heads of 9-16 in. thickness; their longitudinal seams are of the double-butt strap triple-riveted type, while the circumferential seams are double riveted for extra strength, the test pressure having been 600 lbs. hydraulic pressure before acceptance. They were built by the Niles Boiler Works, of Niles, Ohio.

A brief reference to the car air equipment may also be of interest in this connection. Each car is equipped with two storage reservoirs 18 ins. x 78 ins. in size, one beneath each side, for the high-pressure air storage. These are provided with connections ending in a solid head coupling of the usual air-brake hose type, from which they are filled at the car house air supply boxes. From these tanks air is fed through a reducing valve into a service reservoir, 12 ins. x 42 ins. in size, from which the supply is taken through the motorman's valve in the usual manner for the brake system, which is of the Christensen "straight air" type. The reducing valve in the supply to the service reservoir reduces the pressure therein to 50 lbs., thus providing a very large storage capacity. Two gages are provided in each car vestibule, one of the double type to show both the storage tank pressure and the service reservoir pressure; the other gage is connected to the train pipe to show the pressure acting in the brake cylinder. The brake cylinders are of the double piston type of the National Electric Company, and are 8 ins. in diameter; the entire car equipment, including the motorman's valves, brake equipments, etc., were supplied and are being installed by the National Electric Company.

MACHINE TOOL EQUIPMENT

The equipment of tools selected for use in the repair shop, while necessarily not elaborate on account of the limited scope of repair work provided for at this point, is still quite extensive, and permits a range of machining operations sufficient to take care of all ordinary and many special jobs which may come in the way of running repairs. The equipment embraces in brief a lathe, a shaper, a drill press and an emery grinder.

It may be noted that the planer is not included, but the shaper is of sufficient size to take care of all plane-surface work that will perhaps ever be necessary. The lathe was especially selected as regards diameter of swing and length of bed, so as to handle very large work; the farsightedness here shown will prove particularly valuable in the operation of the shop, as this has precluded the necessity of various tools which might otherwise have been necessary. The drill and the emery grinder are, of course, very necessary to the equipment of any shop.

The accompanying engraving illustrates the tools as installed, the view in the shop looking toward the air compressor outfits, however, presenting the better illustration of the drill press. As may be noted, the tools are arranged in line along one side of the shop and conveniently spaced with plenty of room for access and for the storage of material. One of the most important features of the shop equipment is to be seen in the arrangement of driving each tool individually by an electric motor; this is in accordance with the very latest and best machine shop practice, and results in a most convenient and light shop room, owing primarily to the absence of overhead shafting and belts. In addition to the avoidance of cluttering up the overhead room with dirt-bringing shafting equipment, with its resultant dirty condition of shop, the roof trusses were enabled to be made considerably lighter; the latter, while perhaps not of so much consideration in a small room like the one in question, is of great importance in many shops.

The tools were all installed of ample size to provide for wide variations in work. The lathe, which was made by S. W. Putnam Sons, Fitchburg, Mass., has a capacity for 18-in. swing and 6 ft. between centers. This will, it is thought, take care of almost any extreme that may be imposed by the service in question. This tool is driven by a 1¼-hp, 500-volt motor, built by the Magneto Electric Company, Amsterdam, N. Y., the motor being provided with a variable-speed controller operated through field control, to give a speed range at the motor of 500 to 1500 r. p. m. The motor is mounted upon a special frame work above the headstock, and drives directly through two runs of gearing to the spindle. The controller is mounted in front of the headstock and is conveniently arranged for operation by means of a splined shaft beneath the carriage, through which the control is operated by a handle upon the apron wherever it may be located upon the bed.

THE RECREATION ROOM PROVIDED FOR THE USE OF THE CAR-SERVICE MEN WHILE OFF DUTY

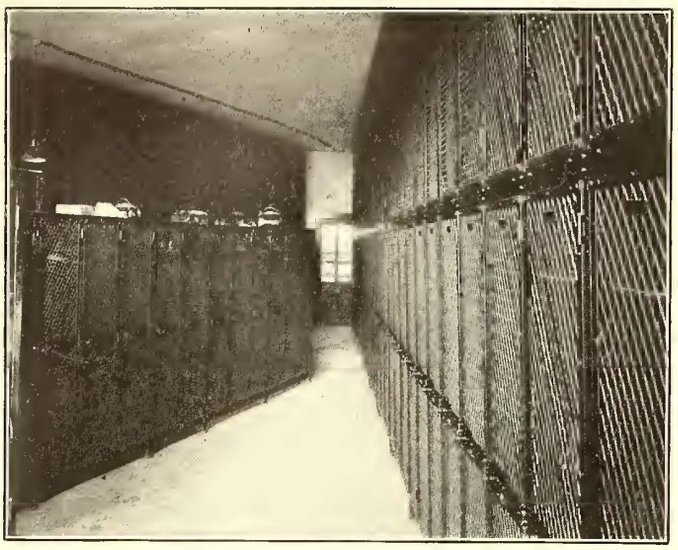
The shaper, which was built by the Cincinnati Shaper Company, Cincinnati, Ohio, has a capacity of a 16-in. stroke. As may be noted, it is driven by a 2-hp, 500-volt General Electric back-geared motor, which is mounted at the rear of the shaper and drives through a belt. This motor is arranged for a speed variation of from 1150 to 2300 r. p. m., the controlling rheostat being mounted on the wall at the rear of the tool.

THE STOCK ROOM USED IN CONNECTION WITH THE MACHINE SHOP FOR THE STORAGE OF REPAIR MATERIALS

The emery grinder is of the new motor-driven double type, with two wheels mounted upon the extended armature shaft of a special motor, the motor in this case being a 6-hp, 500-volt motor, built by the Akron Manufacturing Company, Akron, Ohio. The wheels are both provided with protecting shells and special guide rests upon which to support the work. The starting box used in connection with the motor, which is in this case of the constant-speed type, is located in the pedestal of the tool beneath the motor. This grinder equipment was furnished by the Ransom Manufacturing Company, Oshkosh, Wis. The upright drill is a 22-in. drill press, built by the W. F. & J. Barnes Company, Rockford, Ill. This tool is the standard type of upright drill of this company, but is provided with a special support for the motor drive above the upper cone pulley, as shown. Upon this a 1-hp, 500-volt motor is mounted, which drives by belt to the lower cone pulley of the tool. The motor, which was furnished by the Mechanical Appliance Company, Milwaukee, Wis., is equipped for a 2 to 1 speed reduction, while further changes of speed are obtainable through the cone pulleys. In this case the speed-changing controller is mounted directly upon the side of the drill upright, adjacent to the feed-handle, where it is most convenient to the operator.

In addition to this equipment, as shown, there is installed at the rear of the car storage shed a large open forge of the portable type, which was furnished by the Buffalo Forge Company. This forge is of the large circular type, without hood, so that it may be easily moved from point to point as required. A special ventilating hood was thought unnecessary on account of

the high roof of the shop, which would facilitate ventilation. The forge is provided with a small motor-driven blower outfit, mounted upon an extension of its base, so that the entire equipment is self-contained. The blower is operated at high speed by a ¼-hp direct-connected General Electric motor, so that for operation it is only necessary to carry a pair of wires from a nearby outlet plug to the motor.



THE LOCKER ROOM FOR CAR-SERVICE MEN AND OTHER EMPLOYEES, COMBINING FIREPROOF AND SANITARY ADVANTAGES

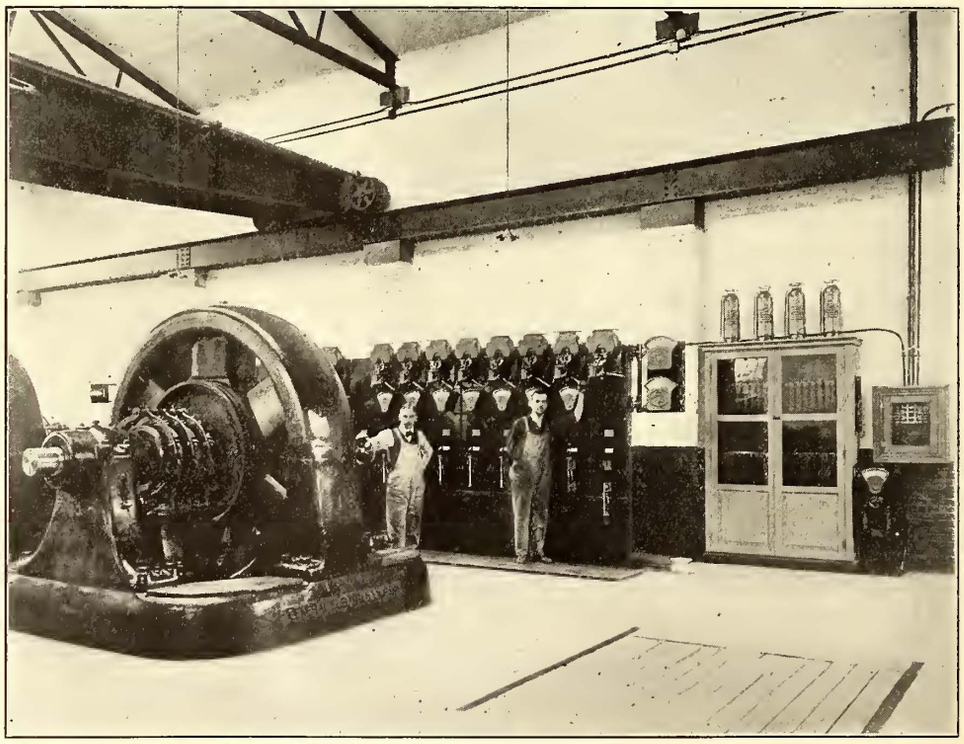
EMPLOYEES' ROOMS

Two of the accompanying views are presented to illustrate the provisions that have been made for the comfort of the car service men, both in caring for their clothing when on duty and in providing a recreation room when they are at leisure. For the former, a locker room has been provided with the latest and most modern equipment to be had. The room in which the lockers are installed is, as may be seen from the view, of a triangular shape, which necessitated a peculiar arrangement of the lockers to conform to the space occupied, but this has been provided for in an arrangement of lockers upon two tiers upon two sides of the room, and a single and a double tier through the middle, at the wider end of the room. This has provided ample room for the men for access to their lockers and also for the changing of clothing, etc. The provision of a storage place where the extra clothing, such as overcoats, rain coats and other personal effects of the motormen and conductors, may be left with safety while on duty is a very important provision on the part of the company. It not only tends toward clean and well-kept conditions in the car house, but also gives the men confidence that their personal effects are cared for in the best possible manner.

The lockers are of the well-known expanded-metal type, built by Merritt & Company, Philadelphia, Pa. As shown in the view, they are arranged in two tiers, each locker being approximately 5 ft. high, thus providing for overcoats and rain coats of average lengths without doubling up. The expanded metal feature provides absolute security against their being broken into, as this type of locker cannot be sprung apart by those maliciously inclined. Each locker is provided with a key, the use of which is extended to any of the employees upon the payment of a nominal deposit. The locker room is kept very clean, as is permissible by the concrete floor construction and general construction of the lockers; another advantage of the open style locker is the fact of the better sanitary condition in them, which results from the freer circulation of air than with closed wooden lockers, and the possibility of the fumigation of the contents if necessary.

Another view shows the arrangement of the club room, adjacent to the locker room, provided for the use of the men while off duty. This is a large, pleasant room, 25 ft. x 60 ft., with ample lighting, in which is installed a pool table, large shuffle board, various games, such as checkers, crokinole, etc., and plenty of reading matter. Easy chairs are provided, and all other provisions for the comfort of the men have been looked after; a feature of no small importance is the pleasant bay window at one end, which looks out over an adjacent pleasant side street. The games are all free for the use of the men, with the exception of the pool table and the shuffle board, which are charged for at a very nominal rate to provide for the expense of the attendant who is kept by the company in charge of the room.

The reading equipment of the club room is of the very best order; many monthly and weekly magazines are provided and a limited number of the better known daily papers. Among the magazines kept regularly upon the reading tables are such of the popular order as "Outing," "McClure's," "The Cosmopolitan," "Scribner's," "Success," "The Ram's Horn" and "Association Men" (the Young Men's Christian Association international magazine). For the weekly magazines: "Leslie's," "Collier's Weekly," "Puck" and "Judge" are kept, while among the daily papers the New York "Tribune," the New York "World" and local dailies are in evidence. Of the technical press, the "Scientific American" and the STREET RAILWAY JOURNAL are kept on file.



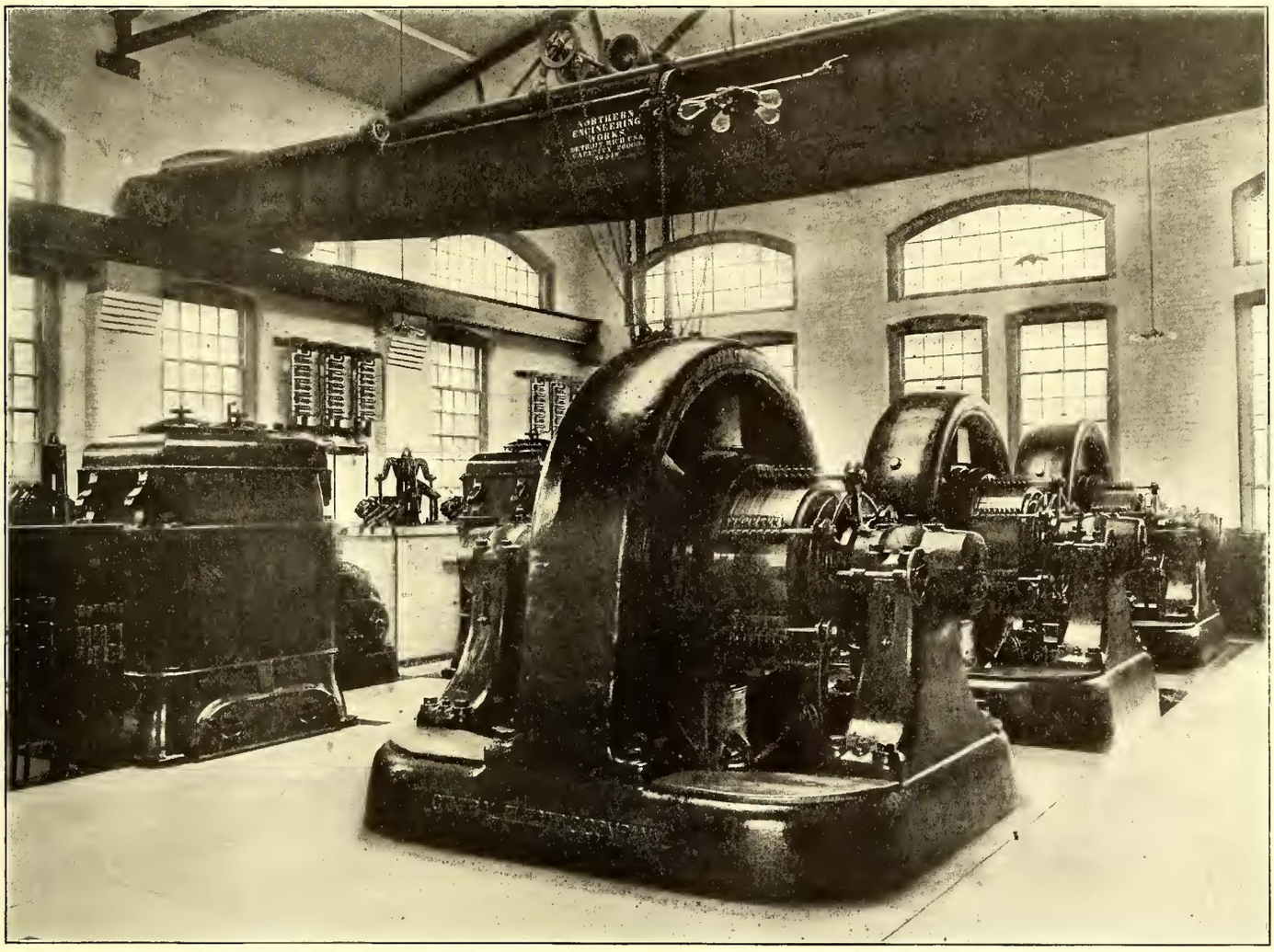
THE SWITCHBOARD IN THE MONTCLAIR SUB-STATION FOR THE CONTROL OF THE RAILWAY FEEDER CIRCUITS

This club room is provided for the men entirely by the company, the expense of the magazines, daily papers, etc., as well as also that of heating, lighting and cleaning of the room, being provided for free of charge to the men. With this is included

a well equipped toilet and bath room, including tub and shower baths, which are also provided for the men. The privileges afforded are very much appreciated by the employees, who make the best use of their opportunities and patronize the club rooms to the exclusion of outside lounging places.

THE MONTCLAIR SUB-STATION

The accompanying illustrations show the interior of the new sub-station which has also recently been installed at this point for the operation of the railway lines of the Montclair division. This sub-station is one of the large chain of power installations that are being provided for by the company, which are all fed by the high-voltage transmission plant at Newark. The desire of the company has been to generate the greater part of its power at the central plant at Newark, where an ample supply of condensing water is provided upon the river front and cheap coal is available by canal boat service, and then transmit it at high voltage to various sub-station points upon its lines.



THE MONTCLAIR SUB-STATION ADJOINING THE CAR HOUSE, CONTAINING HIGH-VOLTAGE APPARATUS AND ROTARY CONVERTERS FOR SUPPLYING THE MONTCLAIR DIVISION OF THE RAILWAY DEPARTMENT

This equipment is one of the latest installed by the company, and represents what is perhaps the best practice in sub-station work. The equipment consists of three 500-kw capacity rotary transformers, with floor space provision for the installation of a fourth when needed. Each rotary is supplied by a separate self-contained three-phase step-down transformer, as shown in the view. The apparatus has been conveniently and compactly arranged in the sub-station, as is shown, with the transformers and oil switches at the rear of the rotaries and the switchboard in front, this representing the standard sub-station practice of this company; also, the room is covered to all corners by a hand-operated traveling crane of 41-ft. span, with 54-ft. travel, which permits the easy handling of all apparatus in the station; this crane is of 10 tons capacity, and was built by the Northern Engineering Works, Detroit, Mich. Another feature to be noted is the unbroken floor level, the oil switches being arranged upon the same level as the machines, which facilitates inspection and care.

Current is received from the generating station at Newark through underground cables, which are of an extra heavily insulated type, owing to the fact that the transmission voltage is 13,200 volts. The cables end in static lightning arresters upon the rear wall of the room above the oil switches, as shown, from whence they lead to the bus-bar compartments in the basement; from the bus-bars current is delivered to the transformers through motor-operated oil switches. The step-down transformers deliver the current to the rotaries at a three-phase voltage of 430, the rotaries delivering to the direct-current bus-bars at 600 volts. The high-voltage bus-bar compartment in the basement is, in accordance with the latest sub-station practice, used as the blower flue for the cooling of the step-down transformers. The blowers are located at the rear of the room beneath oil switches, and are driven by induction motors.

The switchboard has four incoming high-tension feeder panels, only two of which are now occupied, and four rotary panels, of which three are in use; these panels have been equipped with the standard control apparatus generally used upon the switchboards of this type. The delivery or direct-current section of the switchboard is provided with ten feeder panels, eight of which are now occupied. At the right of the switchboard is shown the storage-battery equipment for supplying current for operating the oil switches, and motors for various auxiliary uses. All of the apparatus used in the sub-station, including rotaries, transformers and switching apparatus, was furnished by the General Electric Company.

THE 1400-VOLT DIRECT-CURRENT RAILWAY BETWEEN TABOR AND BECHYNE, BOHEMIA

During the discussion on electric traction at the Vienna convention of the International Street Railway Association, Mr. Krizik, of Prague, referred to a 1400-volt d. c. three-wire railway recently built by him between Bechyne, Bohemia, a famous watering place, and Tabor. As the system of electrical distribution employed differs widely from that used on any American railway, it has been thought that some particulars of it would prove of interest. The line, which is 24 km (16.1 miles)

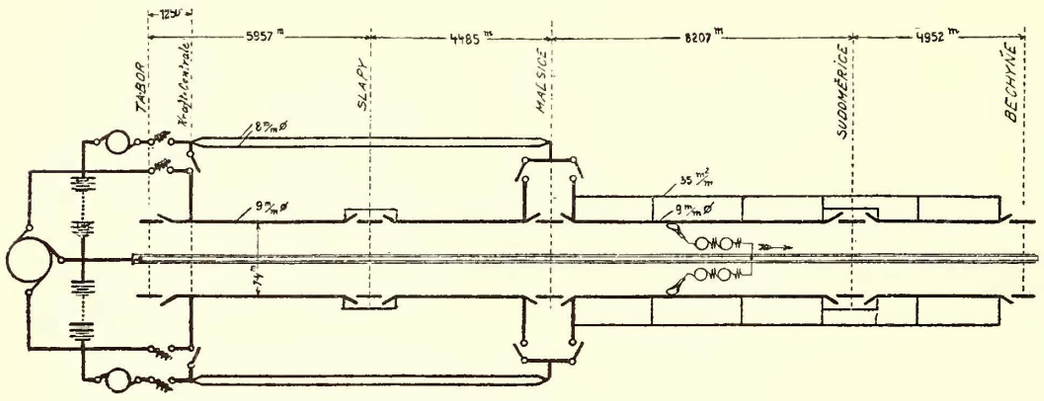


DIAGRAM OF DISTRIBUTION SYSTEM

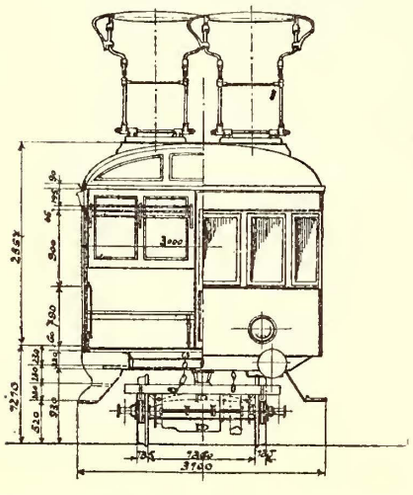
long, was opened for regular traffic on June 22, 1903, and at present eight trains are run every day.

The road construction closely follows the topography of the country, hence fills and cuts are rare. The steepest grade is 3.5 per cent. The only special construction required was the building of a 174-m (571-ft.) bridge across the Luznice River and its valley. The track consists of rails weighing 21.75 kg per meter (43.7 lbs. per yard), laid in 9-m (29.5-ft.) lengths, on pine ties spaced 1 m (39.37 ins.) apart.

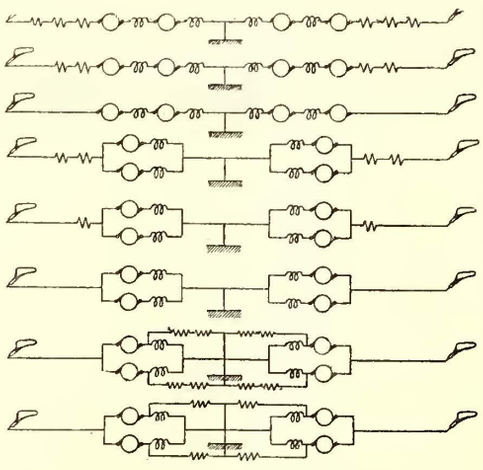
All of the electrical equipment for the cars and power house was furnished by the Fr. Krizik Company, of Prague. Local conditions required the generating plant to be located near the Tabor terminus, over 16 miles from Bechyne. Direct-current distribution at 750 volts, therefore, was not considered advisable, as the heavy drop in voltage would require the installation of a costly storage-battery equipment at some point along the line. Alternating current was rejected owing to higher first cost, lower efficiency on part loads and less availability in using it for a combined railway and lighting plant. Owing to the small rail section used and length of the line, it was decided to install a three-wire, 1400-volt, direct-current system, with 700 volts on each side and the rails as a neutral. As half of the motor equipment operates on one side of the circuit and half on the other, the system is well balanced and very little current flows through the neutral. The advantages over the use of a straight 1400-volt line are, of course, that under no circumstances, even in case of short-circuit, can a motor be exposed to more than 700 volts, and no difficulty has been experienced in commutator or motor insulation with this pressure. In fact, the results have proved so satisfactory that the manufacturers propose the construction of a line operating at 3000 volts and using 800-hp locomotives.

The central station was located on the Luznice River near Tabor with the two-fold object of lighting that city and being near a good supply of condensing water. The station contains three 120-hp engines, of the compound-condensing type, using superheated steam at 300 degs. C. The engines are belted to d. c. generators, one of which supplies current for the railway only, and the others for both railway and lighting. One of these belted sets, running at 220 r.p. m., when operating with the storage battery, is capable of furnishing enough current to operate two 56-ton trains; at other times it is used for lighting purposes. The other engines are of 120-hp, at 180 r. p. m. Two belt-driven boosters have been installed in the station for use if necessary. The storage battery has a capacity of 123 to 171 amp.-hours for three hours loading or unloading. There are also two parallel-wound 500-volt lighting dynamos, which can be operated in parallel with the battery, and a motor-generator set consisting of one motor driving two generators for charging the storage battery or balancing the three-conductor system.

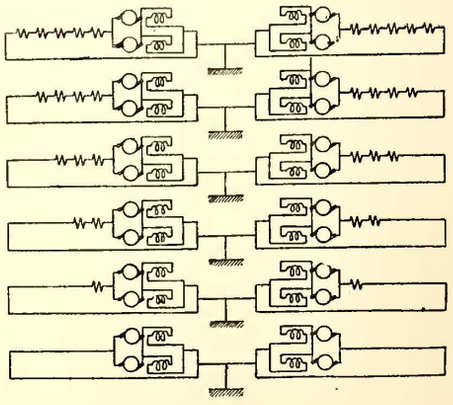
The two overhead conductors are each 9 mm in diameter (No. 00), are 5.5 m (18 ft.) above the ground, and are 1200 mm (47.2 ins.) apart. Current is taken through two bow collectors. Each wire is kept off-center at alternate supporting points so that the bows will not wear unevenly.



CROSS SECTION OF CAR DIMENSIONS IN MM.



For Regular Running



For Braking

WIRING CONNECTIONS

Each double-truck motor car is furnished with four 30-hp 650-700-volt motors, running at 550 r. p. m. The commutator has 121 bars. The gear ratio is 15:75, and the speed attained on a level is 30 km (18 miles) on hour. The weight of a complete motor, including gearing, is 935 kg (1870 lbs.)

At starting, all motors are connected in series, and then two in parallel, but always with an earth connection between the pairs of motors. The resistance has three steps and two run-

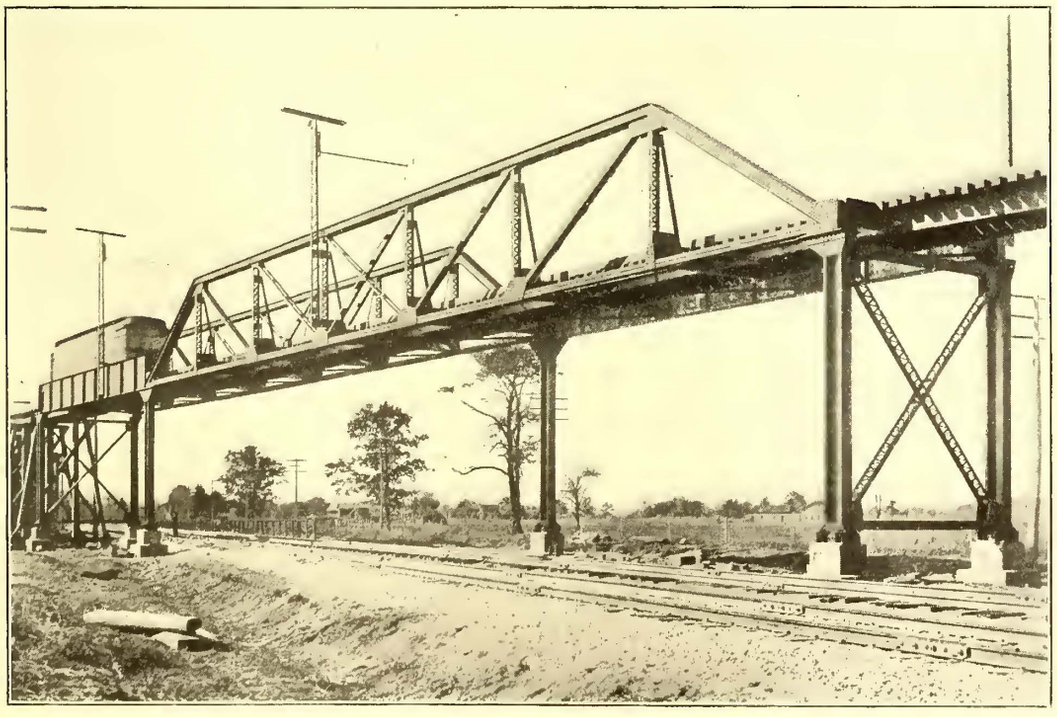
ning points, with the motors in series and in parallel. There are also two steps for higher speeds obtained by weakening the motor fields by shunt resistances, and six braking positions, as shown in the accompanying wiring diagram.

The cars used on this line are similar to those on Austrian steam railroads. They are divided into second-class and third-class compartments, the former seating ten and the latter thirty passengers. Each car weighs 13.5 tons without the electrical equipment. The latter weighs 5.3 tons.

RECONSTRUCTION OF VIADUCT OVER THE MICHIGAN CENTRAL RAILROAD, BY MICHIGAN TRACTION COMPANY, NEAR GALESBURG, MICH.

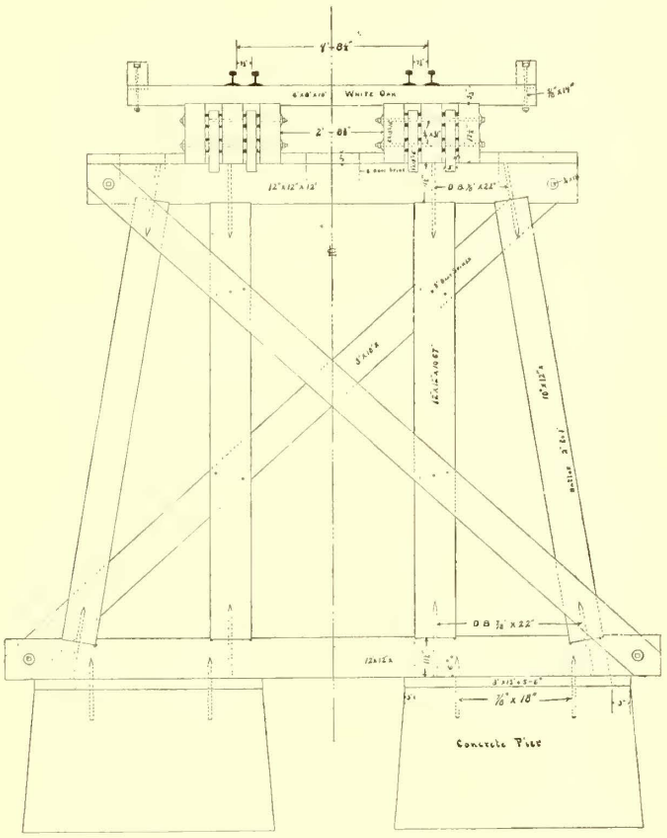
The Michigan Traction Company interurban line between Kalamazoo and Battle Creek crosses the Michigan Central Railroad at Galesburg, Mich., which is about half way between the two terminal cities. This line was built and placed in operation on Aug. 3, 1900. At this time the Michigan Central Railroad was single track, and the west approach to the overhead crossings was made inside the Michigan Central Railroad Company's right of way. At the time the original structure was built it was thought advisable to build a pile trestle, and the crossing with the Michigan Central was made at a 15-deg. angle, with an 8-deg. curve on the north and a 9-deg. curve on the south of the Michigan Central crossing. This structure has been in constant use since the construction of the line, and has given very good satisfaction.

Early in the present year the Michigan Central Railroad began preparing for double tracking at this point, which in turn necessitated remodeling of the viaduct. In order to give the Michigan Central the needed 29-ft. right angle clearance with its track, it was found necessary to construct a steel span for the viaduct proper. The steel span was furnished and erected by the King Bridge Company, of Cleveland, Ohio, and



THE RECONSTRUCTED STEEL VIADUCT BUILT FOR THE MICHIGAN TRACTION COMPANY NEAR GALESBURG, MICH.

is composed of a 126-ft. skew truss, the skew being squared by two 54-ft. plate girders, one being placed on each side at opposite ends. The new approach on the south side is a framed bent trestle supported on concrete foundations. This approach has a 6-deg. curve located about in the center. The curve was given 1 in. elevation for the track, and this elevation was made



FRAMED BENT TRESTLE SUPPORTED ON CONCRETE PIERS

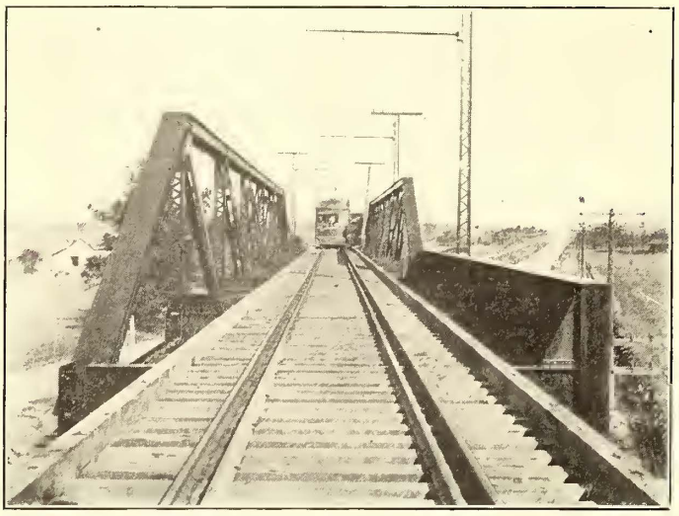
in the concrete foundations so that the cap and sill of the bents are parallel.

All of the foundations, both for frame bents and steel work, are composed of concrete. Those for the frame bents are constructed 3½ ft. deep and rest on sand and gravel, and those for the steel work are from 4 ft. to 6 ft. deep. The steel work is anchored with rods set 6 ft. in concrete, and the foundations from the frame bents have ⅞-in. iron dowel pins set 1 ft. in the concrete and projecting 6 ins. above. The dimensions of timber used in the frame bents, as well as size of the steel in the viaduct proper, are shown by the accompanying illustration. The frame bent approach is composed of thirty-six bents located 16 ft. centers, and is on a 4 per cent grade. At the intersection of the 4 per cent grade and level grade there was used a 3-deg. vertical curve.

The concrete in the foundation was composed of one part Wolverine Portland cement and six parts clean bank gravel. The bank gravel, found in the locality of Galesburg, is composed of two parts screen gravel and one part sharp quartz sand, which is an ideal formation for this work. The concrete

as used was what would be styled "dry concrete," only sufficient water being used so that by thorough ramming, free water could be brought to the surface.

The viaduct was completed and put into service on Oct. 22,



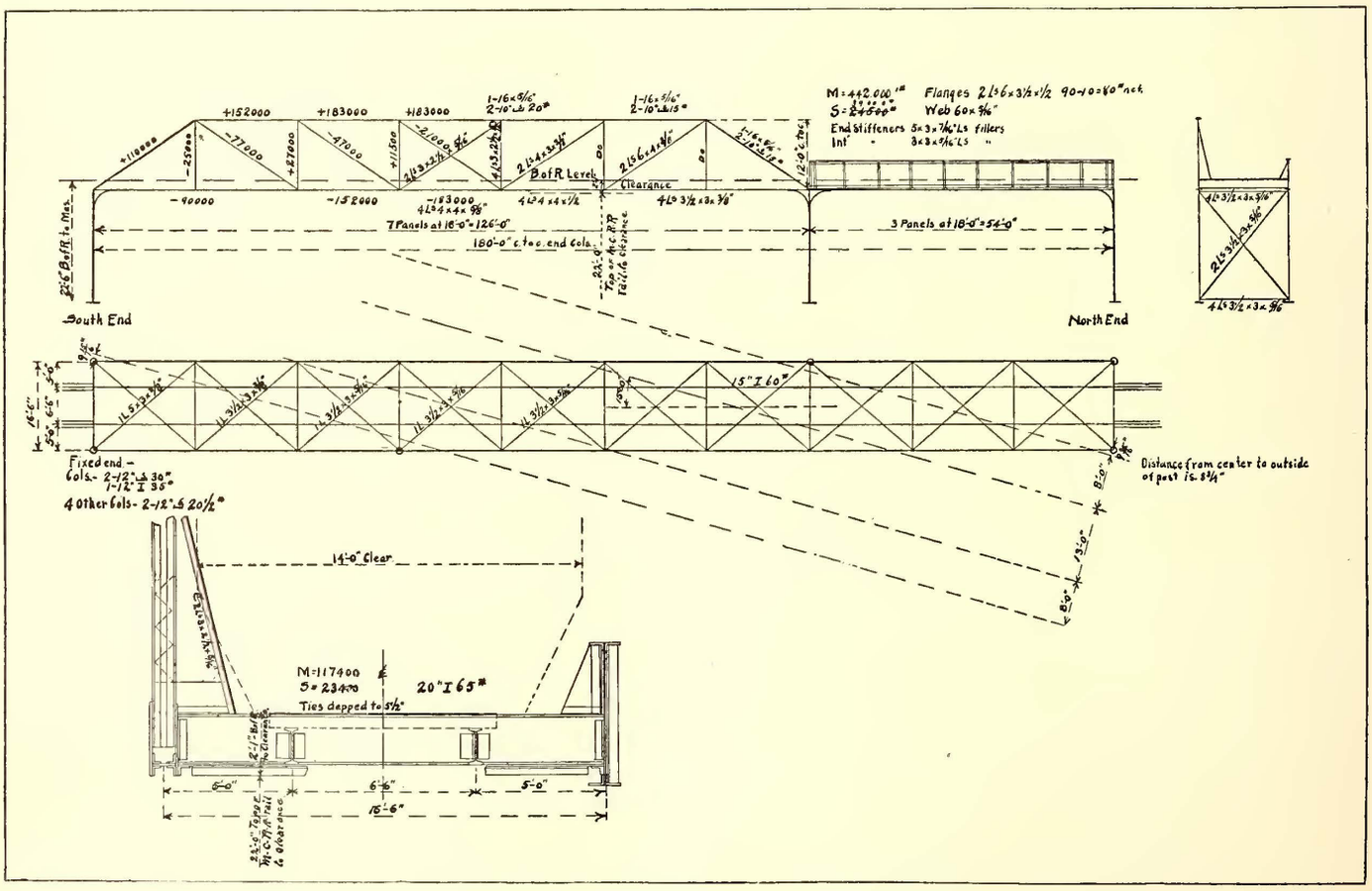
INTERURBAN CAR CROSSING VIADUCT

and all of the work, with the exception of the steel, was done under the direct supervision of S. J. Dill, superintendent, and A. L. Marhoff, engineer, for the Michigan Traction Company. The steel work was erected by the Gribben-Peterson Company,

THE NEW YORK-BOSTON TROLLEY TRIP

Reference has already been made in these columns to the completion of the electric railway between New Haven and Wallingford, Conn., closing the last link in the line between New York and Boston. Because of its general interest, it is thought advisable here to give a general idea of what is involved in a trip by trolley between the two cities. The distance from the Grand Central Station in New York to the Park Street Station, Boston, is 254 miles. The fare is $2.85, and the time required to make the trip is twenty hours. The distance, fare and time between places, in detail, is as follows:

Grand Central Station, New York, to 129th Street, 8 miles, 5 cents, forty minutes; 129th Street to Mount Vernon, 9 miles, 5 cents, one hour; Mount Vernon to New Rochelle, 4 miles, transfer, twenty minutes; New Rochelle to Larchmont, 2 miles, transfer, ten minutes; Larchmont to Portchester, 10 miles, 10 cents, forty-five minutes; Portchester to Stamford, 11 miles, 15 cents, fifty minutes; Stamford to Norwalk, 10 miles, 20 cents, one hour ten minutes; Norwalk to Bridgeport, 14 miles, 20 cents, one hour twenty minutes; Bridgeport to New Haven, 23 miles, 20 cents, two hours; New Haven to Meriden, 20 miles, 30 cents, one hour fifty minutes; Meriden to Hartford, 15 miles, 30 cents, one hour forty-five minutes; Hartford to Springfield, 35 miles, 30 cents, two hours; Springfield to Palmer, 15 miles, 10 cents, one hour; Palmer to Worcester, 38 miles, 55 cents, three hours; Worcester to Boston, 40 miles, 35 cents, two hours fifteen minutes.



DETAILS OF STEEL VIADUCT AT GALESBURG, MICH., BUILT FOR MICHIGAN TRACTION COMPANY

of Cleveland, Ohio, for the King Bridge Company. The steel structure was inspected by H. D. Rumps, bridge inspector for the Michigan Central Railroad, who reports material and workmanship first-class in every respect.

A trackless trolley service was started in Berlin, Germany, early this month. The omnibuses run about 10 miles an hour and are said to be giving general satisfaction.

NEW CALIFORNIA PARLOR CARS

In anticipation of an unusual number of tourists into Southern California this winter, the Pacific Electric Railway Company is building in its local shops two new parlor cars to be used on its interurban lines, as is now done by the "Poppy." These new coaches will be as handsome as those in use anywhere, and will contain all of the latest improvements and conveniences. They will be ready for use early in the new year.

NEW ENGLAND STREET RAILWAY CLUB

The November meeting of the New England Street Railway Club was held at the American House, Boston, on the evening of Nov. 29, President Neal being in the chair. Previous to the meeting, the club enjoyed a banquet in one of the private dining rooms of the hotel, which was followed by a short business meeting. A number of new members were elected, and the club voted that the dues of members joining in November and December be considered as covering these two months, in addition to the coming year. The subject of the evening was then taken up. Clarence Renshaw, of the Westinghouse Electric & Manufacturing Company, Pittsburg, presented a paper upon "Single-Phase Alternating-Current Traction."

Mr. Renshaw began by referring to the history of direct and alternating-current development, and touched briefly upon the relations of each class of work to transmission and utilization problems. He pointed out the well-known superiority of the alternating current in power transmission, and referred at some length to the attempts of European designers to build satisfactory alternating-current motors for railway service. Taking up the motor problem in detail, he brought out the superior features of the series motor as compared with the induction motor in railway work, and then passed to a careful description of the Westinghouse single-phase compensated series motor as it has been developed in response to a demand for alternating-current traction on the part of the engineering community. Full particulars of this equipment have already been printed in our pages in previous issues. From the motor, Mr. Renshaw turned to the other apparatus which forms a part of the alternating-current car equipment, and illustrated both motors and controlling apparatus, trolley fittings, transformer, etc., by a series of excellent stereopticon views. The functions of the induction regulator were described at length, and special attention called to the pneumatically operated bow trolley which is designed to run either forward or backward without requiring any shifting on the part of car crews. The total weight of an a. c. car equipment is about 15 per cent greater than that of an ordinary d. c. equipment of the same capacity, which means an increase in the total car weight of only about 5 per cent.

The speaker stated that with 1000 volts or less on the trolley, the ordinary type of line construction can be modified so as to be suitable for single-phase operation. Above this voltage an improved form of line equipment and construction is necessary, which finds expression in the now familiar catenary suspension of a grooved copper trolley wire from a standard steel messenger cable. The latter is supported in corrugated porcelain insulators. The spans vary from 60 ft. to 120 ft., and every 10 ft. the trolley wire is suspended from the messenger wire by galvanized iron hangers. Iron stirrups protect the insulators from mechanical injury, and these support the messenger wire in case an insulator breaks. Every 1000 ft. a supplementary arm is installed on the overhead system to keep the catenary structure upright and prevent side motion. Overhead lines have been built to work successfully up to 3300 volts.

GROUP OF MEMBERS OF NEW ENGLAND STREET RAILWAY CLUB, TAKEN AT BANQUET NOV. 29

Speaking of the simplicity of transformer stations required to take the place of the present standard rotary converter sub-stations, Mr. Renshaw stated, as an instance of the compactness of the later structures, that a 300-kw single-phase transformer station, reducing the voltage from 2000 to 3000, would have ample room if built in a house 12 ft. x 15 ft. x 20 ft. Such a sub-station should, in general, require no more attention than a transmission line. The resistance of 3 miles of alternating-current trolley line and single track composed of No. 000 B. & S. trolley, 7-16-in. steel messenger wire and 80-lb. rails, is 1.8 times the ohms resistance at 25 cycles, which in this case is equivalent to causing a drop of 60 volts per 100 amps. per mile. With 90 per cent power factor the a. c. drop becomes twice the d. c. drop. With 3000 volts a. c. the percentage drop in transmitting a given amount of power comes to 8 per cent of the fall in voltage with direct current. With two 300-hp

cars half way between sub-stations, and drawing in maximum demand 75 per cent of the combined full load current of the two, 2000 volts on the trolley and 20 per cent drop, the transformer sub-stations need be placed no nearer together than 13 miles. Under the same condition with direct-current, sub-stations must be 5½ miles apart, and a 500,000-circ. mil feeder installed on the low-tension trolley service as well.

Mr. Renshaw then discussed the economies of a. c. over d. c. traction, and pointed out the advantages of the new system for transportation work in sparsely settled communities where a direct-current system cannot be supported. The omission of rotary converters and reduction in attendants' wages are already well understood among the advantages of the new system. Mr. Renshaw stated that it is not the intention of the advocates of a. c. traction to overturn established direct-current practice in large city systems, but that the Westinghouse Company does not advise equipping cars with both a. c. and d. c. control, except in case of great necessity, because of the increased complication and cost of the apparatus. The company thus far has placed no commercial railway in complete operation with a. c. series motors, but at present forty-five complete car equipments, aggregating 11,000 hp in motors, are under contract. The motors vary in capacity from 50 hp to 150 hp. These equipments are for nine different railways, and in less than two months it is expected that some of them will be in operation.

At the conclusion of the paper various questions were asked by the members of the club. It was brought out that the rheostatic losses in acceleration, which amount to from 5 per cent to 15 per cent with direct-current equipment, are almost entirely eliminated by the a. c. inductive control. Three thousand volts was chosen for a line potential because it is high enough to give a satisfactory distribution of sub-stations and low enough not to alarm passengers needlessly. The main difficulty in using much over 3000 volts on the trolleys arises from the line troubles and difficulties in insulation and construction.

A vote of thanks was unanimously passed and tendered to Mr. Renshaw, after which the meeting adjourned.

St. Thomas, Ont., owns and operates the 6-mile electric railway within its corporate limits. The road gives good service, but at an annual deficit ranging from $3,000 to $4,000. The city is to purchase the local gas and electric plant.

TOURING CAR IN CLEVELAND

The arrival of winter and the termination of the "touring car" season permits a review of the results accomplished by the Cleveland touring car during the past summer. The Cleveland Electric Railway Company was one of the first to institute a touring car service in any city, and this car was in operation from July 1 to Oct. 23 under the direction of J. W. Butler, manager of the touring car service.

The car used was one of the company's standard fourteen-bench open cars, seating seventy people. The passengers carried were limited to those who could be seated, and no one was allowed to stand. It was by no means infrequent that a number of people were left on the different trips for the simple reason that the company would not allow them to stand and obstruct the view of those fortunate enough to secure seats.

The car made five trips daily during the greater part of the season, taking about two hours for each trip. The times of starting were 8 a. m., 10 a. m., 12, 2 p. m. and 4 p. m., and were entitled, respectively, "Looping Viaducts," "East End—Garfield Monument," "Looping Viaducts—West End—South Side," "East End—Garfield Monument," "Looping Viaducts—West End—South Side." The largest number of people were carried on the three last trips. The early 8 a. m. trip was patronized principally by strangers coming in on the different boat lines. This trip was taken off Oct. 1, and was also omitted during one or two stormy days in September. On Sundays the crowd was very much larger than on other days, as most of the steamboats brought in special excursions; in fact, the passenger agents of the various lines running into Cleveland were much interested in the touring car and made it one of the features of their excursion bills. Extra cars were run on Sundays during August and September, mostly following the 2 p. m. and 4 p. m. trips.

The tourists were given a small circular descriptive of the routes and the principal points of interest passed by the cars, and in addition the conductor announced and explained the points of interest along the route. Cash fares were collected from each passenger at the rate of 25 cents for each trip. The car did not interfere in any way with regular traffic, as stops were made for passengers only in the downtown district; passengers were allowed to leave the car, however, at any point.

TOURING CAR OF CLEVELAND ELECTRIC RAILWAY COMPANY

The number of car-miles run per day were 95, and the car-hours per day were 9.5. The average receipts per car-mile during the season were 32.29 cents, and the average receipts per car-hour were $3.33.

CONDENSERS FOR STEAM TURBINES*

BY GEORGE I. ROCKWOOD, WORCESTER, MASS.

Visitors to steam turbine power stations generally notice, as a first impression, the relative inconspicuousness of the turbine itself in the midst of its numerous and large condenser auxiliaries. This prominence of the condenser equipment is especially noticeable in the case of the smaller turbine plants, where the floor space occupied by the condenser system far exceeds that required by the turbine.

There appear to be three accepted designs for these condenser systems: First may be mentioned the combination consisting of a surface condenser, a centrifugal hot-well pump, an air cooler, a single-cylinder dry vacuum pump, a centrifugal circulating-water pump, together with their connecting and drip piping and valves. Second, the foregoing arrangement may be varied by omitting the hot-well pump and also the air cooler and dry vacuum pump, substituting the wet vacuum pump—preferably of the Edwards type. The cost per kilowatt is about the same—$7 to $10—for either of these systems. The third system is like the first, except that an elevated jet condenser with barometric tube and hot-well take the place of the surface condenser and hot-well pump. The advantage of this third type over the surface condenser systems is that it may take up less floor space, while its cost is but $5 to $6 per kilowatt. The dry vacuum pump used with barometric condensers must have a two-cylinder air pump, and the exhaust steam from the turbine cannot be used again in the boilers.

The whole cost of a condenser system, as intimated in the opening paragraph, is not, however, fully expressed in the contract with the condenser contractor. The turbine room is made a full third larger, and hence more expensive, by the provision of the necessary floor space; space, too, that is needed in the operations of the turbines. The smaller the turbine plant is, the greater this part of the cost becomes relative to that of the whole power plant.

There is, besides, a fourth type of condenser which may be used with steam turbines and to which it is the object of this paper to direct attention—namely, the injector or ejector condenser.

Within the past year the Atlantic Mills, Providence, R. I., has installed a 400-kw Westinghouse-Parsons turbine. A vacuum of 28 ins. to 28½ ins. is maintained on this turbine by means of the following condenser system: The exhaust steam is led, through 20 ft. of vertical 16-in. cast-iron pipe and three short-turn elbows, into a 16-in. Bulkley injector condenser. The level of the ground floor is 34 ft. below the condenser bulb, while the turbine lies on a concrete steel floor, the level of which is 12 ft. 6 ins. above the ground floor.

The injection water comes 500 ft. from the river to the power house, under a slight head—perhaps 3 ft.—depending upon the state of the river. A 6-in. belt-driven Lawrence centrifugal pump elevates the water into a vertical tank, 30 ins. x 15 ft. deep. The level of the water in this tank is maintained by the waste pipe 6 ins. below the water inlet nozzle on the condenser. From near the bottom of this vertical tank a 7-in. injection pipe rises up to the condenser.

A good deal of air along with the water is pumped into the top of the tank by the centrifugal pump, but apparently the depth of the tank acts efficiently as an air separator, and no air in the form of bubbles passes over into the condenser. At any rate, the vacuum shown by the mercury column is 28½ ins. The remarkable thing is that this is so, as nearly as the height of a mercury column can be measured, whether the column be attached to the bulb of the condenser or to the exhaust chest of the turbine.

To prove this absence of friction in the exhaust pipe, a ¼-in. pipe was connected to the elbow above the condenser, then led down and attached to the turbine exhaust chamber. A branch horizontal pipe leads off to a mercury column. Two valves, one above and one below this horizontal pipe, enable either connection to be made at will. Starting with both valves open and the mercury quiescent, it was impossible to perceive any movement of the mercury, either up or down, after shutting either valve.

Not only is a 16-in. exhaust pipe thus proved ample and more than ample in size for a 400-kw turbine, but the vacuum obtainable with this condenser is substantially the same, whether steam is passing through the turbine or not. The falling of the water through the "throat" is the air pump, and is the only air pump needed. The builders provided a 20-in. exhaust nozzle on the turbine, but Mr. Bulkley believes that, on the contrary, a 14-in. condenser would do as well as the 16-in.

It may be of interest to relate here a rather unusual experience, encountered when this 16-in. condenser was first put into service. It was convenient to have the injection pipe rise on that side of the 16-in. exhaust pipe furthest from the condenser. At the top a 45-deg. bend connected to a long-radius elbow enabled the pipe to turn and pass the exhaust pipe, approaching the condenser horizontally instead of vertically, as in the usual case. Upon starting up the turbine only 22 ins. of vacuum could be obtained. The piping was, nevertheless, proved to be absolutely tight. After shutting the injection valve Saturday afternoon with the turbine blanked off at its nozzle, and with 22 ins. vacuum on the exhaust pipe and condenser, one found 12 ins. vacuum still left on the system Monday morning before removing the blank flange in preparation for starting. Still, only 22 ins. was the maximum height of the mercury column while running.

Finally, at the suggestion of Mr. Bulkley to the effect that in his experience he had found it necessary to have the injection pipe to his condensers approach the condenser vertically rather than horizontally for the best results (although he had no explanation satisfactory to himself why this was so), a rearrangement of the injection piping was made, permitting this vertical approach. At once, upon starting up the turbine, the result was 28½ ins. of vacuum, and this has been maintained without interruption since. With the present load—about 300 kw to 350 kw—the 7-in. injection valve is open only a few turns, the temperature of the hot-well is from 80 degs. to 90 degs., and water enough can be passed through this condenser to maintain the vacuum in summer weather. The highest degree of vacuum thus far recorded, as measured in the turbine exhaust chamber, is 28¾ ins., the lowest 27½ ins. The variation is caused partly by changes in the barometer, but more by variable leakages in drip-valve seats. Perhaps also the amount of air entrained by the injection water varies from time to time.

If water is not to be had in abundance, then the best way is to have two pumps, one of which returns to the condenser the water taken from the hot-well. In this way the highest theoretical temperature of the hot-well water may be reached. It takes 10 hp to supply water by means of the centrifugal pump in sufficient quantity to condense 400 kw of steam.

The method of sealing the spindle of the Parsons turbine against air leak where it passes out to its journals from the low-pressure chambers, namely, by pumping water with centrifugal pumps formed in small recesses in the shaft cover, so as to keep a water pressure in these recesses in excess of that

(*A paper presented at the New York meeting, December, 1904, of the American Society of Mechanical Engineers.)

of the atmosphere, is a perfect success, as the experience with this condenser shows, although when but 22 ins. could be obtained, owing to the fault in the injection pipe design described, the efficacy of these air seals was very seriously doubted. It is interesting to note our experience that no drip pipe or drip pump, for removing the water of condensation or the leakage into the exhaust chamber from these air seals, is found to be necessary or desirable.

It is, indeed, necessary to exclude any accumulation of water in the exhaust pipe for fear that it will sway back and forth until it flushes up on to the large low-pressure blades of the turbine. Running as they do at a very high velocity, sudden contact with water from the exhaust pipe will strip the last row off clean if such contact is permitted. Any further damage, however, to the other rotating blades seems to be prevented by the presence of the fixed row, which, by dividing up the water into small streams, seems to protect the moving rows from contact with solid water and therefore from injury.

The rate of accumulation of water leaking by the small centrifugal air-seal pumps into the exhaust pipe may be any amount up to over 950 lbs. an hour. If, however, there is the least external load on the turbine, the flow of the steam up the exhaust pipe has the power to sweep the exhaust chamber dry. The method of starting the turbine at the Atlantic Mills is to first turn on the injection water. Then admit steam to the turbine without admitting water to the air seals. After the load begins to come on, as shown by the ampere meter, the drip-pipe from the exhaust chamber to the atmosphere, which has been open all night and up to this point, is now closed, the water turned on to the air seals, and the vacuum immediately draws down to 28 ins. It is not found absolutely necessary to start in this way, as the turbine can be run hours before the water accumulates in quantity. The object is simply to drain the turbine up to the moment when the load begins to come on.

If the load is a "jumping" one, from nothing to full load, there is no danger of water accumulation. It is, of course, quite possible to provide a drain receiver and pump which will work under the vacuum if it is deemed desirable to do it. There is no exhaust steam "entrainer," or water trap or seal, provided at the Atlantic Mills turbine.

The injector condenser costs, fully installed, with centrifugal circulating water pump, tank piping and valves, from $2 to $2.50 per kilowatt. This cost is much reduced if there is a natural head of water available. At the installation described, the condenser, two elbows, one tee, 18 ft. of cast-iron exhaust pipe and a 14-in. automatic relief valve cost, erected, $591.50. The room it occupies is practically none at all.

Theoretically considered, in its relation to turbines, the injector condenser would seem to bar out all other condenser system in those situations where the water used in the boilers is pure in its natural state. Where it is absolutely essential to save the water of condensation for re-use as boiler feed-water, owing to the presence of salt, sulphate of lime, wool grease, acid from steel works, or other hurtful pollution, then it pays to use one of the surface condenser systems. If the city water is pure and costs about 7 cents per 1000 gals., water enough for a 400-kw machine at 100 per cent load factor would cost per factory year of 310 days, ten days a day, at 1000 gals. per hour, about $217. With interest at 5 per cent and fixed charges at 8 per cent, this sum warrants the capital expenditure of not to exceed $1670. It is thus clear that it does not pay to buy the surface condenser system simply to save the cost of paying city rates for boiler feed-water.

Much talk has been made about the freedom of the condensed exhaust steam in turbines from cylinder oil, and the advantage which this purity gives to it as compared with the oily exhaust from reciprocating engines, where the condensed steam is returned to the boilers. It should not be forgotten, however, that great purity of feed-water is not in itself a desirable thing, being only better than very impure water; for it pits the tubes and water-legs of steel boilers unless some lime is added.

Where the waste injection water from a jet condenser is used for washing in a dye house, this freedom from oil is of great advantage. Such is the aversion of dyers to using exhaust steam to heat water on account of the supposed presence of cylinder oil, no matter how careful one may be to provide and operate successfully oil eliminators, that this freedom of the turbine from the use of cylinder oil is sufficient cause to determine the purchase of turbines in place of engines for power in such places.

The Atlantic Mills turbine is, so far as the writer knows, the only instance on record of the use of injector condensers for large turbines either of the Parsons or Curtis type.

AUTOMOBILE BUSSES

The Auto Traffic Company,
Pittsburg, Pa., Nov. 29, 1904.

Editors Street Railway Journal:

Your interesting editorial comments of Nov. 12 on the "Trackless Trolley" are very well put and, if your premises be allowed, the conclusions are logical. The writer has been in the electric railway business from the beginning, and remembers when this now towering industry was not "regarded as a rival" by either steam or horse railway men, and when it "bestirred the public to unseemly mirth." And this was so late as 1889—fifteen years ago. Then the electric motor and car was correctly described in the words you apply to the automobile, as "far from an economical mechanism to operate." As to tires, the clients of the Auto Traffic Company here are getting about twice the mileage you allow, from bare solid rubber, in passenger schedule service at commercial speeds. And for many country roads rubber tires are unnecessary and steel quite satisfactory, while, even on city streets, wood is proving a successful substitute for rubber. But even among rubber tires, there is great opportunity for economical selection, the segmental and armored types promising great economy. I do not hesitate to answer your queries on this point in the affirmative, from sufficient experience.

What you say about roads is indisputable. In this connection there is much promise in the steel highway track where the public roads may be so improved, as by co-operation between the authorities in charge and those interested in auto vehicles. Thus the construction and maintenance expense (the latter of which is much reduced by the use of highway track) may be divided in proportion to the mutual interests and benefits involved. This steel highway track is as smooth as that of any railway, if not so clean, and furnishes a complete solution of the problems you state.

In the fullest faith for the future of commercial auto vehicles, I am, yours very truly,

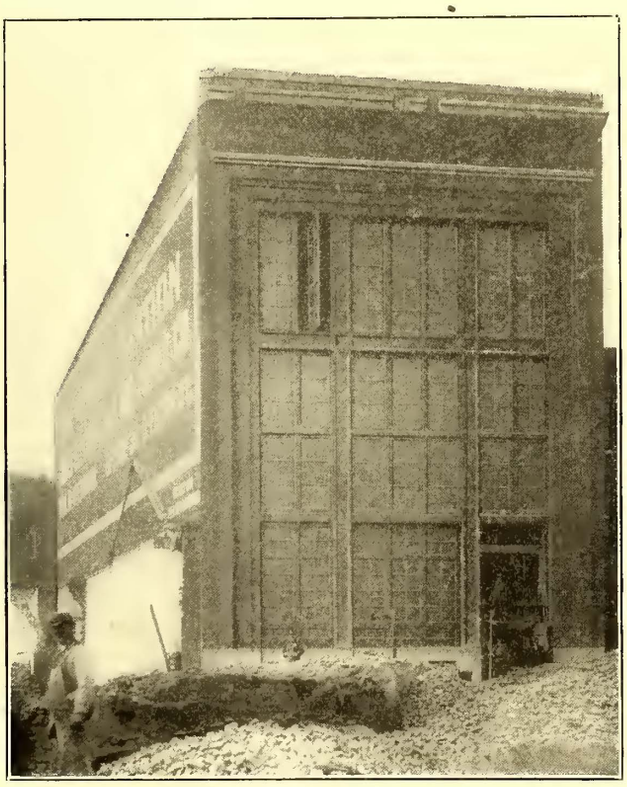
S. J. Macfarren, Manager.

BANQUET OF MASSACHUSETTS RAILWAY EMPLOYEES

The annual banquet of the Marlboro & Framingham division of the Boston & Worcester Street Railway, which occurred at Marlboro early in the morning of Dec. 1, was a successful affair. Employees of this division started the custom of holding an annual banquet when the division was an independent road, and this year they had as guests fifty of the employees of the other divisions. Philip H. Carroll, of Marlboro, presided. Arthur C. Ralph, former general superintendent of the Boston & Worcester Street Railway, was heartily greeted by his former subordinates. Other guests were Auditor A. E. Stone, Assistant General Superintendent E. H. Richards, Assistant Superintendent Maxham E. Nash, General Electrician M. V. Ayers, and M. L. Goodwin and M. H. McPhee, despatchers. Representative J. J. Mitchell was one of the speakers.

WIRE GLASS FOR CAR-HOUSES AND POWER STATIONS

The growing interest in fireproof and fire-resisting construction for street railway car houses and power stations is one of the most important developments of the past two years. The subject has been actively taken up by both the underwriters and the railway interests, with the result that many of the structures formerly considered complete are now regarded as utterly unsatisfactory from a fire insurance standpoint. The Baltimore fire contributed in large measure to the present knowledge on fireproof materials, and, among other points, demonstrated clearly the advantages of wire glass for window and skylight protection. In fact, the escape from destruction of the greater part of the Pratt Street power station of the United Railways & Electric Company, of Baltimore, and of the sub-station of the United Electric Light & Power Company, of the same city, is attributed by the officers of the companies entirely, or in large part, to the use of wire glass in the sashes and skylights. Both stations were in the path of the conflagration, but in both instances the wire glass withstood the heat and



VIEW OF SUB-STATION IN BALTIMORE, TAKEN IMMEDIATELY AFTER FIRE

preserved the buildings and their contents. The transformer station furnished a particularly interesting exhibit of the fire-resisting qualities of wire glass, because on account of the necessity for a circulation of air for cooling the transformers, the whole front and rear of the building were designed so that they could be practically open, and a large skylight was necessary in the roof for the same purpose. This building prevented the spread to the west and north of the fire, which had not been stopped by the other so-called "fireproof" office buildings in its path. The transforming machinery contained in the station was unimpaired and practically ready for operation directly after the fire. This fire demonstrated that when used in metal sashes, wire glass performs all the offices of metal shutters, and has the advantages that it is always in position, does not corrode and is thoroughly sightly. Underwriters allow it the same rebate in premium as metal shutters, and personally recommend it.

In this connection it is interesting to note that the subject of material for skylights for train sheds and stations has recently been taken up by the Pennsylvania Railroad and carefully considered. Such a succession of troubles had been experienced that a committee of engineers was appointed to investigate the conditions obtaining in this class of structures all over the country. Part of the findings of their report applies directly to car house construction. It is as follows:

(1) From the testimony elicited and from personal observations, we find the percentage of breakage in ribbed, hammered and wire glass is about equal. We do not find that the breakage of wire glass results from any internal stress being set up by the contraction and expansion of the wire within it. (2) The larger sizes of glass break more readily than the smaller. (3) Glass set horizontally, or at an angle, breaks more readily than glass set vertically. (4) Wire glass is most desirable, because, when fractured, the wire will generally hold it in position until repairs can be made.

EVERETT-MOORE SYNDICATE MAKES IMPORTANT DEALS

The Everett-Moore syndicate, of Cleveland, has recently made arrangements which will go a long way toward clearing up its indebtedness, and if certain other negotiations now being made in the interest of its telephone properties can be put through, it is expected that the syndicate will be able to adjust all its obligations. In this event, the bankers' committee, which has been supervising its affairs, will be discharged. The recent sale of $8,200,000 of Detroit United Railway bonds, mentioned in the last issue of this paper, was arranged by Messrs. Everett and Moore, and their disposal removed further care from the syndicate in the matter of the Detroit United, and frees it from obligations of a local nature.

J. R. Nutt, of the Citizens Savings & Trust Company, of Cleveland, has closed an option for Northern Ohio Traction & Light bonds of a par value of $578,000, which includes all the Everett-Moore holdings in this issue. The price is said to have been 62½, which is considerably higher than the bonds sold for a short time ago. A large block of these bonds went to Eastern parties. The balance will be held by the trust company in question, as they are regarded as an excellent investment, yielding nearly 6½ per cent at the price paid for them. There has been a general advance in Everett-Moore securities recently, and other sales have been made which have brought the syndicate considerable money. A year ago the bankers' committee secured from the creditors an extension to April, 1, 1905. The statement is made by one of the committee that the obligations which a year ago amounted to $4,500,000 have been reduced to less than $1,500,000.

SERIOUS WRECK ON NORTHERN OHIO

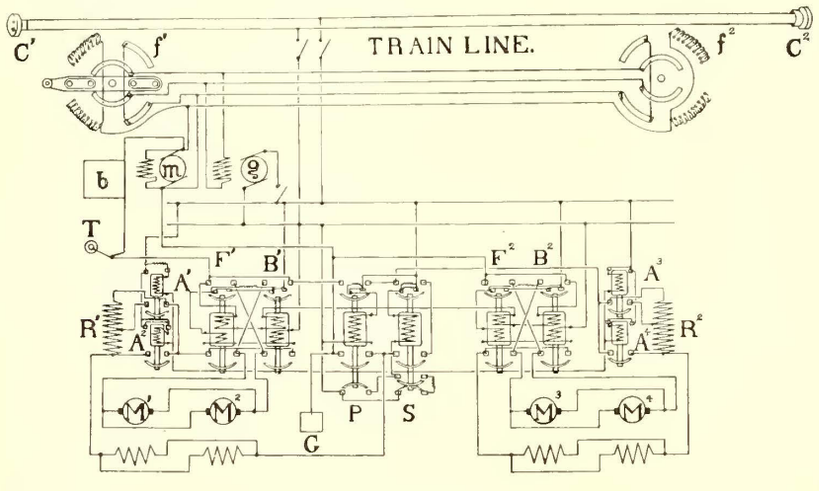
A serious wreck occurred two weeks ago on the interurban line of the Northern Ohio Traction & Light Company. A mile beyond Bedford the line crosses at grade the double tracks of the Pennsylvania. A traction car going south toward Akron was halted before reaching the crossing by a milk train standing on the northbound track of the steam line. The derailing lever was on the side toward the car, and after the milk train had passed, the conductor pulled the derailer and the traction car started over the crossing. When in the center of the crossing, it was struck by a southbound passenger train going at very high speed. The traction car was badly wrecked and all of the eighteen passengers more or less seriously injured, as well as the conductor, who had pulled the derailer and jumped on the car as it was passing. The matter is still under investigation and the blame has not yet been placed. The conductor claimed the northbound milk train shielded the southbound passenger so that it could not be seen. The crossing had been installed only a few months when the steam railroad changed over to the new route.

A TWO-WIRE MULTIPLE-UNIT SYSTEM

A patent has recently been issued to the Cutler-Hammer Manufacturing Company covering a radically new system for controlling motor-driven cars, operated on the so-called multiple-unit plan. The unique feature of this invention is the fact that both the direction and speed of the driving motors installed on the entire train are controlled by means of but two small wires running the entire length of the train, and by the use of a controller of about the same size as a standard field regulator for a 3-kw generator.

The two wires constituting the train line are attached at each end of the car to automatic couplings C^1, C^2, which enable the cars to be shifted either end to, thus requiring no attention in coupling up so far as the electrical equipment is concerned. The maximum current carried by the two-wire train line is the output of a 3-kw 110-volt generator when used in connection with six cars equipped with four motors on each car, capable of developing 300-hp per car, or 1800-hp per train of six cars. Each car may be equipped with a 3-kw motor-generator *m*, *g*, capable of controlling the speed of the motors of the entire train, or by another method each car can be equipped with a ½-kw motor-generator, capable of controlling the speed of its own car only. The direction of travel of the train is controlled by the direction of the current flowing in the two-wire train line, and the speed of the train is controlled by the voltage of the current impressed upon the two-wire train line. These wires are utilized for supplying the necessary current for energizing the windings of a number of solenoid switches, which control the current supplied to the driving motors M^1, M^2, M^3, M^4, mounted on the trucks.

The drawings in the patent show the two driving motors on each truck treated practically as one motor, but provided with an independent solenoid reversing switch *F*, *B*, and two solenoid



PLAN OF CONNECTIONS

accelerating switches *A* for cutting out the starting resistance *R*. Two other solenoid switches *S*, *P* are also employed for connecting the motors on one truck, either in series relation with the motors on the other truck or in parallel relation therewith, in accordance with the speed desired. The method of operating the reversing switches in accordance with the direction of the current flowing through the two-wire train line is quite simple. Each solenoid used on the reversing switches *F*, *B* is provided with two windings. One of these windings is permanently connected between the trolley *T* or third rail and the ground *G*. The other winding is permanently connected to the train line. The coil on the forward solenoid reversing switch *F* is wound left-handed, and that on the back-up solenoid reversing switch *B* is wound right-handed. It is evident, therefore, that when the current is flowing in the train line in one direction, it will assist the winding of one of the solenoid switches and neutralize the action of the other solenoid winding, so that the desired solenoid switch will be energized in accordance with the direction of the current flowing in the two-wire train line. The windings of the accelerating solenoids and the series and paralleling solenoids are wound to actuate their plungers at different voltages. The operation of the system is briefly as follows:

Suppose that each car is equipped with a 3-kw motor-generator *m*, *g*. At each end of the car is installed a 3-kw field regulator *F*, having a double set of resistance buttons and segments. An ordinary 3-kw 110-volt starting box *b* is also provided. The operator first starts the 3-kw motor by means of this starting box. He then moves the field regulator lever F^1 in the direction in which it is desired to move the train. When the lever of the field regulator makes contact with the first step of the resistance, current is admitted through this resistance to the shunt field of the 3-kw generator *g*, thereby causing same to impress a voltage on the two-wire train line of, say, 20 volts. This voltage is sufficient to supply enough current to energize the forward reversing solenoids F^1, F^2, and cause same to lift their plungers, assisted by the current taken directly from the trolley or third rail. The same voltage also supplies sufficient current to energize the winding of the series solenoid switch *S*, which attracts its plunger and closes the circuit of the four driving motors M^1, M^2, M^3, M^4 in series relation. The operator then moves his 3-kw field regulator lever to the second notch, which increases the voltage on the two-wire train line to, say, 40 volts, which is sufficient to energize the first of the solenoid switches A^1, A^3 for cutting out the first step of starting resistances R^1, R^2. The operator then continues to advance the 3-kw field regulator lever, thus gradually increasing the voltage on the two-wire train line until finally the second step of resistances R^1, R^2 is cut out. The paralleling switch *P* is then energized and the starting resistances R^1, R^2 reinserted, which resistances are then again cut out until the driving motors are finally operating in parallel relation at full speed. The only wires which run the entire length of the car are the two-train wires capable of carrying about 30 amps., and the four-wire cable connecting the two 3-kw field regulators, and capable of carrying a small fraction of an ampere in each wire. The solenoid switches controlling the driving motors are assembled in two sets near each truck, so that only four large wires are necessary for connecting the motors on the two trucks in series or parallel relation.

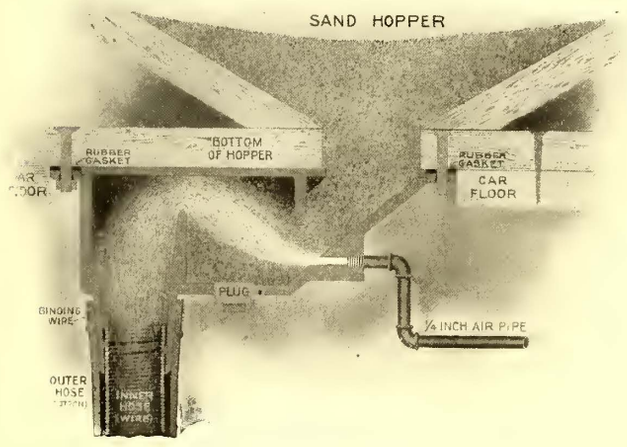
A second method, not shown in this particular patent, has been made the subject of another patent, and installs a ½-kw motor-generator on each car, and varies the voltage of each generator by varying the voltage of the train line. In this case the train line carries current sufficient only for energizing the fields of six ½-kw generators at 500 volts, or about 6-10 amp., the field windings being adapted for 500 volts and the armature windings having a maximum of 110 volts for supplying the various solenoid windings on each car. It will be noticed that there is absolutely no operator's switch in the train line circuit, and that the system is totally different from the usual method of employing a multiplicity of wires running the entire length of the train, and utilizing each wire to energize some particular set of solenoids. The system has a still further advantage in employing a low voltage on the solenoid windings, as well as on the controlling wires. It is possible to control the entire train by means of one wire, using a rail return, but two wires are preferable for practical work. It is also true that it is practically impossible for the operator to too rapidly accelerate the train, for the reason that the potential of the generators used will not respond instantly to changes in the

energizing current of their field magnets when designed with this feature in mind. In practice, therefore, the operator has merely to move his controlling lever to the full speed position and the train will smoothly and rapidly acquire full speed without further attention.

PNEUMATIC SANDERS

Most railway managers and engineers agree that rapid acceleration is not only desirable but necessary on high-speed interurban and city roads, where stops are frequent and where a fast schedule must be maintained. To secure rapid acceleration or to maintain high speeds, a thoroughly efficient track sanding device is absolutely necessary, as without such provision there is invariably excessive power consumption, due either to the spinning of the wheels or to the heavy equipment which is necessary to prevent such spinning. Although a number of track sanding devices of different kinds have been exploited, most have proved unreliable in operation.

To find a device that would fulfil all the requirements demanded, the Ohio Brass Company, of Mansfield, Ohio, made a careful study of the sander question, resulting in its arrangement to manufacture and sell the Nichols-Lintern pneumatic sander. The convenience of having the sand always under



SECTIONAL VIEW OF SAND TRAP AND FITTINGS

instant control, the certainty of operation, the absence of all movable mechanism subject to derangement, and the fact that it works as well on curves as on straight track, are features of the Nichols-Lintern sander which cannot fail to appeal to practical street railway men.

The sander is invaluable as an aid in starting a car, especially where the rail is slippery or in poor condition, as it will effectively prevent any spinning of the car wheels.

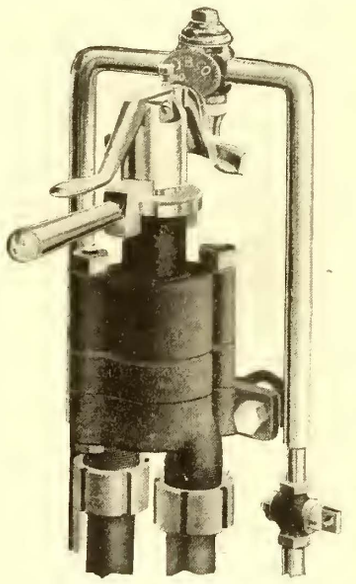
Another of the valuable features is that it deposits the sand on the rails regardless of the position of the truck with respect to the car body. A special truck attachment is employed by which the hose is held directly in front of the wheels at all times. The flexibility of the hose enables it to follow the various movements of the truck with ease, and without in any way affecting the flow of the sand.

The manufacturers state that, despite a popular impression to the contrary, it is a fact that a car equipped with this sander, in addition to an air-brake equipment, will use less air than a car with the air-brake equipment alone. The reason for this is, that in order to get the greatest braking efficiency with any braking apparatus, the condition of the rail must be the best available. A bad rail, or one in a slippery condition, necessitates several applications of the air brake before the speed is checked, while with the sander a slight application of sand will stop the car in less time and with a considerable saving of the air applied to the brakes. This results in an actual net saving of air.

In stopping a car equipped with air brakes, the power applied to the brakes is often sufficient to lock the wheel before the car stops, causing it to slide on the rails and, consequently, producing flat spots on the wheels. This trouble can only be prevented by a judicious use of sand, and for this reason alone this sander is a valuable adjunct to an air-brake equipment.

A feature of the sander which will appeal strongly to master mechanics is that the sand trap can be located at almost any desired point. The absence of any movable mechanism is another important feature in its favor. The sand trap is absolutely moisture proof, preventing moisture from interfering with the proper flow of sand.

The supplementary sander valve, illustrated above, is attached to the motorman's brake valve and becomes practically a part of the same. The handle of the supplementary valve interlocks with the handle of the brake valve and rotates with the latter, so that the sander can be operated with the brake valve in any position. If sand is desired for starting the car, a slight pressure will operate the sander, whether the brake-valve handle is in the service stop, lap or release position, or passing from or to any of these positions. The principal feature of this supplementary valve is that it gives the motorman absolute control of the sander at all times, with the least amount of attention. Hence, this arrangement is superior to any method where the motorman must make various movements to apply and shut off the sand.



AIR BRAKE CONTROLLING MECHANISM FITTED WITH SUPPLEMENTARY PNEUMATIC SANDING VALVE

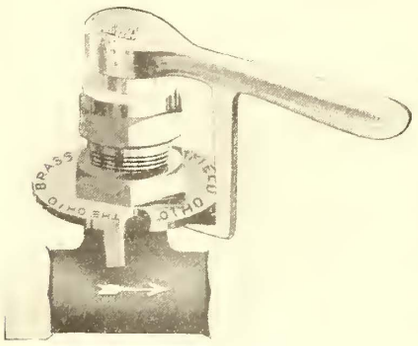
The flow of sand also is shut off automatically as soon as the pressure on the valve handle is released, thus preventing waste of sand. The operation of this valve will bring a car to a gradual stop on either bad or slippery rails without any undue sand losses or wear on any part of the equipment. An excellent feature of this device is that in throwing the brake valve in the emergency stop position, the supplementary valve automatically opens and sands the track without attention on the part of the motorman. By means of the supplementary sander valve, the sand can be applied just before the brakes are set, thus preventing skidding of the wheels.

If it is desirable to allow the sander valve to remain open continuously for a considerable period, as in climbing long grades, the valve can be kept open by screwing down on the thumb nut adjustment on top of the supplementary valve.

It is common practice with some motormen to throw the brake valve into the emergency position for ordinary service stops, and this practice is universally condemned owing to the severe strains imposed on the brake apparatus. The supplementary sander valve will completely obviate this evil, as the misuse of apparatus can be easily detected. A reducing valve is used in connection with the supplementary sander valve to reduce the air pressure, which ordinarily is higher than is necessary for operating the sander.

The arrangement of the sand trap and the method of its attachment to the car floor are clearly shown in the accompanying sectional view of sand trap and fittings. The sand trap is

so arranged that it can be placed at almost any convenient part of the car where the hose will properly reach the wheel. Its design is such that only an application of air will drive the sand through it, so that there is no leakage or waste of any kind. The tendency of the sand to clog is entirely eliminated by the manner in which the air acts upon it, and as there is no moving mechanism about the device there is nothing to get out of order. By means of the truck attachment the sand hose is securely



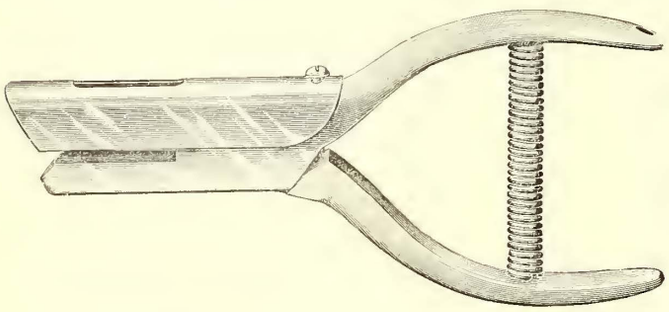
INDEPENDENT SANDER VALVE

fastened at any desired point with respect to the wheel, and follows it whether on straight or curved track.

The independent sander valve is intended to take the place of the supplementary valve, where, for any reason, it is desirable to use a separate valve for operating the sander. This valve may be connected into the piping at any point where it is convenient to the motorman. It is so constructed that a slight movement of the handle will cause a flow of sand, the first notch being intended for ordinary service, and the second and third notches for emergency stops. The indicator plate can be adjusted to accommodate itself to wear in the valve seat, and to the different positions it may be desirable to set the valve. This valve must be so connected up that the flow of air will be in the direction of the arrow.

CONDUCTORS' TICKET PUNCH

Conductors' ticket punches have long been a specialty of Kraeuter & Company, Newark, N. J., and in the course of their



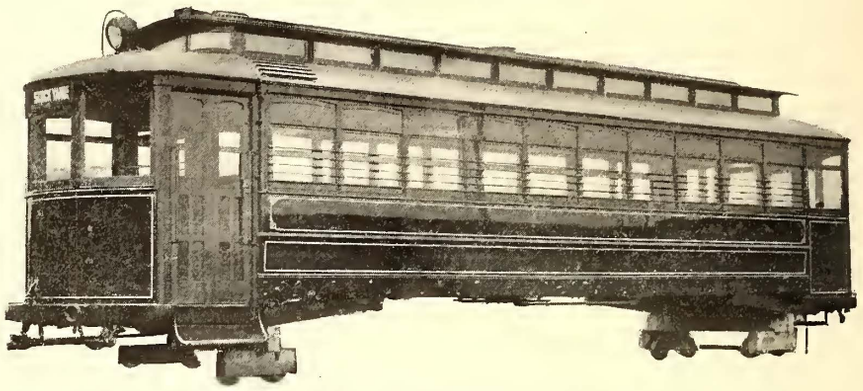
TICKET PUNCH FOR RAILWAY WORK

forty years' experience in this line they have brought out a large number of improved types. Among the numerous styles now made by this company, the one illustrated in the accompanying cut has been found especially serviceable for railroad and steamship use. It is made of nickeled steel, is 5 ins. long, and has a reach of 1 in. This punch is known as style No. 2579, and is adapted for over 200 perforation designs.

The cars of the Ballston, Albany and Troy street railway companies are being equipped with portable telephones. Connections with the local offices can be made every 1000 ft. by inserting a flexible connection in the plug of the nearest pole.

MORE CITY CARS FOR EAST ST. LOUIS

The East St. Louis & Suburban Railway Company has recently had delivered to it by the St. Louis Car Company fifteen closed double-truck motor cars for city service, one of which is shown herewith. These cars have longitudinal seats and concave and convex panels. The length of the body is 28 ft. The end doors are single and placed on the side of the car nearest



BODY OF DOUBLE-TRUCK MOTOR CAR FOR CITY SERVICE IN ST. LOUIS

the steps, one side of each vestibule being closed. The vestibules are provided with drop sash on every side save the one occupied by the doors. The cars are equipped with St. Louis illuminated signs, sand boxes and draw-bars.

IMPROVED FARE REGISTER

The Recording Fare Register Company, of New Haven, Conn., is now placing on the market an improved recording fare register, known as type D. One of the principal improvements in this machine over the other types is the practically unlimited capacity of the record strip used therein, having a sufficient length to care for from 100 to 500 half-trips without changing.

This type is made to shift the direction indicator automati-

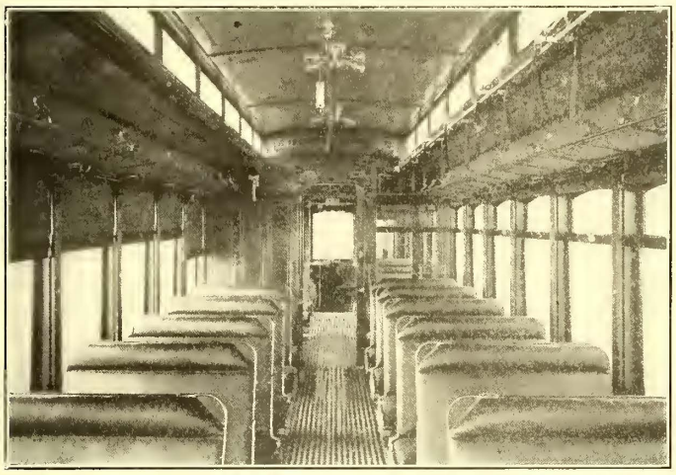
IMPROVED RECORDING FARE REGISTER

cally—that is, from in to out (up to down), or may be furnished with an independent shifter for use where the "zone" system of collecting fares is desirable. By this latter method any number of collections may be made and the direction dial always indicate the proper direction. Other improvements have been made in this type of machine, all tending to simplify the mechanism.

EQUIPMENT FOR THE NEW ROAD BETWEEN JOLIET AND AURORA

Two handsome cars for high-speed service on the new road between Joliet and Aurora were lately completed by the American Car Company, of St. Louis, the cars being ordered by the Fisher Construction Company, the well-known Chicago construction engineering firm. The terminal cities are 22 miles apart and are important railway centers; both cities are about 25 miles from Chicago. The country traversed by the lines is thickly populated and there are a number of good sized towns along the route.

The seating capacity of the cars is fifty-two. The seats are upholstered in leather, and have high backs with head rests; they are of the step-over type, and are 36 ins. long. The passenger compartment is 22 ft. long, and is furnished with a toilet room of standard character. The smoking compartment is 14 ft. long, and is separated from the other compartment by a hardwood partition fitted with a single sliding door. The window sashes are arranged to drop into pockets in the side walls. The small upper sash is stationary. Continuous basket racks are provided in both compartments. The interior finish is golden oak, handsomely inlaid and carved, and the ceilings are tinted light green and decorated in gold.



SEATING ARRANGEMENT OF CAR, SHOWING GRAB HANDLES AND HIGH BACKS

The general dimensions of the car are as follows: Length over bodies, 36 ft.; length over the vestibules is 46 ft.; width over sills, including sill plates, 8 ft. 8 ins.; from center to center of side posts, 2 ft. 8 ins. The center sills are 5 ins. x 8 ins., with 8-in. x ¾-in. sill plates on the outside. The end sills are 5 ins. x 7 ins. The thickness of the corner posts is 3¾ ins., and the side posts, 3 ins. The width of the aisle is 24 ins.; height of the steps, 18¾ ins. from the rails, and risers, 14½ ins. The trucks are Brill No. 27-E-1, capable of 60 miles an hour. The wheel base is 6 ft., and the wheel diameter, 33 ins.

A TYPICAL SPECIMEN OF THE JOLIET, PLAINFIELD & AURORA RAILWAY COMPANY'S NEW CARS

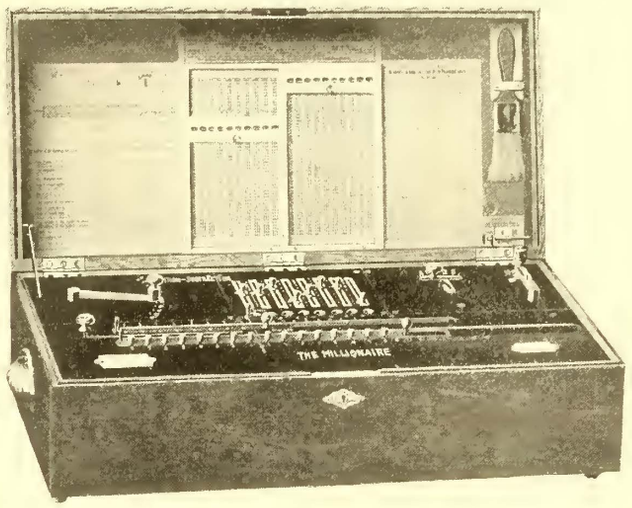
The City Council of Chicago has passed the Ravenswood extension ordinance of the Northwestern Elevated Railroad by a vote of 51 to 11, omitting the provisions that before prevented its acceptance by the company.

ARITHMETICAL CALCULATING MACHINE

The "Millionaire" calculating machine shown in the accompanying illustration is in use in the accounting and statistical departments of a large number of railroads, insurance companies and many other places where much computation is required. It is manufactured in Zurich, Switzerland, by Hans W. Egli, who is represented in the United States and Canada by W. A. Morschhauser, of New York.

The principal advantage claimed for this machine over others consists in the rapidity and simplicity with which multiplications, divisions and compound calculations can be performed.

Only one turn of the crank is required for each figure, while in the use of other machines a turn of the crank is required for the number of units represented by each figure comprising the multiplier or quotient. The figures shown irregularly on the marker slides, denoting the multiplicand or divisor, are reproduced simultaneously below in a straight line, thus insuring accurate demonstration.



CALCULATING MACHINE COMPLETE IN CASE

When a multiplication is completed, the units of the product appear vertically underneath the units of the multiplicand, and the first figure on the left of the result is immediately underneath the first left-hand figure of the multiplier. By inserting the decimal studs to mark off the decimals in the factors, the determination of the decimal point in the product is easily made.

Should an error be made in a calculation by the operator, the machine will detect it by the ringing of a bell, when it can be rectified by addition or subtraction without starting the calculation anew.

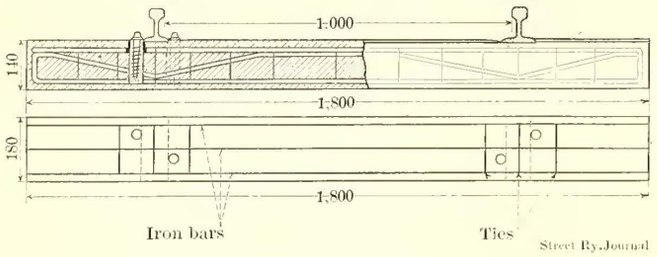
The cancelling or effacing devices are very simple, for both of the two knobs moved independently, according to requirements, efface the result and control respectively.

The "Millionaire," if set for addition or subtraction, will work out all calculations by the same process followed by all other machines, but if set for multiplication it is a regular multiplying machine, giving the results immediately according to the multiplication table.

In addition to the machine illustrated, the manufacturer also builds a similar one known as the "Excelsior," used exclusively for multiplication.

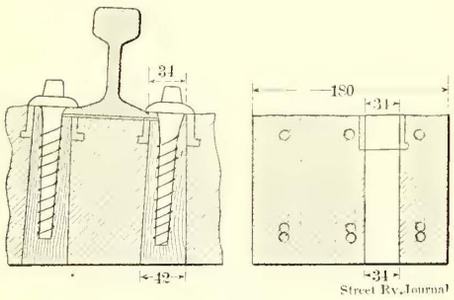
FERRO-CONCRETE STRINGER USED IN FRANCE

Ferro-concrete stringers, as experimented with by the Ulster & Delaware Railroad, are also being used in France to some extent. The light railway of Voiron (Isère) laid down a type of stringer in 1903 which has given much satisfaction, and has



PART LONGITUDINAL SECTION AND PLAN OF STRINGER

just made extensions of its use. The stringer weighs 105 kg (225 lbs.), and costs Frs. 4.50 ($.90). The accompanying sketch shows that the iron frame work (weight, 18 lbs.) is connected vertically and transversely by stays, and a wooden plug is fitted to receive the ties for the rails. This plug is easily replaced when required. The iron frame work is covered with



DETAIL CROSS SECTIONS OF FERRO-CONCRETE STRINGER

a cement to the thickness of 15 cm (6 ins.). The cost of this stringer is five-thirds that of an oak stringer, but five times the wear is obtained therefrom. Suspended from the center, this stringer sustained a load of 4500 kg (9900 lbs.) without excessive bending.

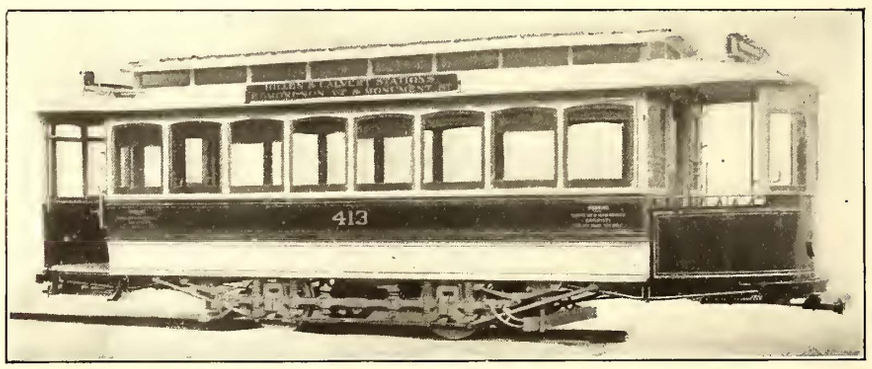
LECTURES TO RECRUITS ON ACCIDENTS

W. F. Weh, claim adjuster of the Cleveland Electric Railway Company, is of the opinion that personal talks with new employees about how to avoid accidents and how best to act in the event of an accident are of great advantage in supplementing the general rules of the company, and he is giving lectures and chalk demonstrations two evenings each week, with a view to carrying home the sense of responsibility that it is necessary for a man to feel if he is to become an efficient employee. The motorman is shown how many different accidents may occur, how to watch out for pedestrians and vehicles in the streets, and is given a general idea of the rulings of the courts as to what the rights are of street cars on highways. Conductors are likewise shown the source of most of the claims from people who ride on the cars. They are told that many of the claims come from children and women who fall in getting on or off cars, and suggestions are made as to means for preventing these accidents. The treatment and care of passengers on cars is gone into, and the law in many important cases is reviewed. The new recruit is impressed with the fact that his responsibility does not cease when the passenger is safely aboard the car, but that the passenger must be treated in a way that will give him no cause for complaint against the company. The annoyance caused to the company by the seemingly trivial accident is also pointed out. Motormen and conductors are shown that in many cases the claim department is left without material with which to combat a suit against the company, simply because the occurrence that prompted the suit was thought of insufficient import to warrant a report with details. The plan seems to be productive of good results, and the work may be extended so as to include a series of lectures to the old employees of the company.

MORE CARS FOR BALTIMORE

The J. G. Brill Company has just completed an order for 150 cars, like the one shown in the illustration, for the United Railway & Electric Company, of Baltimore. Including this lot, the railway company is operating over 1700 cars, and has a trackage of nearly 400 miles in the city and suburbs of Baltimore. The builders last year furnished 110 closed cars with 28-ft. bodies, and 110 twelve-bench open cars, all of which were mounted upon "Eureka" maximum traction trucks.

The new cars measure 22 ft. 11 ins. over the end panels, and 32 ft. 11 ins. over the crown pieces. The width over the sills, including the panels, is 7 ft. 2 ins., and over the posts at the



ONE OF THE NEW BALTIMORE SINGLE-TRUCK CARS WITH 5-FT. PLATFORMS AND PORTABLE VESTIBULES

belt, 7 ft. 10 ins. The seats are placed longitudinally and upholstered in plush. The interior finish is cherry, with ceilings of decorated birch. The platforms are 5 ft. long, with the dasher brought around to the body at one side, the entrance at the opposite side being provided with a folding gate of the builders' type. Portable vestibules are included in the platform arrangement. Single sliding doors are at either end of the car, and the windows have pockets in the sides, of the usual type. The side sills are 4¾ ins. x 6¼ ins., and the end sills, 4¼ ins. x 6¼ ins.; thickness of corner posts, 3¾ ins., and side posts, 2¼ ins. The cars are all mounted on No. 21-E trucks, having a wheel base of 7 ft. 6 ins., 33-in. wheels and 4-in. axles. The weight of the car and truck without motors, 14,500 lbs.

The Big Four and the Lake Erie & Western Railroads (steam) have put on sale "two-trip" tickets for traffic between Indianapolis, Ind., and Lafayette and Crawfordsville, at a rate almost as low as that given by the Northwestern Traction Company. The tickets are good for thirty days, and two persons can ride one way or one person take the round trip on the tickets.

FINANCIAL INTELLIGENCE

WALL STREET, Dec. 7, 1904.

The Money Market

Increased ease characterised the money market this week, rates for both call and time loans declining materially, despite the activity in the local securities market, and the renewal of gold exports. The supply of funds was comparatively large, both local and out-of-town institutions showing more disposition to place their funds than for some time past. Demand money, which, at the close of last week, commanded 3¾ to 4 per cent, was offered in abundance during the present week at 3 to 3½ per cent, while the rates for time contracts ran off ½ per cent to 3½ per cent, contracts for four to six months on first-class collateral being negotiated on that basis. On ordinary mixed securities funds were readily obtainable at 3¾ per cent. Mercantile paper remains quiet and entirely unchanged as to rates. The choicest names are discounted at 4 to 4½ per cent, while names less well known bring 4¾ and 5 per cent. The amount of prime material coming upon the market was only moderate, and there seemed to be a better inquiry from all sources. A feature of the week was the sharp break in the price for sterling exchange, prime demand bills on Monday last selling as low as 4.86¼, as against 4.86 a week ago. The weakness in this branch of the market was due to the heavy offerings of cotton bills and the prospects of a heavier movement of cotton in the near future, resulting from the break in the price of the staple. Despite this severe decline in sterling exchange, gold amounting to $1,000,000 was engaged for export, and in addition the total output of bars of the Assay Office up to Friday was engaged. The date of shipment and the destination of the gold was not disclosed by the firm making the consignment. Money at the principal European centers showed no material change. The discount rate at London was 2⅞, a decline of ¼ per cent, and at Paris and Amsterdam the discount charges were unchanged at 2¼ and 3 per cent, respectively. German discount was harder, the rate being 3⅞ per cent, as against 3¾ per cent a week ago.

At the close all indications point to a continued easy market for the remainder of the year. It was pointed out that although the shipments of funds to the South in connection with the cotton movement has been extremely heavy during the past few weeks, they have been more than offset by the heavy receipts of currency from the West and nearby Eastern cities.

The Stock Market

Transactions upon the Stock Exchange continued in large volume this week, and although prices displayed an irregular tendency, the general tone was strong. The news of the week was, in the main, favorable. Money on call and on time was offered with considerable freedom, at comparatively low rates, and the railway traffic returns showed substantial increase over those for the corresponding period of a year ago. Speculation centered largely in the industrials, nearly all of which were active and decidedly strong. In other quarters of the market there were also evidences of bull aggressiveness, and prices for many issues established new high records for the year. At the opening there was heavy selling to realize profits, which was accompanied by recession in prices, but the ease with which prices rallied was a matter of much comment. It was not until near the close that the upward movement received a serious setback. The announcement of the engagement of a large amount of gold for export, despite the low prices for sterling exchange, caused some selling on Monday afternoon, but on the following days prices more than recovered the losses. Just before the close on Tuesday, the market broke sharply on heavy selling. In some quarters the break was attributed to the passage in the President's message suggesting that the Interstate Commerce Commission should have power to fix rates. However this may be, the downward movement was helped to a considerable extent by the heavy selling of Amalgamated Copper, which movement was generally understood to be engineered by a prominent Boston speculator. The closing was weak and unsettled.

There were no important developments in the local traction issues. Trading in them was fairly active, and prices held strong until the close, when there were fractional recessions in sympathy with the balance of the market. Brooklyn Rapid Transit sustained a sharp loss, the net decline for the week amounting to 2⅛ to 66¼. Manhattan, Metropolitan Street Railway and Metropolitan Securities closed fractionally below the previous week's closing figures.

Philadelphia

Less interest was manifest in the local traction stocks during the past week, and although dealings in them were comparatively small, prices generally showed strength and closed at fractional gains over those prevailing at the close of a week ago. Early in the week, considerable activity and strength developed in United Gas and Improvement, the price advancing about 2½ points to 107⅜ on the exchange of about 21,000 shares. In other issues the gains were confined to the small fractions. Consolidated Traction of New Jersey advanced ¼, about 800 shares selling at 77½, as against 71¼, last week's closing figure. Philadelphia Traction held its own, about 750 shares changing hands at from 98 to 98½ and back to 98. Philadelphia Rapid Transit was fairly active, over 3000 shares changing owners at from 18¾ to 18⅝, an advance of ⅛. Philadelphia Company common, after declining to 41, rose to 41⅞ and closed with a net gain of ½ point, while the preferred moved up from 46¼ to 47½, a gain of 1¼. About 2500 shares of the common, and about 600 shares of the preferred were dealt in. Railways Company General held firm at 4, about 400 shares selling at that price. Union Traction gained ⅛ to 59⅛ on the exchange of about 900 shares. American Railways was exceptionally weak, the price declining a full point to 48¾ on the exchange of odd lots. It is expected that the gross earnings of the company for November will show an increase of nearly $8,000, while the passenger receipts of the Interstate Railways for the same period will show a loss of $1,576, as compared with the same month a year ago.

Chicago

There were a number of unexpected developments in the local tractions during the past week, the most important of which was the proposition to "trolley" the North and West Side cable lines, and, as a result, a fight is threatened between the city authorities, Judge Grosscup and the Union traction interests in the East. According to the reports, Judge Grosscup desires the cable lines changed to trolleys, and it is understood that he contemplates issuing an order for that purpose, on the ground that, as custodian of the Union Traction property, he has the authority to make any improvements which will improve the service and increase the company's earnings. The improvements, will, it is estimated, cost $1,000,000, and the Eastern interests are said to be opposed to putting so large an amount of receivers' certificates ahead of the bonds. In addition to the expenditure incurred by these improvements, some of the receivers are desirous of issuing a large amount of receivers' certificates to pay for various other improvements, and for the purchase of new cars, and the taking up of certificates now outstanding. The hearing of the receivers' petition is set for Dec. 15. It is stated that Mr. Govin will spend the winter in Cuba.

Judge Grosscup has ordered Charles T. Yerkes and other stockholders of the Consolidated Traction Company to answer, or demur, to the petition for a receiver for that company on or before Jan. 5. Facts at hand are said to show that Mr. Yerkes still owns practically all of the outstanding bonds against the company, and is practically the sole owner of the suburban company.

The City Council has passed an ordinance, allowing the Ravenswood extension of the Northwestern Elevated Railway Company. The vote was 51 in favor of the extension, to 11 against.

The traction issues were practically neglected in the Chicago market, there being a general disposition to await further developments in the local traction situation. Chicago Union Traction was extremely quiet, but strong, odd lots of the stock changing hands at from 11½ to 13, the latter figure showing a net gain of 1½ points. Chicago & Oak Park Elevated preferred advanced 2 points on light dealings to 27, but subsequently it lost half of the gain. The company's traffic returns for the month of November shows a daily average of 44,106, against 43,319 last year, an increase of 787 or 1.81 per cent. Taking the transfers into consideration the daily average was 45,759, against 44,691 last year, an increase of 1068 or 2.39 per cent. The common stock was also strong at 8, a gain of ½ point. Northwestern Elevated brought 25½ and 25 for small amounts of the stock. Metropolitan Elevated fluctuated

between 24¾ and 24⅛, and closing at the lowest, a loss of ⅝, while the preferred ruled strong at 67 to 67½. The daily passenger average during November was 115,803, an increase of 1655; South Side Elevated was also weak, the stock sustaining a loss of 1¼ points to 97. For the month of November the company's daily passenger traffic showed 85,160, an increase of 2¼ per cent over the corresponding month in 1902. No comparison can be made with last year's as the road averaged 143,398, owing to the strike of the City Railway employees. West Chicago advanced 1⅜ to 51½, but subsequently it lost all the improvement. Chicago City Railway broke from 188¾ to 186 on the exchange of about 150 shares, and North Chicago advanced ⅛ to 76⅛.

Other Traction Securities

The feature of the Baltimore market was the extreme activity and strength in the United Railroad stocks and bonds, trading in these issues being stimulated by reports of pool-buying for New York interests. United Railway stock opened at 10⅜, an advance of ⅞, and rose rapidly to 14¾, where it closed, showing a net gain for the week of 5¼ points. About 45,000 shares of the stock were dealt in. The 4 per cent bonds advanced ½ to 93½ on the exchange of about $80,000, but the income bonds advanced 7¼ points, upwards of $400,000 changing hands at from 48¼ to 56. Virginia Railway & Development sold at 98½ for about $5,000, and one $1,000 Augusta Railway & Electric 5 per cent sold at 104. Norfolk Railway & Light stock advanced ½ to 11¼.

The Boston market was also extremely quiet, but generally firm. Boston Elevated was dull but firm, the price remaining unchanged at 154, despite the favorable showing made by the company's annual report. Massachusetts Electric stock broke rather sharply on the formal passing of the semi-annual dividend of 2 per cent on the preferred stock. The common declined a point to 15, and closed at the lowest. The preferred lost ½ to 62 at the opening, but subsequently it regained more than the early loss, the closing price being 62¾, a net gain of ¼. West End common advanced ½ to 93, and a small lot of the preferred brought 113. In the New York curb market considerable interest centered in Interborough, which fluctuated widely on fairly large transactions. From 165⅛, last week's closing figure, the price advanced sharply to 169, and after reacting to 165½ it recovered to 168⅞ and closed at 168, a net gain of 2⅞ points. About 15,000 shares were traded in. The company has declared a dividend of 3 per cent, and announcement is made that hereafter dividends will be paid quarterly. The directors, however, do not commit themselves to any fixed rate of distribution on the stock. Washington Railway stock and bonds sustained fractional recessions, the former selling at 28 and 27½, while the 4 per cent bonds sold at 87½ for $9,000.

Security Quotations

The following table shows the present bid quotations for the leading traction stocks, and the active bonds, as compared with two weeks ago.

	Closing Bid Nov. 23	Dec. 6
American Railways	49¾	48½
Aurora, Elgin & Chicago (preferred)	—	45
Boston Elevated	154	153
Brooklyn Rapid Transit	68½	66⅛
Chicago City	190	183
Chicago Union Traction (common)	15	12½
Chicago Union Traction (preferred)	45	41½
Cleveland Electric	—	75
Consolidated Traction of New Jersey	77½	77½
Consolidated Traction of New Jersey 5s	110½	*108¼
Detroit United	77½	79¼
Interborough Rapid Transit	159	168
Lake Street Elevated	—	—
Manhattan Railway	167	167¼
Massachusetts Electric Cos. (common)	16	14¾
Massachusetts Electric Cos. (preferred)	61	62½
Metropolitan Elevated, Chicago (common)	24¾	24
Metropolitan Elevated, Chicago (preferred)	66½	67½
Metropolitan Street	124	123
Metropolitan Securities	82	81⅝
New Orleans Railways (common)	9	5
New Orleans Railways (preferred)	27¾	25
New Orleans Railways, 4½s	80½	80
North American	104½	102¾
Northern Ohio Traction & Light	—	17½
Philadelphia Company (common)	40⅞	41¼
Philadelphia Rapid Transit	17½	18
Philadelphia Traction	97¾	98
South Side Elevated (Chicago)	—	97
Third Avenue	131	131
Twin City, Minneapolis (common)	106½	106¼
Union Traction (Philadelphia)	58⅞	58½
United Railways, St. Louis (preferred)	68½	68½
West End (common)	91½	92½
West End (preferred)	112	113

Iron and Steel

The "Iron Age," in its weekly review, says that its monthly blast furnace statistics foreshadow a very large production of pig iron at an early date, and that the United States Steel Corporation will soon have its entire capacity in operation. During the past month the steel companies made 960,626 tons, against 971,447 in the thirty-one days in October. General consumption has increased by 140,000 tons per month since August. With steel works consuming 1,000,000 tons a month, and merchant furnaces shipping 600,000, and charcoal furnaces making 30,000 per month, we are now using fully 19,500,000 tons of pig iron per year, a startling change, when compared with a year ago. The conclusion is reached that there is a year of full work before us.

REPORT OF THE BOSTON & WORCESTER

The following report of the Boston & Worcester Street Railway Company, for the year ending Sept. 30, 1904, has just been made public, and is of more than usual interest, owing to the fact that the road is the principal high-speed interurban electric railway in New England:

OPERATING REPORT FOR YEAR ENDING SEPT. 30, 1904

INCOME

Passenger receipts		$392,695.42
Freight		200.00
U. S. Mail		250.00
Track and power rental		3,537.43
Rents of buildings, equipment, advertising, etc.		3,339.22
Total income		$400,022.07

OPERATING EXPENSES

Repair track	$10,209.72	
Repair line	4,027.05	
Repair buildings	119.08	
Repair steam plant	953.27	
Repair electric plant	17.10	
Repair equipment	20,196.96	
Repair electric equipment	17,625.59	
Transportation labor	65,290.80	
Power station labor	13,586.54	
Sub-station labor	1,411.52	
Salaries	13,303.41	
Fuel for power stations	47,252.28	
Fuel for car houses and office buildings	756.22	
Power station expense	2,221.09	
Transportation expense	1,106.98	
General expense	4,131.37	
Sub-station expense	52.71	
Printing, tickets and stationery	2,282.05	
Removal of snow	2,367.85	
Track rental	87.14	
Power rental	3,140.12	
Damages	999.07	
Amusements	302.79	
Insurance	6,639.11	
Use of equipment	702.90	
Advertising	1,676.40	
Special cars	73.75	
Total operating expenses		220,532.87
Net income		$179,489.20
Interest charges	$63,116.39	
Taxes	25,075.94	88,192.33
		$91,296.87
Surplus from Oct. 1, 1903, after payment of accident claims, etc.		12,837.12
Net surplus		$104,133.99
Dividend paid July 1, 1904		46,944.00
Net surplus Oct. 1, 1904		$57,189.99

Passengers carried, 8,000,000. Car miles run, 1,800,000

BALANCE SHEET, NOV. 25, 1904

ASSETS

Track, roadway and overhead line construction...		$2,302,231.67
Power stations		490,789.84
Car houses, lands, etc.		197,566.12
Rolling stock and miscellaneous equipment		498,390.18
Mortgage bond discount		40,250.00
Suspense account		14,061.88
		$3,543,289.69

LIABILITIES

Capital stock		$1,724,900.00
Funded debt		1,717,000.00
Notes payable	$434,943.05	
Accounts payable	36,430.82	
Interest accrued but not due	20,914.69	
Gross debt	$492,288.56	
Less Cash and Other Assets.		
Cash in banks	$149,083.61	
Due from bankers for bonds undelivered	233,025.00	
Other accounts receivable	41,138.88	
Coal and other supplies	21,351.85	
Prepaid interest and insurance.	18,812.72	463,412.06
Net floating debt		28,876.50
Profit and loss surplus		72,513.19
		$3,543,289.69

FRANCHISE MATTERS IN CLEVELAND

Several important incidents took place last week in the street railway franchise fight in Cleveland, and two of them at least work to the advantage of the Cleveland Electric Railway Company, which now operates all the local city lines. Councilman Kohl, a 3-cent fare advocate, has introduced a new franchise ordinance, which in brief extends all franchises to 1925, in return for a 3-cent fare for a single ride from the city limits to the public square or any points between, or a 5-cent fare with universal transfers if the ride extends beyond these limits. The ordinance gives the city the right to regulate routes and service and extend tracks into new territory where railroad facilities are needed.

Councilman Behm has introduced another Woodland Hills Avenue crosstown line ordinance, which is similar to the one defeated a short time ago through the claim that it contained a "sleeper" which might extend other grants. The ordinance provides that it shall in no way be construed to extend other grants.

The Circuit Court, on an appeal, has decided that the revocation of consents of abutting property holders invalidates the franchise of the Forest City Street Railway, the so-called 3-cent fare line which built 2 miles of track on Denison Avenue. The consents had been given, but a number of them were subsequently revoked. The lower court held that the revocation of these consents did not hold, and that the withdrawals came to the attention of the City Council too late to be effective. The decision of the Circuit Court reverses this ruling. The case will probably be carried to the Supreme Court.

In the case of a suit brought by a property owner to restrain the Cleveland Electric Railway from extending its crosstown line on Doan Street, on the ground that the company did not have the necessary consents, the Circuit Court has sustained the lower court, and refused to grant an injunction.

NEXT MEETING OF THE NORTHWESTERN ELECTRICAL ASSOCIATION

The next meeting of the Northwestern Electrical Association will be held in Milwaukee, Jan. 18, and is of particular interest to street railway companies, owing to the decision of the association at its St. Louis meeting to include the street railway interests. The membership fee is $5, and the annual dues are $5. The following is a list of the officers: President, T. F. Grover, Fond du Lac, Wis.; first vice-president, George B. Lukes, Evanston, Ill.; second vice-president, Ed. Daniell, Menominee, Mich.; secretary and treasurer, Thomas R. Mercein, Milwaukee, Wis.; directors, W. H. Schott, Chicago, Ill.; D. C. Jackson, Madison, Wis., and H. Almert, Oak Park, Ill. The legislative committee includes J. I. Beggs, of Milwaukee, and W. Worth Bean, of St. Joseph, Mich.

NEW YORK RAILROAD CLUB MEETING

The next regular meeting of the New York Railroad Club will be held at Carnegie Hall, 154 West Fifty-Seventh Street, on Friday evening, Dec. 16, at 8 o'clock. H. D. Emerson will read a paper on "Theory and Practice of Single Track Blocking." The president anticipates the pleasure of a large attendance, especially of those who may be interested in this subject, and whose participation in the discussion is desired and urged.

ANNUAL REPORT OF THE BOSTON ELEVATED RAILROAD

The Boston Elevated Railway Company has issued its report for the year ended Sept. 30, 1904. The income account compares as follows:

	1904	1903
Gross receipts	$12,391,353	$11,959,514
Operating expenses	8,631,553	8,259,860
Net earnings	$3,759,800	$3,699,654
Other income	45,240	59,856
Total income	$3,805,040	$3,759,510
Charges	2,975,268	2,932,556
Surplus	$829,772	$826,954
Dividends	798,000	798,000
Surplus	$31,772	$28,954

Passenger traffic statistics compare as follows:

Rev. miles	48,317,881	47,476,702	45,772,836	43,631,384
Rev. pass	241,681,945	233,563,578	222,484,811	213,107,600

The charges of $2,975,268 are made up of the following items:

Interest	$629,600
Taxes	925,418
Rentals	1,223,043
Subway rental	197,206
Total	$2,975,268

Single surface trackage operated, 423.211 miles; elevated, 16.015 miles.

Total addition to property during the year, $2,802,387.

The cost of removal of ice and snow was $284,476.

Damages paid for injuries, $563,013.

Legal expenses were $254,833.

Wages paid, $3,912,151.

The general balance sheet as of Sept. 30, 1904, compares as follows:

ASSETS

	1904	1903
Construction	$7,313,099	$5,133,359
Equipment	1,845,500	1,614,332
Real estate	5,337,145	5,104,898
Subway and tunnel construction and equipment	319,578	160,343
Cash on hand and in bank	3,564,190	5,083,214
Stocks, bonds and miscellaenous	2,044,859	3,261,912
Total	$20,423,859	$20,358,058

LIABILITIES

Capital stock	$13,300,000	$13,300,000
Capital stock subscribed	.....	.....
Notes payable	.....	.....
Audited vouchers and accounts	288,530	293,784
Salaries and wages	131,329	124,051
Dividends not called for	12,835	7,697
Matured interest, coupons unpaid	20,017	31,337
Rentals unpaid	333,873	333,873
Outstanding tickets and checks	25,037	24,407
Interest accrued, not due	114,513	113,651
Taxes accrued, not due	908,456	904,351
Rentals accrued, not due	142,849	131,825
West End lease account	1,207,202	1,207,201
West End bond account	.....	171
Sinking and special funds	1,579,756	1,558,015
Surplus	2,359,462	*2,327,687
Total	$20,423,859	$20,358,058

*$1,815,000 of the surplus represent premiums on recently issued stock and is reserved for construction by direction of the railroad commissioners.

ELECTRICITY ON THE LACKAWANNA'

Recently there was printed in the New York press a statement coming from one of the small cities in New York State about plans made by the Delaware, Lackawanna & Western Railroad Company for the substitution of electricity for steam in the operation of the company's suburban lines out of New York City. In this dispatch, President Truesdale, of the company, was quoted as making some rather positive statements as to when the change would be made. This story was afterward officially denied by Mr. Truesdale. Evidently to pacify the demand for a statement of the company's policy on the question of the substitution of electricity for steam, Mr. Truesdale, on Dec. 1, gave out a statement that, in a general way, the company has in contemplation the operation by electricity of trains on the line between Hoboken and Montclair. This change will be made as soon as projected improvements can be completed in Bloomfield and Glen Ridge. These include the building of a second track from Bloomfield to Montclair, the elimination of grade crossings between the two places, and better passenger station facilities. The plans have been submitted to the municipal authorities with a view of gaining their reasonable cooperation. No headway has been made thus far, and the apparent lack of interest taken by them has led the company to the conclusion to let the work go over until Bloomfield and Glen Ridge can see the important bearing it will have on their future growth or standstill. Mr. Truesdale said he thought it feasible to introduce electricity as motive power as soon as the grade crossings are abolished, but not before.

BULLETIN ON ELECTRIC LOCOMOTIVES

The General Electric Company has just issued bulletin No. 4390, dated October, 1904, and devoted to the electric locomotives which it manufactures and to the general advantages of electric locomotives over steam for different classes of service. To illustrate this, three cases are taken. One is of a road using locomotives for pushers over a heavy grade; the second is a road handling freight over a section on which a great deal of traffic originates, so that the service demands a great deal of switching and short runs; the third is a road handling ore over a section with heavy loads in one direction and empty trains in another. Statistics are given of the total number of steam and electric locomotives required in each of these classes of service; the operating statistics per locomotive mile and per 1000 ton-miles. The bulletin also contains a number of convenient formulæ for calculating draw-bar pull, acceleration, etc., and statistics of the different locomotives built by the company.

CONSTRUCTION COMPANY ORGANIZED TO BUILD 'PORT CHESTER LINE

The New York Railroad & Development Company has been incorporated under the laws of New Jersey by interests identified with the New York & Port Chester Railroad Company, to build the proposed four-track, third-rail electric railway of the latter company from New York City to the State line of Connecticut, near Port Chester, N. Y., a distance of about 27 miles. The board of directors of the new company is made up principally of men prominent in financial circles in New York, and the company as constituted represents an aggregation of wealth beyond estimate. The Street Railway Journal is able to give authoritatively this board of directors, as elected on Tuesday, Dec. 6. It is organized as follows: Charles W. Morse, John W. Gates, J. Horace Harding, George R. Sheldon, Dave H. Morris, Henry F. Shoemaker, Harry Black, R. R. Moore, John B. McDonald, Samuel Untermeyer, C. D. Simpson, O. C. Barber and W. C. Gotshall. The paid-in capital stock of the company is $1,500,000. This is likely to be increased to $3,000,000.

The New York & Port Chester Company's rights are all secured, except those needed to cross streets in the city of New York. In this city, the company has been unable to secure rights, and for no apparent reason. Application for the right to build was first made to the Aldermen in October, 1903. Finally, at the instigation of a committee of citizens, a public hearing was held. This was held Dec. 8, but was adjourned. On Feb. 2, 1904, the railroad committee of the Council, to which body the application had been referred, reported adversely. A week later the application was refused. The application was renewed March 1, and again was referred to a committee. Public hearings, and even mass meetings in the Bronx were held in favor of the bill. Charles D. Barney & Company came forward at that time with an offer to furnish bonds to guarantee that the road would be built. This had no effect. Two weeks after the Council had granted the application of another company to use the same streets or district, the Board refused the application of the Port Chester Company. It is now reported that the New York & Port Chester Company will attempt to secure grants in New York from the Legislature.

PERJURY IN AN ACCIDENT CASE IN BROOKLYN

Justice Gaynor, sitting in Part IV. of the Supreme Court, in Brooklyn, frequently attracts public attention by his very able rulings. One day last week the justice did a most commendable thing. He committed for perjury two persons who evidently conspired to secure damages for an accident which never occurred. The case was one brought by a Mr. Corcoran against the Brooklyn Rapid Transit Company, in which he sought damages for an accident said to have been received by him on Dec. 2, 1902, while traveling on one of the company's cars. He claimed a fracture of the right foot and right ankle. There was no report on file with the company to show that any such accident had occurred. Later, one La Rowe called on the company and claimed he had been a witness to the accident. He made a statement and swore to it. When the case was called in court, the company showed a release signed by Corcoran to the Metropolitan Street Railway Company, of New York, and was able to prove that he had been injured while a driver for the Metropolitan Company on Aug. 20, 1901, and that his injuries were identical with those he claimed he had received on Dec. 2, 1902, in Brooklyn. Furthermore, the company proved that Corcoran was really confined in St. Francis' Hospital on the day he said he was hurt in Brooklyn.

In dismissing the case, Justice Gaynor said: "I think I will close this case. Case dismissed. Let the plaintiff and witness be committed for perjury. Send for the District Attorney. This shameless perjury is getting too common. We have so much of it that when people come before us who are deserving we are compelled against ourselves to disbelieve them."

CHICAGO TRACTION MATTERS

Stockholders of the North Chicago Street Railroad, and of the West Chicago Street Railroad have filed in the United States Circuit Court a petition for the appointment of a receiver for the Consolidated Traction Company. This latter company is owned by the Chicago Union Traction Company and is a consolidation of various outlying lines formed by Charles T. Yerkes before he formed the Chicago Union Traction Company. In their petition for receiver the stockholders of these companies ask the court to decree that the Consolidated company was organized by fraudulent means. They petition that the credits and moneys of the Consolidated Company be found the properties of the two companies from which it was formed, in the proportion in which each contributed, either in cash or guaranty of bonds. They further asked that the mortgage of $6,750,000 be declared void and that the bonds delivered to Mr. Yerkes by the Union Traction Company, to which the Consolidated Company was sold, be found void, and that, pending ascertainment of the identity of these bonds, the receivers of the Union Traction Company be enjoined from paying interest on them. A receiver is asked for the Chicago Consolidated Company.

TWO INTERESTING AIR-BRAKE PUBLICATIONS

The Westinghouse Traction Air-Brake Company has commenced the publication of two valuable circulars, in bulletin form, in regard to all of its classes of brakes for street railway service, and which promise to be of the greatest interest and value. One of these is of the regular catalogue form and is issued with binding edges, so that it can be kept in a patent binder, similar to the bulletins published by the Westinghouse Electric & Manufacturing Company and other prominent corporations. The typographical work on the bulletin is of a very high grade, and its object is to illustrate new designs of pumps, compressors, valves and other parts of the large number of types of street railway brakes manufactured by the company. In this way the bulletin fulfills the requirements of a commercial catalogue, which, by the monthly system of publication adopted, is always up to date.

The second publication is a series of instruction pamphlets, each devoted to a different type of brake or part of the apparatus. These pamphlets, like the catalogue, are issued to bind in a flexible binder, and are intended for the use of the brake inspectors on the different roads. The object of having a number of pamphlets is so that the manual is not encumbered by descriptions and instructions about apparatus which is not used. The practical nature of the bulletins can be obtained from some of the titles of the different pamphlets, which include "Leverage" "Operating Valves," "Piston Travel," "Reservoirs," "Brake Inspection and Maintenance," and "A Chapter of Don'ts."

THE TEST OF CAR-HOUSE SPRINKLERS IN NEWARK

The test conducted by the Underwriters' Electrical Bureau, of New York, at the Belleville avenue car house of the Public Service Corporation in Newark, on the value of automatic sprinklers in extinguishing fires, was held Dec. 2 and was very successful. The Belleville avenue car house measures 80 ft. x 150 ft., contains seven tracks and has a wooden truss roof. Several of the tracks were equipped with automatic sprinklers, which were arranged to throw the water both on the roof of the car and through the windows. The first test conducted was that on a car with the windows closed and the doors open and with other cars on each side. The fire was started by paper distributed under the seats. The second test was on a car in the middle of the rear row of cars with the windows open. The third test was on the middle car of a side row, in which two car windows on opposite sides in front were open and the remaining windows closed. This car contained wood and shavings saturated with kerosene oil. At the termination of each test, there was an exhibit of the system of water distribution, during which the sprinkling heads on each side of the car and those above the car were opened and the amount of water thrown first with city pressure and afterwards with pump pressure was noted. There was also a test with hose nozzles in the front and rear of the building.

The tests were inspected by a large number of railway managers and engineers including C. Loomis Allen, of Utica; C. C. Lewis, of Schenectady; W. Boardman Reed, of New York; W. E. Harrington, of Camden; W. S. Twining and A. S. Kibbe, of Philadelphia; Messrs. Adams and Taylor, of Baltimore, and B. B. Nostrand, of Peekskill; also by the following insurance representatives, among others: E. G. Richards, manager, North British and Mercantile Insurance Company; C. F. Shallcroff, manager, Royal Insurance Company; George Hoyt, department manager, Liverpool, London & Globe Insurance Company; C. B. Smith, secretary, German-American Insurance Company; Henry E. Hess, manager, New York Fire Insurance Exchange; John M. Hughes, Newark Fire Insurance Exchange; C. A. Hexamer, manager, Philadelphia Fire Insurance Exchange; E. V. Crosby, general agent, North British & Mercantile Insurance Exchange, and representatives of every rating organization in the eastern part of the United States.

A more extended description of these tests will appear in an early issue of this paper.

HUNTINGTON TO BUILD TO SANTA ANA

Henry E. Huntington has just come into possession of about 600 acres of land at Newport Beach, and it is announced that he will at once extend his line from Huntington Beach down to Newport Beach, and from there build an 11-mile electric line to Santa Ana. This work is to be done by the Pacific Electric Railway Company. The right of way has already been secured from Huntington Beach to Newport Beach. The distance is 9 miles, and the right of way allows a double track of standard gage.

THE CHARLES N. WOOD ELECTRIC COMPANY

This company was recently organized in Boston by Chas. N. Wood, who for a number of years past was vice-president and general manager of the Frank Ridlon Company. Mr. Wood retired from the Frank Ridlon Company in the middle of November. The new company, under Mr. Wood's personal direction and management, will deal in street railway supplies, new and second-hand dynamos and motors, do all classes of electrical repair work and act as New England and Eastern agents for a number of prominent manufacturers of street railway apparatus. The Eastern business of the International Register Company, of Chicago, Ill., will be taken care of by this company. Arrangements are now pending between a number of other manufacturers and Mr. Wood to represent them in New England and the Eastern States. The main part of the new company's business, however, will center in its repair shop. A new shop is now being equipped at 246 Summer Street. It is in a new, airy, light building, with plenty of floor space—more space can be had if required—with convenient shipping facilities, excellent freight elevator service, with tools only of the best for efficient and expeditious work. P. J. Murphy, for years foreman of the Frank Ridlon shops, will have direct charge of all repair work. Those managers who have tested and are familiar with Mr. Murphy's repair work will appreciate the excellence of the class of work he will be able to turn out under new and favorable conditions.

Besides general electrical repair work, particular attention will be given to the rewinding of armatures, repairing and truing of commutators, making of armature and field coils and assembled commutator segments for street railway service. The tools, machinery, good will and business of the repair department of the Chase-Shawmut Company, of Newburyport, has been purchased outright and moved to Boston, so that the new company will start in with a well-established repair business in advance. With an excellently equipped shop under the superintendence of Mr. Murphy, and a well-organized business staff under Mr. Wood, whose wide acquaintance and straight-forward business methods are too well known to need comment here, the success of this company is assured.

STREET RAILWAY PATENTS

[This department is conducted by Rosenbaum & Stockbridge, patent attorneys, 140 Nassau Street, New York.]

UNITED STATES PATENTS ISSUED NOV. 22, 1904

775,293. Snow Plow; Elhanan Bowman, Elmwood, Canada. App. filed June 22, 1904. Details of a rotary snow plow.

775,300. Elevated Railway Switch; James Hughes, Mount Vernon, Ia. App. filed Nov. 28, 1902. Relates to a switch adapted for switching cars from a track at one level to another at a lower or higher level.

775,358. Street Car Fender; Joseph W. Wilderman, St. Louis, Mo. App. filed March 12, 1903. Connections between the fender support and frame, whereby the frame may be supported in an upper and in a lower position, an electromagnet to hold the frame in its upper position and means for de-energizing the magnet.

775,366. Folding Car Step; John A. Kratzm, Baltimore, Md. App. filed April 3, 1903. Consists of hanger devices holding step-supporting means, mechanism for operating the step-supporting means to fold and extend the latter and means for disconnecting a part of the mechanism to permit the steps to remain extended or folded.

775,528. Car Seat; Francis K. Fassett, St. Louis, Mo. App. filed Jan. 11, 1904. A walkover seat, the back of which is connected with a sliding guide plate which co-acts with a groove in the frame, a toothed sector co-acting with a fixed rack carried by the frame and a relatively movable connection between the sector, guide-plate and back.

775,529. Electrically Operated Railway Track Switch; George H. Fretts, Springfield, Mass. A switch in the trolley wire is automatically actuated simultaneously with a switch in the rail.

775,531. Trolley Pole; Willis E. Harmon, Mechanic Falls, Me. App. filed Feb. 9, 1904. A two-part, hinged trolley pole, provided with a detent which permits it to fold up when it leaves the wire and rises above it.

775,592. Insulating Support for Electric Third Rails; Walter H. Barnard, New York, N. Y. App. filed July 28, 1904. The rail-securing clamp is pivoted upon the insulator so as to be adjustable.

775,713. Hand Brake; Hayes B. Vickers, Schenectady, N. Y. App. filed June 27, 1904. Details of the worm and worm-wheel by which leverage is obtained.

775,743. Car for Traveling on Single-Rail Elevated Railways; Fritz B. Behr, London, England. A bogie frame for a car which is to travel on a single-line elevated railway, comprising guide-wheels, axles for the said guide-wheels, guides which are circular arcs struck from the railway, and in which the axles are free to slide, curved surfaces on the said axles and springs in compression between the surfaces and the frame.

775,777. Trolley; Edward L. Naret and Joseph R. Ernst, Morgantown, W. Va. App. filed Sept. 16, 1904. Details.

775,808. Trolley; Joseph B. Alker and James F. Tobin, Pittsburg, Pa. App. filed Jan. 26, 1904. A trolley wheel adapted to travel over the wire in a vertical position, and being held in connection therewith by a spring in the hollow end of the pole, which acts upon the harp mounted therein.

775,834. Electromagnetic Brake; Robert C. Lowry, New Westminster, Canada. App. filed Aug. 13, 1903. A bar having brake wheels at each end is pivotally mounted between the two wheels and adapted to be brought into contact with the car wheels when they are magnetized.

775,836. Traction-Increasing Device; Robert C. Lowry, New Westminster, Canada. App. filed Aug. 13, 1903. Details of construction for magnetizing car wheels.

775,837. Traction-Increasing Device; Robert C. Lowry, New Westminster, Canada. App. filed Aug. 13, 1903. A yoke in sections and extending between the axles adjacent to the wheels and encircling at its ends the axles, is wound with a magnetizing coil.

775,847. Trolley Wheel; Miles L. Mowry, Greenfield, Mass. App. filed March 14, 1904. A hard metal tread inserted in the wheel.

775,867. Trolley; William S. Stockton, Philadelphia, Pa. App. filed Aug. 18, 1904. Details.

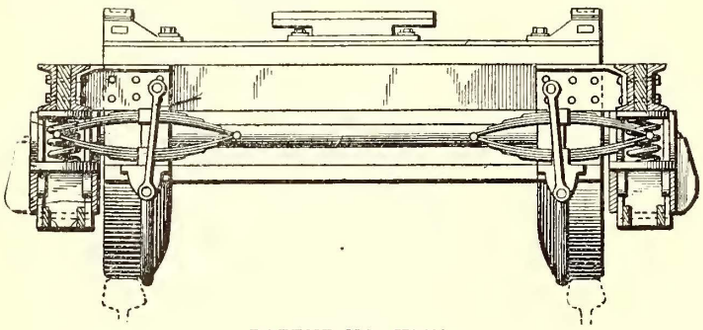
775,904. Railroad Switch; Samuel F. Kates, Salem, N. J. App. filed July 26, 1904. Means for throwing the switch from a moving car.

UNITED STATES PATENTS ISSUED NOV. 29, 1904

775,909. Method of Treating Roads to Allay Dust; Harold Bentley Anderson, Cleveland, Ohio. App. filed July 23, 1904. The surface of the road is sprinkled with a liquid comprising oil incorporated with a more volatile adulterant.

775,937. Car Fender; Luther Ridout, Memphis, Tenn. App. filed July 21, 1904. Improvements directed toward means for readily moving the fender into and out of operative position.

775,993. Guard for Trolleys; Joseph B. Short, Wilkinsburg, Pa. App. filed March 1, 1904. Details.



PATENT NO. 776,030

776,030. Truck; Edgar Peckham, Kingston, N. Y. App. filed Feb. 24, 1902. A sidebar composed of spaced members having corresponding portions of each curved or disked outwardly in opposite directions, whereby sockets are formed there between for the reception of spring-pockets.

776,064. Trolley; William A. Holland, London, Ohio. App. filed Dec. 11, 1903. The trolley has a swivel connection with the pole to permit free movement to accommodate deflections in the wire and automatic means for restoring the wheel to its proper position in alignment with the pole when it leaves the wire.

776,220. Controller for Electrical Vehicles; Henry H. Cutler, Milwaukee, Wis. App. filed April 15, 1903. Novel apparatus relating to means for throwing signals and locking them against disturbance.

776,353. Automatic Switch; Edwin H. Saunders, Proctorville, Ohio. App. filed July 8, 1904. Relates to that class of switch adapted to be preliminarily set for operation by the wheel of a car and then operated or not, as desired, by means under control of the motorman.

776,374. System of Electrical Distribution; Bion J. Arnold, Chicago, Ill. App. filed Dec. 17, 1901. A polyphase system of distribution for railways, wherein successive sections of a trolley wire are connected to different leads of the polyphase system to thereby equalize the load on said lead. The invention also comprises means for taking auxiliary current from the mains when it is desired.

PERSONAL MENTION

DR. LEONARD F. PITKIN, surgeon of the Interborough Rapid Transit Company, of New York, is dead.

MR. LOUIS H. MUTHART has resigned as superintendent of the Philadelphia & Easton Electric Railway Company, because of ill health.

MR. RAY WORLEY has been appointed general ticket agent at Cleveland for the interurban roads using the union station in that city, to succeed Mr. J. C. Mengensdorf.

MR. JOHN McGRATH, at present with the Columbus, Delaware & Marion Railway Company, of Columbus, has been appointed superintendent of construction for the Marion-Bucyrus Railway & Light Company, which is preparing to build a line from Marion to Bucyrus, Ohio.

MR. J. A. BRETT, formerly general manager of the Electrical Installation Company, of Chicago, has allied himself with the Westinghouse Electric & Manufacturing Company's Chicago office, and will hereafter devote himself exclusively to the railway department of the company in that city.

MR. JOHN B. McDONALD has resigned from the Interborough Rapid Transit Company and the Rapid Transit Construction Company, of New York, as a director, and Mr. James H. Hyde, vice-president of the Equitable Life Assurance Society, has been elected to succeed him in these companies. Mr. McDonald was banquetted in New York Thursday evening, Dec. 1, at the Manhattan Club, and on Saturday, Dec. 3, was the guest of honor at a dinner given in the Hotel Belvedere in Baltimore. Some two hundred and twenty-nine members attended the club function in New York. A bronze statue by Gasq, 4 ft. high, and representing "Victory" was presented to Mr. McDonald as a gift from his fellow-members in the club.

MR. WILLIAM BARCLAY PARSONS has resigned as chief engineer of the New York Rapid Transit Commission to open an office in the city as a general consulting engineer. Mr. Parsons expects to go to Panama about Jan. 1 in connection with his duties as a member of the Canal Commission.

MR. R. B. DAVIS, who has been connected with the Connecticut Railway & Lighting Company for the past four years as roadmaster, with headquarters at Bridgeport, Conn., has resigned that position to become superintendent of construction and maintenance of way with the Mexico Electric Tramways Company of Mexico City.

MR. C. E. WARWICK, superintendent of the Hamilton division of the Cincinnati, Dayton & Toledo Traction Company, of Hamilton, Ohio, has resigned to accept the position of superintendent of a traction company at Galveston, Texas. He will be succeeded by Mr. Charles A. Hamilton, who has been with the company in another capacity.

MR. L. H. McINTIRE, general manager of the Sheffield Company, under whose personal direction the electric street railway between Tuscumbia, Sheffield and Florence, Ala., has been built, and a system of waterworks and electric lights has been installed, all within the last fifteen or eighteen months, has resigned his position as general manager of the company.

MR. JAMES W. LEAHY, who for many years was in charge of the North Jersey Street Railway Company's lines in Hudson County as roadmaster, and who occupied a similar position with the Public Service Corporation when it took over the North Jersey's property, has been promoted to the position of superintendent of maintenance of way, having charge of all tracks.

MR. FRANK E. SCOVILL, retiring superintendent of the Austin Electric Railway Company, of Austin, Tex., was recently presented with a gold watch by the employees of the company as a token of their esteem. In addition to this, his personal friends and acquaintances presented him with a diamond shirt stud. Mr. Scovill is to become connected with the Laredo, Electric & Railway Company, of Laredo, Texas.

MR. M. R. McADOO, of New York, has just been elected president of the Winnebago Traction Company, of Oshkosh, Wis., instead of general manager of the company, as stated in the last issue of this paper. This road is now controlled by the McMillen interests, and Mr. McAdoo will continue to make his headquarters in New York, and will direct the policy of the company from this city. The new general manager of the company is Mr. E. B. Kirk, who will assume his duties Dec. 14.

MR. HENRY SANDERSON formally announced his resignation as president of the New York Transportation Company Nov. 30, an office which he has held since April 9, 1900. He is to be succeeded by Mr. R. W. Meade, formerly of the New York City Railroad Company. Mr. Sanderson's resignation was the result of his decision to enter the firm of Edey, Brown & Sanderson, recently formed to do a general banking and brokerage business as members of the New York Stock Exchange. He will remain a director and member of the executive committee of the New York Transportation Company. On the evening of Nov. 30, Mr. Sanderson was tendered a farewell dinner by the executive staff and employees of the company, at which they gave him a testimonial in the form of a handsome desk set of Tiffany bronze, and engrossed resolutions. Mr. H. H. Vreeland made the presentation speech.

MR. RICHARD W. MEADE, assistant to the president of the New York City Railway Company, has resigned that office and has been elected president of the New York Transportation Company, vice Mr. Henry Sanderson, resigned. Mr. Meade assumed the duties of his new office on Dec. 1. The executive work previously performed by him on the New York City Railway will hereafter devolve upon Mr. Frank S. Gannon, vice-president, whose duties have also been recently enlarged so as to include a considerable amount of the purchasing. Although Mr. Meade is a young man, he has had an extended experience in railroading, all of which was with steam railroads until Feb. 1, 1902, when he accepted the position with the New York City Railway Company which he has just resigned. His previous work included that of secretary to the general manager of the New York Central Railroad and general foreman of the same company at Sixtieth Street, the chief terminal of the company for the distribution and lighterage of carload freight. Mr. Meade is also secretary of the American Street Railway Manufacturers' Association, and in this position was able to contribute greatly to the success of the St. Louis convention of the American Street Railway Association last October.